Answers to questions prescribed by medical state boards / by Robert B. Ludy.

Contributors

Ludy, Robert B.
Francis A. Countway Library of Medicine

Publication/Creation

Philadelphia : John Jos. McVey, 1907.

Persistent URL

https://wellcomecollection.org/works/dxs5pcue

License and attribution

This material has been provided by This material has been provided by the Francis A. Countway Library of Medicine, through the Medical Heritage Library. The original may be consulted at the Francis A. Countway Library of Medicine, Harvard Medical School. where the originals may be consulted. This work has been identified as being free of known restrictions under copyright law, including all related and neighbouring rights and is being made available under the Creative Commons, Public Domain Mark.

You can copy, modify, distribute and perform the work, even for commercial purposes, without asking permission.

wellcome collection

Wellcome Collection
183 Euston Road
London NW1 2BE UK
T +44 (0)20 7611 8722
E library@wellcomecollection.org
https://wellcomecollection.org

6. G. 327.

Digitized by the Internet Archive
in 2012 with funding from
Open Knowledge Commons and Harvard Medical School

http://www.archive.org/details/answerstoquestio1907ludy

ANSWERS

TO

QUESTIONS PRESCRIBED

BY

MEDICAL STATE BOARDS

BY

ROBERT B. LUDY, M.D.,

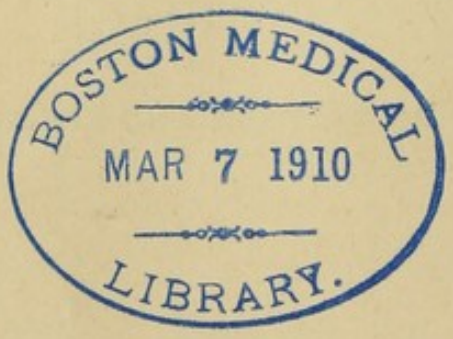
LATE ACTING-ASSISTANT SURGEON, U. S. A.; LECTURER ON PRACTICE OF MEDICINE IN TEMPLE COLLEGE OF PHILADELPHIA; AUTHOR OF "ANSWERS TO QUESTIONS PRESCRIBED BY DENTAL STATE BOARDS;" "ANSWERS TO QUESTIONS PRESCRIBED BY PHARMACEUTICAL STATE BOARDS," ETC.

THIRD EDITION, REWRITTEN AND ENLARGED.

PHILADELPHIA:
JOHN JOS. McVEY.
1907

6 B327
8676 B

Entered according to the Act of Congress, in the year 1907,
BY JOHN JOS. McVEY,
In the Office of the Librarian at Washington, D. C.



PREFACE TO THIRD EDITION.

THE large sale of this work has permitted the early preparation of a third revision. The entire text has been carefully scrutinized, corrected where necessary, revised and abbreviated where improvement could be made, and added to by the incorporation of recent examination questions and answers. This third edition has been edited throughout by Charles Platt, M. D., Ph. D. ROBERT B. LUDY.

PREFACE TO SECOND EDITION.

THE indorsement of the first edition of this book by teachers and students, as shown by numerous expressions of approval, as well as by its rapid sale, is extremely gratifying to the author and seems to warrant its continuance.

All new State Board questions which have appeared since the publication of the first edition have been added. It is hoped that the careful revision to which the work has been subjected has eliminated the errors which appeared in the first edition.

Everything has been sacrificed to brevity and accuracy, so that students will find the book indispensable in preparing for college, hospital, army and navy examinations in the shortest possible time.

Many persons having an adequate knowledge of the subject in which they are tested, fail because of their inability to interpret properly the intents and purposes of the questions to be answered by them. To aid in this, as well as to afford a convenient manual for the general preparation of medical students in their work, is the sole object of this book.

Having collected a large number of questions from different states, it was found that duplications occurred ranging from 30% to 80%, varying according to the several subjects. Thus a comprehensive knowledge of these questions and answers will serve excellently in the preparation of future examinations before such Boards.

In order to secure a critical interpretation of the questions, and concise, yet complete, answers to the same, the author has been favored by the assistance of well-known specialists in their several lines, whose competence and experience give to the work a range and value impossible of attainment in the product of a single author.

To them the author makes grateful acknowledgment. The high value of their carefully prepared answers is fully appreciated by him, and will be by those into whose hands the work is committed.

ROBERT B. LUDY.

SPECIAL AUTHORS.

Herbert L. Northrop, M. D.

Professor of Anatomy, and Associate Professor of Surgery in the Hahnemann Medical College and Hospital of Philadelphia.

Wm. Harmar Good, A. M., M. D.

Demonstrator in Physiology at the Medico-Chirurgical College of Philadelphia.

Charles Platt, A. C., M. D., Ph. D., F. C. S. Lond.

Author of Platt's Medical Chemistry; Member of the American Chemical Society; Member of the Société Chimique de Paris; Honorary Fellow of the Society of Biological Chemistry of London.

W. Wayne Babcock, M. D.

Professor of Surgery and Clinical Surgery in Temple College of Philadelphia; Assistant Pathologist to the Philadelphia Hospital, and Joint Author of Vol. V., Cohen's System of Physiologic Therapeutics.

W. Hersey Thomas, M. D.

Lecturer on Surgery, Medico-Chirurgical College; Assistant Surgeon, Medico-Chirurgical Hospital.

W. A. Newman Dorland, M. D.

Associate in Gynecology, Philadelphia Polyclinic; Assistant Obstetrician, Hospital of the University of Pennsylvania; Author of "Modern Obstetrics," System of American Medical Dictionaries, etc.

Thomas L. Coley, M. D.

Assistant Visiting Physician and Chief of Medical Dispensary, Methodist Episcopal Hospital; Associate Editor Therapeutic Monthly.

CONTENTS.

PAGE

I. Anatomy 9
By Herbert L. Northrop, M. D.

II. Physiology 73
By Wm. Harmar Good, A. M., M. D.

III. Hygiene 135
By Robert B. Ludy, M. D.

IV. Chemistry 173
By Charles Platt, M. D., Ph. D.

V. Pathology and Bacteriology 307
By W. Wayne Babcock, M. D.

VI. Surgery 339
By W. Hersey Thomas, M. D.

VII. Obstetrics and Gynecology 433
By W. A. Newman Dorland, M. D.

VIII. Therapeutics and Materia Medica 519
By Thomas L. Coley, M. D.

IX. Practice of Medicine 613
By Robert B. Ludy, M. D.

BOSTON MEDICAL
MAR 7 1910
LIBRARY.

ANATOMY.

What is connective tissue? Where in the body is connective tissue found?

Connective, or areolar, tissue consists of branched cells, or connective tissue corpuscles, the fibres of which interlace and form spaces or areolæ. It is freely distributed throughout the body, forms sheaths of muscles, blood vessels, nerves, etc., binds parts together and forms a generally evenly spread-out layer beneath the skin, the superficial fascia.

Into what and how far from the pyloric orifice of the stomach does the ductus communis choledochus normally open?

Into the duodenum upon its concave side (descending portion) three or four inches below the pyloric orifice.

Give the course, relations and structure of the ureter.

Begins in the upper expanded portion, the "pelvis of the kidney," passes downward behind the peritoneum upon the psoas magnus muscle, over the brim of the pelvis into pelvic cavity, forward to base of bladder, between rectum and bladder in male, ½ inch from cervix in female, then between vagina and bladder, terminating at posterior angle of trigone. It consists of three coats, fibrous, muscular and mucous.

What constitutes the brachial plexus?

The 5th, 6th, 7th and 8th cervical nerves and 1st thoracic nerve.

Mention the ligaments, fissures and lobes of the liver.

Ligaments are five in number, falciform (suspensory), round, coronary, right and left lateral; fissures are five in

number, fissure for round ligament (obliterated umbilical vein), for gall-bladder, for ductus venosus, for inferior cava, and transverse fissure; lobes are five in number, right, left, quadrate, Spigelian, caudate.

Mention the abdominal muscles. Describe any one of these muscles.

External and internal oblique, transversalis, recti, pyramidales. (Quadratus lumborum, psoas magnus and parvus, and iliacus might be included.) Internal oblique takes origin from outer half of Poupart's ligament, from anterior two-thirds of middle lip of iliac crest, from lumbar aponeurosis, from last three ribs; is inserted into linea alba and inner extremity of ilio-pectineal line behind Gimbernat's ligament. Its aponeurosis divides to form sheath of rectus for its upper three-fourths, passing in front of rectus for its lower fourth. The line of this division of internal oblique is called linea semilunaris; internal oblique unites with transversalis to form conjoined tendon. Action is to flex thorax upon pelvis, or *vice versa,* to rotate trunk toward same side, and to compress abdominal viscera.

Locate the principal groups of lymphatic glands.

Inguinal (superior and inferior), axillary and cervical (superficial and deep).

Give the anatomy of the true vocal cords.

Are two in number, formed by crico-thyroid membrane, attached to retiring angle of thyroid cartilage anteriorly and to vocal process of arytenoid cartilage posteriorly; have thyro-arytenoid muscle along their outer side. They are covered by mucous membrane, which is closely attached and thin, and consisting of stratified, squamous epithelial cells.

Give the point of opening of the parotid duct, of the submaxillary duct and of the sublingual duct.

Parotid duct, in cheek wall opposite middle upper molar tooth; of submaxillary duct, in frænum linguæ; sublingual duct, close to frænum linguæ.

Describe the ischiorectal fossae and their contents.

Are located between the lower part of the rectum and the ischial tuberosities; are triangular in shape, bounded internally by sphincter ani, levator ani and coccygeus muscles; externally by tuberosity of ischium; are filled with adipose tissue; in outer wall is internal pudic artery; crossing the space are inferior hemorrhoidal vessels and nerves.

State origin, course, and distribution of sixth cranial nerve.

Superficial origin, from groove between medulla and pons; course, forward through cavernous sinus, exit from cranial cavity by sphenoidal fissure; distribution to external rectus of eye.

Give the relations of the right kidney.

Rests upon quadratus lumborum and psoas magnus muscles, is in contact with under surface of right lobe of liver, has duodenum and ascending colon in front.

Describe the right ventricle of the heart.

Is placed mostly upon anterior aspect of heart, does not extend to apex, is crescentic in cross-section, contains tricuspid valve, which guards right auriculo-ventricular opening, to left and front of which is conus arteriosus leading up to pulmonary orifice, which is guarded by pulmonary semilunar valves, contains columnæ carneæ, musculi papillares and chordæ tendineæ.

Describe endothelium.

Irregular, flattened (squamous) cells, attached edge to edge, resting on basement membrane.

Describe the external carotid artery.

One of the two terminal branches of common carotid, given off at level of upper border of thyroid cartilage, extends up neck, passes into parotid gland, where it terminates by dividing into superficial temporal and internal maxillary arteries. Branches are: Ascending pharyngeal, to lateral wall of

pharynx; superior thyroid, to larynx and thyroid body; lingual, to tongue; facial, to superficial parts of face; occipital, to post-cervical and occipital regions; posterior auricular, to external and middle ear; superficial temporal, to scalp; internal maxillary, to deep parts of face and by middle meningeal (through foramen spinosum of sphenoid), to inner skull wall and dura.

What muscles form the calf of the leg? Describe any one of these muscles.

Gastrocnemius and soleus. Gastrocnemius takes origin by two heads from internal and external condylar ridges of femur; these heads unite, join the soleus, thus forming the tendo Achillis, which is inserted into the posterior extremity of the os calcis.

Describe the thyroid gland.

It consists of right and left lobes connected by an isthmus across 2d, 3d and 4th rings of trachea; has a capsule and trabeculæ enclosing closed follicles, which contain colloid material.

Give a comprehensive description of any one of the long bones of the body.

The humerus possesses a shaft and two extremities. The upper end has a head which is hemispherical and articulates with glenoid cavity of scapula. Just below it is the anatomical neck, to which the capsule of the shoulder-joint is attached. Then come the greater and lesser tuberosities, serving for the attachment of muscles, while below them is the surgical neck. The bicipital groove and ridges extend downward between the two tuberosities, and also serve for the insertion of muscles. Upon the posterior surface of the shaft is the musculo-spiral groove. Rough impressions are found upon the outer and inner aspects of the shaft for the deltoid and coraco-brachialis muscles respectively. The lower end is expanded laterally, to receive the radius and ulna, and supports the outer and inner condyles. The articular surface is di-

vided into a capitellum externally for the head of the radius, and a trochlea internally for the greater sigmoid cavity of the ulna. Above the trochlear surface is the coronoid fossa anteriorly, and the olecranon fossa posteriorly.

Into what two great classes are muscles divided? Give a macroscopic and a microscopic description of each.

Voluntary and involuntary. The voluntary muscles number about 311 in the body. The fibres are bound into bundles by connective tissue (perimysium), and are attached to bones, ligaments or integument by bands of white fibrous tissue called tendons. The involuntary muscular tissue is found throughout the greater part of the wall of the alimentary tract, in the walls of the arteries and veins, and in the uterus. The microscopic appearance of a voluntary fibre is one that is transversely striated, with a sarcolemma (sheath) inclosing the sarcous elements. The involuntary fibre is fusiform, is longitudinally striated, and possesses a centrally placed nucleus.

Describe the right and the left subclavian vein.

The right subclavian vein rests on the first rib in front of the scalenus anticus muscle, and is a continuation of the axillary vein; just below and behind the sterno-clavicular joint it unites with the internal jugular vein to form the right innominate vein. The left subclavian vein does not differ materially from the right; at the junction of subclavian and internal jugular on the left side the thoracic duct terminates. The subclavian veins receive the blood from the upper extremities, shoulders, chest wall and superficial area of face and neck.

Mention the flexor muscles of the forearm and describe one of them.

Flexor carpi radialis, flexor carpi ulnaris, flexor sublimis digitorum, flexor profundus digitorum, flexor longus pollicis. Flexor profundus digitorum takes origin from upper ¾ of shaft of ulna, from coronoid process and from interosseous

membrane; is inserted by 4 tendons into last phalanx of each finger; action, to flex last phalanx.

Compare aponeuroses with tendons.

Aponeuroses are broad, flat sheets of fibrous tissue to which muscular fibres are attached, serving as tendons of insertion for these fibres. Tendons are rounded (cord-like) or narrow (ribbon-like) bundles of fibrous tissue attaching muscles to bones or forming ligaments of joints (shoulder, hip).

Give the number of the cervical vertebrae and mention the marked characteristics of such of these vertebrae as are in any way peculiar.

Seven. The atlas is a ring with two lateral masses supporting a superior and an inferior pair of articular processes; it has no spinous process; the axis has an odontoid process on the upper surface of its body; the 7th vertebra has a long spine, hence its name, the vertebra prominens.

Name the bones of the head.

Occipital, 2 parietals, frontal, 2 temporals, sphenoid, ethmoid, 2 nasal, 2 lachrymal, 2 inferior turbinals, vomer, 2 maxillæ, 2 palate, 2 malar, mandible.

Describe the acetabulum.

Is formed by union of ilium, ischium and os pubis; has horseshoe-shaped articular surface and non-articular depression at bottom; cotyloid notch is below and in front; is deepened by cotyloid ligament in recent state attached to rim.

Name the seven muscles of the orbit.

Levator palpebræ superioris, superior, inferior, external, internal recti, superior and inferior oblique.

Where is the compressor urethrae muscle?

Between the two layers of triangular ligament and surrounds membranous urethra.

Describe the origin and distribution of the optic nerves.

They arise from the optic commissure, pass out of cranial

cavity with ophthalmic artery through optic foramen, pierce sclerotic and choroid coats of eyeball to nasal side of posterior pole and are distributed to retinæ.

What is the solar plexus?

A neuro-ganglionic collar of the sympathetic nervous system surrounding celiac axis, from which nerve trunks accompany arterial branches to supply all abdominal viscera.

Name the foramina at the base of the skull, and the structures transmitted through each.

Foramen magnum: Spinal cord, meninges, spinal accessory nerves, vertebral arteries. Posterior condyloid (inconstant): Veins. Anterior condyloid (2): Hypoglossal nerves. Mastoid: Emissary vein. Internal auditory meatus: Auditory and facial nerves, auditory artery. Jugular foramen: Lateral and inferior petrosal sinuses, glosso-pharyngeal, pneumogastric and spinal accessory nerves. Hiatus Fallopii: Great superficial petrosal nerve. Middle lacerated foramen: Internal carotid artery, sympathetic plexus. Foramen spinosum: Middle meningeal artery. Foramen ovale: Mandibular division of sensory root of fifth cranial nerve and motor root of fifth. Foramen rotundum: Maxillary division of fifth. Vidian canal: Vidian nerve. Optic foramen: Optic nerve and ophthalmic artery. Sphenoidal fissure: Motor oculi, trochlear and abducens nerves, ophthalmic division of fifth, ophthalmic vein. Olfactory foramina: Olfactory nerves.

Describe the female urethra as to (a) location, (b) dimensions, (c) structure.

Is located anterior to vagina, extending from internal urinary meatus (neck of bladder) to external urinary meatus in vestibule, close to anterior margin of vaginal orifice. It is 1½ inches long and quite dilatable. Is lined with mucous membrane (squamous epithelium, stratified) which is thrown into longitudinal folds, and is surrounded by an areolar coat and by muscular layers containing inner longitudinal and

outer circular fibres, with an abundance of yellow elastic tissue and many vessels, especially veins.

What is contained in the right hypochondriac region?

Part of right lobe of liver, part of gall-bladder, part of ascending colon, hepatic flexure, part of right kidney.

What muscles form the tendo Achillis, and where is the tendon inserted?

Gastrocnemius and soleus; inserted into posterior part of os calcis.

What forms the internal malleolus of the ankle-joint?

The lower end of the tibia.

Describe the bones of the foot, giving their divisions and articulations.

Tarsus consists of os calcis, astragalus, cuboid, scaphoid, cuneiform bones (internal, middle and external); metatarsus consists of five bones; phalanges number fourteen. Astragulus articulates with tibia, fibula, os calcis, scaphoid. Os calcis articulates with astragalus, cuboid. Scaphoid articulates with astragalus and three cuneiform bones. Cuneiform bones articulate with scaphoid behind, with each other laterally, and with first, second, third and fourth metatarsal bones in front. Metatarsals articulate with three cuneiform and cuboid behind, with each other, and with first phalanges. Phalanges articulate with metatarsals and with each other.

Name the articulations of the occipital bone.

Atlas, two parietals, two temporals, sphenoid.

What are the special characteristics of the left ventricle of the heart?

It forms the apex of the heart; its wall is thicker than that of the right ventricle; its musculi papillares are fewer in number and larger; auriculo-ventricular valve (mitral) is made up of two segments.

Describe the auditory apparatus.

Consists of three divisions, viz., external, middle and internal ear. Auricle is attached to temporal bone, is made up of elastic cartilage, leads into external auditory meatus, at bottom of which is obliquely placed membrana tympani. Middle ear is narrow cavity in petrous bone, Eustachian tube connecting it with the naso-pharynx; mastoid antrum is in upper posterior part, leading into mastoid cells; it is lined with mucous membrane. The internal ear consists of osseous labyrinth containing membranous labyrinth, and is made up of vestibule, cochlea and three semicircular canals. To membranous labyrinth auditory nerve is distributed.

Mention the sutures at the vertex of the skull and state what bones they unite.

Sagittal suture, uniting the two parietal bones; lambdoid, uniting occipital with both parietals; coronal, uniting both parietals behind with frontal anteriorly.

Mention and describe the salivary glands.

Parotid, submaxillary, sublingual. Parotid, largest, placed in front of ear, behind ramus of mandible; duct (Steno's) passes across masseter muscle, perforates buccinator muscle, terminates in cheek wall opposite upper middle molar. Parotid has facial nerve, external carotid artery, temporo-maxillary vein passing through it.

Submaxillary gland is located upon inner side of body of mandible posteriorly, is crossed by facial artery; duct (Wharton's) passes forward, terminating close to frænum linguæ.

Sublingual gland, located in shallow fossa upon inner side of body of mandible, near symphysis, is covered by mucous membrane of mouth; ducts (Bartholin's) terminate near frænum linguæ.

Mention any one muscle which moves the humerus (a) forward, (b) backward, (c) inward.

(a) Coraco-brachialis; (b) posterior fibres of deltoid; (c) latissimus dorsi.

What would be the collateral circulation if the brachial artery were ligated below its profunda branches?

Superior and inferior profunda above, anastomotica magna, radial and ulnar (anterior and posterior) recurrent below.

Describe the Meibomian glands.

Sebaceous glands embedded in posterior surface of tarsal plates of eyelids, consisting of single duct with closely attached acini, orifices of ducts terminating in single row of apertures along posterior lid-margin.

Give location and a description of the tubercula quadrigemina.

Located upon upper surface of crura cerebri, just behind third ventricle and beneath posterior part of velum interpositum; nates anterior to testes. They consist of gray matter externally, white internally, and are connected with brachia of optic tracts.

Describe the renal blood circulation.

Arterial blood enters sinus through hilum by means of renal artery, branches of which pass between Malpighian pyramids to cortico-medullary junction, where they form transverse branches which send arterioles into cortical and medullary portions of kidney, forming glomeruli in the former, and plexuses around the uriniferous tubules in the latter. The veins collect the blood from these parts, form cortico-medullary branches and pass through medullary portion between pyramids, leaving kidney through sinus as renal vein.

Mention the muscles attached to the great trochanter of the femur.

Gluteus medius and minimus, pyriformis, obturator internus, gemellus superior and inferior, obturator externus.

What arteries, muscles and nerves would be severed in a cross-section at the middle of the humerus?

Brachial, superior and inferior profunda; biceps, triceps,

insertions of deltoid and coraco-brachialis, origin of brachialis anticus; musculo-cutaneous, internal cutaneous, median, ulnar, musculo-spiral.

Describe the vagina.

Begins at vulvar aperture, extends upward and backward in axis of outlet of pelvis, surrounds cervix uteri, reaching higher up on cervix posteriorly than anteriorly, is lined with laminated squamous cells, has large venous plexuses in submucosa, contains circular (within) and longitudinal (without) involuntary muscle fibres. Bladder and urethra are in front, rectum is behind. Peritoneum covers upper posterior wall.

Differentiate synarthrosis, amphiarthrosis, and diarthrosis, giving an example of each.

Synarthrosis is an immovable joint consisting of two bones placed edge to edge with little or no fibrous tissue intervening; example, lambdoid suture. Amphiarthrosis is joint permitting of slight motion, made up of two bones with intervening fibro-cartilaginous plate or disk and held together by ligaments; example, joints formed by bodies of vertebræ and intervertebral disks. Diarthrosis is freely movable joint, consisting of two or more bones with articular surfaces covered with hyaline cartilage and surrounded by ligaments lined with synovial membrane; example, hip-joint.

Describe the shoulder-joint.

Variety, enarthrodial (ball-and-socket); bones, glenoid fossa of scapula, head of humerus; ligament, capsular, which is intimately blended with tendons of insertion of sub-scapularis, supraspinatus, infraspinatus and teres minor muscles; tendon of long head of biceps passes within capsule over humeral head, and is surrounded by synovial membrane; movements, flexion, extension, abduction, adduction, rotation and circumduction.

Give the origin, insertion, action and nerve supply of

any one of the following muscles: superior oblique, masseter, trapezius.

Trapezius, origin from external occipital protuberance, inner third of superior curved line of occipital bone, ligamentum nuchæ, spine of seventh cervical vertebra, spines of all thoracic vertebræ; insertion into posterior border, outer third of clavicle, inner margin of acromion and entire upper border of spine of scapula; action, to retract head, to approximate scapulæ, to elevate point of shoulder, to assist serratus magnus in rotating scapula, as in act of carrying arm to upright vertical position; nerves, spinal accessory, third and fourth cervical.

Give the origin, main branches and relations of any one of the following arteries: external carotid, axillary, femoral.

Axillary artery is continuation of subclavian from outer border of 1st rib, extends to lower border of axilla (teres major muscle) in line indicated by coraco-brachialis muscle (inner border), lying behind and above axillary vein; outer cord of brachial plexus is above it, inner cord is below it, posterior cord is behind it, median nerve lies upon it; pectoralis minor muscle crosses it in front, pectoralis major is anterior to first and third portions; branches are superior thoracic, acromial thoracic, long thoracic, alar thoracic, subscapular, anterior and posterior circumflex.

Describe the course of the nerve fibres in the optic commissure.

Fibres upon its posterior surface (Gudden's commissure) have nothing to do with sight, and unite posterior quadrigeminal bodies (testes); middle fibres decussate, those from right optic tract passing to left optic nerve and *vice versa,* to terminate in nasal half of retina; outermost fibres of each tract do not decussate, but pass into optic nerve to be distributed to temporal half of retina of same side.

Give the origin, course and distribution of the great sciatic nerve.

Origin from lower lumbar and upper sacral nerves (sacral plexus; course, through great sacro-sciatic foramen below pyriformis muscle, from beneath lower margin of gluteus maximus midway between trochanter major and tuber ischii, rests upon adductor magnus and divides about middle of thigh into internal and external popliteal nerves; it supplies semitendinosus, semimembranosus, adductor magnus and biceps. Internal popliteal is continued down leg as posterior tibial, distributed to back of leg and sole of foot; external popliteal curves around below head of fibula to front of leg, becoming anterior tibial to front of leg and dorsum of foot.

Describe the great omentum.

Made up of double fold of peritoneum, extending from greater curvature of stomach downward for variable distance, then returning, surrounds transverse colon. It contains between its layers more or less adipose tissue.

Give the gross and the topographic anatomy of the pancreas.

The " abdominal salivary gland " is located in upper posterior part of abdomen, behind stomach, in front of vertebral column and left kidney, and to right of spleen. Is elongated, soft in consistency, made up of lobules held together by connective tissue, is pinkish in color, and is divided into tail, body and head, the latter embraced by curve of duodenum. Is supplied by branches from splenic artery, which courses along upper border. Its duct, extending throughout the length of the gland, terminates with common bile duct in descending portion of duodenum.

Locate and describe the pericardium.

Fibro-serous sac surrounding heart, pyramidal, with base attached to central tendon of diaphragm, apex corresponding to great vessels at base of heart, and connected with deep

cervical fascia by fibrous prolongations upward. Outer layer fibrous, lined with parietal serous layer, which is reflected upon heart and vessels at its base, constituting the visceral layer.

Describe and give the anatomical relation of the appendix vermiformis.

Is 3½ to 4½ inches long, made up of inner mucous coat, which is thickly set with simple, tubular glands (crypts of Lieberkuhn) and covered with columnar epithelium, beneath which is a thick layer of adenoid tissue, diffused and collected into closed follicles; outside of mucous membrane is submucosa, with plexuses of vessels and nerves; next comes muscular layer, having thick, inner circular and thinner, outer longitudinal layer; the peritoneum surrounds the appendix and forms a meso-appendix, usually extending along one-half the length of the organ; in this the appendicular artery (branch of ileo-colic) courses; arterial supply is of the end-artery variety; the nerves are branches of the superior mesenteric plexus of the sympathetic system. The appendix is attached to the cecum, usually depending from its inner and posterior aspect, not far from ileo-cecal junction; it may extend in any direction. In the female a fold of peritoneum is continued from the broad ligament to the meso-appendix (appendiculo-ovarian ligament), and conveys a branch of the ovarian artery.

Describe Poupart's ligament, naming its anatomical relations and uses as a surgical guide.

Is formed by aponeurosis of external oblique muscle blending with fascia lata, and extends, slightly curved downward, from anterior superior iliac spine to pubic spine; a reflected portion, Gimbernat's ligament, is attached to pubic end of iliopectineal line, forming inner margin of femoral (crural) ring (neck of femoral hernia). Beneath Poupart's ligament external cutaneous nerve, ilio-psoas muscle, anterior crural nerve, femoral artery and vein are located; above and to

outer side of pubic spine it forms outer pillar of external inguinal ring.

Describe the femoral artery and its branches.

Begins as continuation of external iliac beneath middle of Poupart's ligament, extends downward, bisecting Scarpa's triangle, through Hunter's canal, at lower end of which it becomes the popliteal. Branches are superficial epigastric, superficial circumflex iliac, superficial and deep external pudic, profunda, anastomotica magna, muscular.

Name the principal lobes of the brain and the fissures dividing them.

Frontal, parietal, temporal, occipital, central (island of Reil). Fissure of Rolando separates frontal from parietal; fissure of Silvius separates frontal and parietal from temporal; parieto-occipital fissure separates parietal from occipital; central lobe is found deeply placed in Sylvian fissure.

Name the twelve pairs of cranial nerves.

Olfactory, optic, motor oculi, trochlear, trigeminal, abducens, facial, auditory, glosso-pharyngeal, pneumogastric, spinal accessory, hypoglossal.

Name the bones articulating with the humerus.

Scapula, radius, ulna.

Describe the Eustachian tubes.

Two tubes connecting middle-ear with naso-pharynx. Pharyngeal orifice is usually vertical slit just above floor of nasal chamber, behind posterior naris, and bounded posteriorly by " cushion " of pharynx. Tube is formed by temporal bone in angle between squamous and petrous portions, and by coiled plate of cartilage attached to edge of bony part of tube; is lined with ciliated columnar epithelium.

Describe the diaphragm, its principal openings and nerve supply.

Dome-shaped muscle, origin from inner surface of last six

costal cartilages, posterior surface of ensiform cartilage, by two crura from bodies of lumbar vertebræ (2d to 4th), from ligamenta arcuata, external and internal. Insertion into aponeurotic central tendon, which consists of three leaflets. Aortic opening is between crura, and transmits aorta, thoracic duct and vena azygos major; esophageal opening is anterior and slightly to left of vertebral column, transmitting esophagus and both pneumogastric nerves; caval opening is in right leaflet of central tendon, and to its margins the outer coat of inferior cava is attached. Nerve supply, both phrenics.

Describe the broad ligaments of the uterus and their anatomical relations.

Double folds of peritoneum attached to floor and lateral margins of true pelvis, covering uterus anteriorly and posteriorly, reflected from it to bladder in front and to vagina behind. Between its layers are found Fallopian tubes, round ligaments, utero-ovarian ligaments, uterine and ovarian arteries and veins, lymphatics, and fetal relics. The ovaries are attached to it behind, near the pelvic brim.

Describe the crystalline lens, and state what tissues are in contact with it, and how.

Is a transparent, biconvex body, convexity being greater upon posterior surface than upon anterior; is contained in capsule, which is elastic; it consists of lens-fibres, which are derived from epithelial cells (ectoderm), arranged in layers, which are of softer consistency near the surface (cortex), more compact and dense at the center (nucleus). It is non-vascular in the adult, its nutrition being maintained by intercellular transmission of nutritive fluids. Its suspensory ligament is formed by hyaloid membrane enclosing the vitreous, and is attached to lens capsule. The lens rests in patellar fossa of vitreous, iris (pupillary margin) rests upon its anterior surface, and ciliary processes are in relation with its circular edge.

Give a brief description of the membranes of the brain.

The dura lines the cranial cavity, is adherent to the vault, sides and base, and sends processes between cerebral hemispheres (falx cerebri), between cerebrum and cerebellum (tentorium cerebelli), and between hemisphere of cerebellum (falx cerebelli); it splits to form spaces for the intima of veins, known as venous sinuses. The arachnoid, between dura and pia, is thin and delicate, and contains spaces for cerebrospinal fluid, best developed at base of brain. The pia closely invests the encephalon, dipping into fissures and sulci, sending arterial branches into cerebral substance and receiving veins from same, and passes through transverse fissure into interior of brain, constituting velum interpositum, and furnishing choroid plexuses of ventricles.

Describe the gross anatomy of the larynx.

Consists of cartilaginous framework, ligaments, muscles, and is lined with mucous membrane. Cartilages are thyroid, cricoid, two arytenoids, two cornicula laryngis and epiglottis. Thyroid is shield-shaped, projects forward as pomum Adami; cricoid is ring-shaped, is placed below thyroid, is broad posteriorly and supports arytenoids, one on each side of posterior quadrilateral portion. Epiglottis is attached by stem to angle of thyroid, and is directed upward over entrance to larynx. Crico-thyroid membrane extends from cricoid cartilage upward within thyroid, and by rounded, free edge forms true vocal bands, which extend between thyroid anteriorly and vocal processes of arytenoids posteriorly. Lateral crico-arytenoid muscles approximate vocal bands, posterior crico-arytenoid muscles separate them. Superior laryngeal artery pierces thyro-hyoid membrane to supply interior of larynx, superior laryngeal nerve is nerve of sensation to mucous membrane, and recurrent laryngeal is motor nerve to all muscles but one (crico-thyroid) supplied by superior laryngeal.

Minutely describe the relations of the peritoneum to the bladder.

Covers upper surface and sides, reflected on to rectum in

male and vagina in female; leaves anterior abdominal wall just above symphysis to form loose fold between bladder and symphysis, then passing to summit of bladder without covering its anterior wall, thus forming prevesical space (space of Retzius).

Describe the endocardium.

Is continuous with the tunica intima of the vessels at the base of the heart, lines both auricles and both ventricles, and forms, strengthened by fibrous tissue, the several valves of the heart.

What parts of the brain does the Pons Varolii connect?

Cerebellum with posterior quadrigeminal bodies (testes), one cerebellar hemisphere with the other, parts below (cord and medulla) with cerebral hemisphere above.

Name the ganglia connected with the 5th pair of cranial nerves.

Gasserian, ophthalmic, spheno-palatine (Meckel's), otic, submaxillary.

Give an anatomical description of the bronchial tubes.

Formed by division of trachea; right and left bronchial tubes pass into right and left lungs respectively at root of lung, dividing and subdividing, finally becoming bronchioles. Each consists of rings or plates of cartilage held together by an elastic membrane, and are lined by mucous membrane possessing ciliated columnar epithelial cells in larger tubes and squamous cells in smallest tubes.

Name the branches of the subclavian artery.

Vertebral, internal mammary, thyroid axis (inferior thyroid, transverse cervical, suprascapular), superior intercostal.

Describe the inguinal canal.

Is a flat-sided passage in the lower part of the inguinal region, extending between internal and external abdominal rings; its "floor" is formed by transversalis fascia meeting

Poupart's ligament; its "roof" by conjoined tendon (internal oblique and transversalis muscles); interior wall by skin, superficial fascia, aponeurosis of external oblique, internal oblique; posterior wall by transversalis fascia, pre-peritoneal fat and peritoneum. Is about 1½ inches long in adult, transmitting spermatic cord in male and round ligament in female.

If the femoral artery were obstructed at the apex of Scarpa's triangle, through what channels would the blood flow to reach the tibial artery?

Through profunda femoris and its branches, anastomosing with articular branches of popliteal.

Name the structures that maintain the bladder in position, male and female.

Recto-vesical fascia, folds of peritoneum, in both sexes; rectum in male, uterus and vagina in female.

Where are the ventricles of the larynx?

Between the true and false vocal cords.

Describe the triangle of the elbow and name the structures that pass through it.

Base directed upward, formed by line drawn between the two condyles, outer side bounded by supinator longus, inner side by pronator radii teres; floor is formed by brachialis anticus and supinator brevis. It contains brachial artery and venæ comites, radial and ulnar arteries, median and musculo-spiral nerves, and tendon of biceps.

Name the abdominal viscera partially covered by peritoneum.

Right and left suprarenal bodies, right and left kidneys, pancreas, duodenum, ascending and descending colons, rectum, bladder, uterus.

Describe the arteries and veins passing to and from the kidneys.

Renal artery, branch of abdominal aorta, enters hilum,

breaks up into branches which pass between Malpighian pyramids to cortico-medullary junction, then sending branches into cortex and medulla. Veins are similarly arranged, beginning in interior of kidney; they leave by passing through sinus and hilum, known as renal vein, to join inferior cava.

Give the anatomy of the bladder, including blood and nerve supply.

A reservoir in the pelvis, partially covered by peritoneum, consisting of involuntary muscular fibres extending in longitudinal and circular directions, a submucosa and a mucous membrane, the latter possessing transitional, squamous epithelial cells. Blood supply is from internal iliac artery, through superior, middle and inferior vesical branches; nerve supply is from pelvic plexus of sympathetic and from 3d to 4th sacral nerves.

Describe the testes.

They are two seminal glands contained within the scrotal cavity, suspended by the spermatic cord, and surrounded by a peritoneal process, the tunica vaginalis testis. Each gland consists of a fibrous stroma, the tunica albuginea, dividing the interior into compartments which contain the seminiferous tubules, the latter converging toward the posterior part of the gland, and emerging to constitute the epididymis.

Describe the structure of the prostate gland and give its anatomical relations.

It possesses a capsule of fibrous tissue, enclosing voluntary and involuntary muscle and branched tubular glands opening into prostatic urethra; base is closely applied to "neck" of bladder, circular muscular fibres of which are continued around prostatic urethra, which pierces prostate from base to apex; behind is rectum; in front is pubo-prostatic plexus of veins separating it from symphysis pubis; ejaculatory ducts pass through gland between middle and lateral lobes.

With what bones does the clavicle articulate?

Sternum, cartilage of first rib, scapula.

Give the origin and distribution of the median nerve.

Formed by branch from outer and one from inner cord of brachial plexus in axillary space, over front of axillary artery, is in close relation to brachial artery to bend of elbow, when branches are distributed to all superficial muscles in front of forearm except flexor carpi ulnaris; a branch known as anterior interosseous supplies outer half of flexor profundus, flexor longus pollicis and pronator quadratus (deep muscles); in the palm the median is distributed to integument of flexor surface of thumb, index, middle and middle-finger half of ring finger and their contiguous sides, and dorsum of distal segment of thumb and fingers (2½), motor branches to abductor and opponens pollicis, superficial head of flexor brevis pollicis and two outer lumbricales.

Where is the fissure of Sylvius and what artery does it contain?

Begins at anterior perforated space, separates frontal and parietal lobes from temporal lobe, passes upward and backward to terminate in parietal lobe; contains middle cerebral artery.

Name the branches of the brachial artery.

Superior profunda, nutrient, muscular, inferior profunda, anastomotica magna, radial and ulnar (terminals).

Name the component parts of the spermatic cord.

Spermatic artery, spermatic veins (pampiniform plexus), vas deferens, deferential artery and deferential veins, lymphatics, nerves (spermatic plexus of sympathetic).

What forms the internal hamstrings?

Tendons of semitendinosus, semimembranosus, gracilis.

Describe the location of the intercostal arteries.

In the intercostal groove near the lower border and inner surface of the rib; anteriorly it occupies the upper part of the intercostal space.

What bone forms the heel and with what does it articulate?

Os calcis; with astragalus and cuboid.

What arteries supply the heart with blood, and where do they originate?

Coronary (2), springing from arch of aorta just above sinuses of Valsalva of aortic semilunar valve.

Name the structures located in the inguinal canal and give their anatomical relations.

Spermatic cord in male, round ligament in female. Are in relation with walls of inguinal canal, which are, anterior, external oblique aponeurosis entire length, conjoined tendon (internal oblique, transversalis) for outer third; posterior, transversalis fascia and, at inner end, insertion of conjoined tendon; floor is formed by Poupart's ligament and transversalis fascia; roof by arched fibres of conjoined tendon.

Describe the thoracic duct.

Begins upon body of second lumbar vertebra in dilated pouch called receptaculum chyli, passes through aortic opening in diaphragm, then through posterior mediastinum, and at base of neck arches to left, terminating at junction of left subclavian and internal jugular veins. It drains the lymph from all parts of body except right upper extremity, right side of head and neck, right half of thorax (right lung and right side of heart) and upper surface of liver.

Describe the pleura.

A closed serous sac lining the thoracic wall (parietal layer), from which it is reflected to the lung, investing it (visceral layer), dipping into the fissures and sending process from root of lung to diaphragm (ligamentum latum pulmonis).

Name the seven openings into the pharynx.

Two posterior nares, two Eustachian orifices, mouth, larynx, esophagus.

Locate and describe the spleen.

Is in the left hypochondriac region, dorsally, to left of fundus of stomach and to left of tail of pancreas; is in contact with under surface of diaphragm, which separates it from 8th, 9th, 10th and 11th ribs. It has convex outer surface, antero-internal and postero-internal surfaces, is entirely covered by peritoneum, at hilum splenic artery breaks up into branches to enter gland (ductless) and splenic vein leaves interior. Anterior border is notched; capsule invests it and sends trabeculæ into interior at hilum, dividing it into compartments, or areolæ, which contain splenic pulp. Wall of arteriole becomes thickened with lymphoid material, which thickenings are known as Malpighian corpuscles. Minute arterioles terminate abruptly in areolæ, where blood mixes with splenic pulp. Color of spleen is purple.

What bones make up the pelvis? Give the gross anatomy of the bony pelvis.

Two ossa innominata (ilium, ischium, os pubis), sacrum and coccyx. Bony pelvis consists of upper expanded portion called the false pelvis, and lower slightly cordiform cavity known as the true pelvis. The true pelvis has inlet, cavity and outlet, conjugate (antero-posterior), transverse and oblique diameters.

Mention the muscular and the ligamentous attachments of the patella.

Quadriceps extensor femoris (rectus, vastus internus and externus, crureus); ligamentum patellæ.

Describe the wrist-joint.

Is formed by radius and triangular cartilage above, scaphoid, semilunar and cuneiform below. (Ulna is separated from cuneiform by triangular interarticular cartilage, hence is excluded from wrist-joint). Ligaments are anterior and posterior, external and internal lateral. Movements are flexion, extension, abduction, adduction, circumduction.

What muscles assist in mastication? In deglutition?

(a) Temporal, internal and external pterygoids, masseter. (b) Mylo-hyoid, digastric, stylo-hyoid (first part of act); omo-hyoid, sterno-hyoid, sterno-thyroid, thyro-hyoid (second part of act).

State (a) the nerve supply of the rectum, (b) the blood supply of the rectum.

(a) Sympathetic branches from inferior mesenteric and hypogastric; plexuses inferior hemorrhoidal, branch of internal pudic. (b) Superior and middle hemorrhoidal arteries, branches of inferior mesenteric and anterior trunk of internal iliac respectively; inferior hemorrhoidal, branch of internal pudic.

Describe the internal jugular vein.

Is formed just below jugular foramen by lateral and inferior petrosal sinuses; courses down neck beneath anterior border of sterno-cleido-mastoid muscle, in a common sheath with the internal carotid (above), common carotid (below), and pneumogastric nerve, the latter behind and between, and the artery to the inner side of the vein, which partially overlaps the artery. Behind sternal end of clavicle it unites with subclavian to form innominate vein.

With what bones does the radius articulate?

Humerus, ulna, scaphoid and semilunar.

Name the branches of the abdominal aorta.

Two phrenics, celiac axis (brs. gastric, hepatic, splenic), superior and inferior mesenteric, suprarenals, renals, lumbar arteries (4), spermatic or ovarian, middle sacral and right and left common iliacs.

What are the anterior and posterior boundaries of the axilla, and what arteries and nerves pass through it?

Anterior boundary: Pectoralis major and minor. Posterior boundary: Subscapularis, teres major and latissimus

dorsi. Arteries passing through: Axillary and its branches (superior thoracic, acromial thoracic, long thoracic, alar thoracic, subscapular, anterior and posterior circumflex). Nerves passing through: Brachial plexus, consisting of outer, middle and inner cords, with branches as follows: Musculo-cutaneous, internal and lesser internal cutaneous, circumflex, ulnar, musculo-spiral, median.

Give the origin and distribution of the third division of the fifth pair of nerves.

Origin: From Gasserian ganglion at apex of petrous bone, passes through foramen ovale with motor root, with which it now unites; divided into anterior and posterior divisions, anterior being mostly motor to muscles of mastication (temporal, pterygoids, masseter), posterior division forming inferior dental, which furnishes mylo-hyoid to muscle of same name, branches to teeth, incisor and mental branches; auriculo-temporal, sensory to ear and temple; lingual, which receives chorda tympani branch of facial and is distributed to tongue.

Bound Scarpa's triangle, and mention the vessels and nerve in it.

Is bounded by Poupart's ligament above, sartorius externally, adductor longus internally; vessels are common and superficial femoral, profunda femoris arteries; femoral vein; nerve is anterior crural.

Give the location and describe the anatomical structure of the kidneys.

Are placed in loins, resting upon psoas magnus and quadratus lumborum muscles, upper end of left reaching as high as upper border of 11th rib, upper end of right as high as lower border of 11th rib. Each is capped by suprarenal body, is surrounded by capsule and perirenal connective tissue containing fat, is supplied by renal artery, and drained by renal vein and lymphatics; nerves from renal plexus of sympa-

thetic system. The kidney is bean-shaped, notch upon inner border is called the hilum, leading into a depression or cavity known as the sinus; here the renal duct, or ureter, begins and the vessels and nerves enter or leave. The interior of the gland consists of a connective tissue parenchyma supporting vessels and uriniferous tubules, arranged as cortex and medulla; the cortex contains the glomeruli (coiled-up blood vessels—"little ball of yarn") and some of the tubules; the medulla consists of pyramids (Malpighian or medullary) made of parallel collecting tubules, which terminate upon the apex of the pyramid, pouring urine into the calices of the "pelvis of the kidney," the upper expanded portion of the ureter. The uriniferous tubules begin around a glomerulus as a closed extremity (capsule of Bowman), then pass tortuously through the cortex down into the medulla and back again into the cortex (loop of Henle), terminating in one of the collecting tubules found in the pyramid of Ferrein, whose base is in apposition with the base of a medullary pyramid.

Describe the mesentery.

Is a double fold of peritoneum attached to posterior abdominal wall in an oblique line extending between the left side of the body of the second lumbar vertebra to the right sacro-iliac joint, a distance of about eight inches. Between its two layers are found arteries, veins, lymphatics (lacteals), lymphatic nodes (mesenteric "glands"), and more or less fat; to its expanded, convoluted edge the small intestine is attached, the mesenteric layers surrounding it and constituting its serous covering.

Give the name and location of the various glands found in the small intestine.

Glands in small intestine: Duodenal ("Bruner's"), in duodenum; intestinal follicles ("crypts of Lieberkuhn"), in whole length of small and large intestine; solitary glands, in wall of small intestine, collected into colonies in ileum, then known as Peyer's patches.

Give a brief yet comprehensive description of the heart.

Base corresponds to upper level of third costal cartilage, one inch to right of sternal margin and one-half inch to left; apex to fifth intercostal space just internal to vertical line drawn through left nipple; base is directed upward and backward to the right, apex downward, forward and to the left. Is surrounded by fibro-serous sac called pericardium, consisting of two layers, fibrous externally, serous internally, the latter lining sac (parietal layer) and covering heart (visceral layer), it is attached to central tendon of diaphragm. Right auricle has openings of superior and inferior venæ cavæ and coronary sinus; right ventricle receives blood from right auricle through right auriculo-ventricular opening (tricuspid valve), and expels it through conus arteriosus into pulmonary artery, which is guarded by pulmonary semilunar valve; right ventricle contains columnæ carneæ, musculi papillares, chordæ tendineæ attached to tricuspid valve segments; left auricle has four openings for pulmonary veins and left auriculo-ventricular opening, guarded by mitral valve; left ventricle has columnæ carneæ, etc., like right, its wall is thicker; it forms apex of heart, and blood leaves it by passing into aorta, which is guarded by aortic semilunar valve; coronary arteries (2), branches of aorta above semilunar valve, supply heart muscle. Heart is lined with endocardium. Pneumogastrics and cardiac plexuses of sympathetic nervous system supply heart.

What forms the external malleolus?

Lower end of fibula.

Describe one of the vertebrae.

Consists of centrum, or body, projecting anteriorly, with arch behind, made up of two (lateral) pedicles, converging laminæ to form spinous process, transverse process on each side, superior and inferior pair of articular processes, intervertebral notch on under side of each pedicle.

Describe the position of the palmar arterial arches.

Superficial palmar arch is placed upon tendons of flexor sublimis digitorum, extending across palm at level of line drawn transversely at angle of web between thumb and index finger; deep arch lies upon metacarpal bones and interossei muscles, one-half inch nearer carpus than superficial arch.

What blood vessels pass to and from the liver?

To it, hepatic artery, portal vein; umbilical vein in fœtus; from it, hepatic veins.

Describe the pyloric orifice of the stomach.

Is directed backward and to right, is near neck of gall-bladder, consists of special thickening of stomach wall produced by circular muscular fibres, which have sphincter-like action.

What tissues of the abdominal wall are divided in the operation for appendicitis?

Skin, superficial fascia, external oblique muscle, internal oblique and transversalis muscles, transversalis fascia (pre-peritoneal fat), peritoneum. Or, skin, superficial fascia, linea semilunaris, transversalis fascia, peritoneum.

With what bones does the frontal articulate?

Both parietal, both malar, both nasal, both lachrymal, both maxillæ (superior), ethmoid, sphenoid.

Give the course and relations of Stenson's duct.

Is formed in parotid gland, emerges from its anterior border, resting upon masseter muscle a finger's breadth below zygoma; it then perforates buccinator muscle, runs forward and pierces mucous membrane of cheek wall opposite upper middle molar tooth.

Describe the Fallopian tubes and give their relations.

Oviducts are attached to cornua of uterus, extend laterally to a point near pelvic brim, here expanding into fimbriated extremity; one of the fimbriæ is attached to ovary (tubo-

ovarian ligament). Each tube is lined with mucous membrane thrown into folds, possessing columnar, ciliated epithelium, outside of which is muscular coat of internal circular and external longitudinal fibres, the whole being covered by peritoneum of broad ligament. Ovarian and uterine arteries anastomose along their lower border; fimbriated extremity is in close relation to ovary; outer part of broad ligament, extending from tube to pelvic wall, is called infundibulo-pelvic ligament, and contains ovarian artery and veins.

Describe the dura mater. Mention the processes and sinuses of the dura mater.

Forms the lining or endosteum of cranial cavity, and extends through foramen magnum into neural canal as external layer of theca of cord; is tough and fibrous, forms projections or shelves in cranial cavity for support of encephalon. These are falx cerebri, falx cerebelli, tentorium cerebelli. Dura consists of two layers, endosteal and meningeal, which separate at certain places to permit the entrance of the tunica intima of a vein, thus forming venous sinuses of cranium. These are superior and inferior longitudinal, straight, two lateral, occipital, two superior and inferior petrosal, transverse, circular, and two cavernous.

Give the macroscopic and the microscopic appearance of (a) kidney tissue, (b) lung tissue, (c) nerve fiber.

(a) Kidney tissue is moderately firm, somewhat granular, reddish-brown in color. Microscopically it presents glomeruli, uriniferous tubules, blood vessels and interstitial connective tissue. (b) Lung tissue is of a mottled pink color, soft and porous. Under the microscope it shows bronchioles (fibrous wall of elastic tissue lined with mucous membrane) and alveoli, dilatations lined with mucous membrane of squamous epithelial cells, outside of which are seen capillary blood vessels. (c) Nerve fibre is cord-like, soft and white. Histologically it consists of axis cylinder surrounded by white substance of Schwann (medullary substance) (absent in non-

medullated nerves) and encased in the neurilemma. Interruptions in the medullary substance occur (nodes of Ranvier).

What anatomic parts are normally found in the left hypochondriac region?

Fundus of stomach, spleen and tail of pancreas, splenic flexure of colon, part of left kidney.

Give in language or by drawing, the normal curvatures of the spinal columns, and describe a typical cervical vertebra.

Curves are cervical, thoracic, lumbar, sacro-coccygeal; convexity is forward in cervical, backward in thoracic, forward in lumbar, backward in sacro-coccygeal. The line of gravity of the trunk passes through the chords of these curves. A typical cervical vertebra consists of a small body, diverging pedicles, a bifid spinous process, bifid transverse process grooved on upper border, with a costo-transverse foramen for vertebral artery at base of transverse process; neural foramen is relatively large.

Name the bones and ligaments of the ankle-joint.

Tibia, fibula, astragalus; anterior and posterior, internal (deltoid) and external lateral ligaments.

Name the principal muscles that keep the body erect on the thigh and give the origin and insertion of any one of them.

Gluteus maximus, gluteus medius, gluteus minimus, hamstrings; gluteus maximus takes its origin from outer surface of ilium between posterior part of crest and superior gluteal line, from vertebral aponeurosis, two last pieces of sacrum, posterior surface of great sacro-sciatic ligament, and is inserted into gluteal ridge of femur and ilio-tibial band of fascia lata.

Give the origin, distribution and branches of the middle meningeal artery.

Is branch of internal maxillary, passes through foramen

spinosum of sphenoid, traverses wall of middle cranial fossa, dividing into anterior and posterior branches (meningeal) supplying dura and bony wall of cranium.

Where does the glosso-pharyngeal nerve rise and what structures are supplied by this nerve and its branches?

Arises from groove between olivary and restiform bodies, passes out of cranial cavity through jugular foramen, divides into lingual and pharyngeal branches, supplying mucous membrane of posterior part of tongue (circumvallate papillæ) and mucous membrane of pharynx. A branch (Jacobson's) is distributed to tympanum.

Describe the pharynx.

Belongs to both respiratory and alimentary tracts, is lined with mucous membrane possessing ciliated columnar cells above, and squamous, stratified cells below level of soft palate; pharyngeal aponeurosis is between mucous membrane and constrictor muscles; constrictor muscles are three in number, superior, middle, inferior. Pharynx is flattened antero-posteriorly, is widest opposite greater cornua of hyoid bone, and communicates with posterior nares, with middle ears by Eustachian tubes, with mouth, larynx and esophagus. The pharyngeal tonsil is located upon upper posterior wall, and consists of a special collection of adenoid tissue, which is found more or less freely distributed throughout naso-pharynx.

Name the regions of the abdomen.

Draw transverse line through anterior superior iliac spines; also through costal cartilages of 10th ribs; intersect with vertical lines through center of Poupart's ligament. Nine regions thus formed are, from above downward, right and left hypochondriac, epigastric, right and left lumbar, umbilical, right and left inguinal, hypogastric.

Locate and describe the cecum.

First part of large intestine, found below ileo-cecal junc-

tion in right iliac fossa; is entirely surrounded by peritoneum, possesses sacculations, that upon right side usually larger, thus throwing original (fetal) apex to left, at which point appendix vermiformis is attached. Longitudinal muscular bands well defined.

Describe the eyeball and give its parts.

Is spherical in shape, embedded in orbital fat, has ocular muscles attached to it, is perforated by optic nerve and ciliary arteries and veins, posterior five-sixths opaque, anterior one-sixth transparent. Its walls are made up of sclerotic and cornea, uveal tract (choroid) and retina, enclosing crystalline lens and vitreous body. Behind cornea is anterior chamber containing aqueous humor; in front of crystalline lens is iris.

Give the names of five muscles of the male perineum.

Ischio-cavernosus, compressor urethræ, bulbo-cavernosus, transversus perinei, sphincter ani externus.

Name five muscles of the back of the leg.

Gastrocnemius, plantaris, soleus, tibialis posticus, flexor longus digitorum.

Name the principal divisions and subdivisions of the internal carotid artery.

It divides, after passing through cavernous sinus, into anterior and middle cerebral arteries; its subdivisions are ophthalmic and posterior communicating.

Locate and describe the ileo-cecal valve.

Is found at junction of ileum with cecum, formed by ileum passing upward and outward to the right to meet large bowel obliquely; its orifice is a horizontal slit projecting into cecal lumen.

Describe either the ascending or descending vena cava.

Ascending vena cava is formed by union of the two common iliac veins upon body of fifth lumbar vertebra, passes upward, resting on bodies of vertebra to right of aorta, pierces dia-

phragm at caval opening, and almost immediately enters right auricle. Its tributaries are lumbar veins, right spermatic vein (or ovarian), renal veins, hepatic veins, phrenic veins.

Name the bones that form the ankle-joint and give their relations.

Tibia and fibula above, with internal and external malleoli, respectively, forming mortise for astragalus, whose trochlear surface and sides fill up the space between the two bones of the leg.

What muscles form the quadriceps extensor crureus and where is its conjoined tendon inserted?

Rectus femoris, vastus externus, vastus internus, crureus; tendon is inserted into tubercle of tibia.

With what bones does the malar articulate?

Frontal, superior maxilla, temporal, sphenoid.

What arteries supply the bladder in the male, and from what are they branches?

Superior, middle and inferior vesicle, branches of anterior trunk of internal iliac.

In an amputation of the forearm, 3 inches above the wrist, what arteries will it be necessary to tie, and of what are they branches?

Radial and ulnar arteries, branches of the brachial; anterior and posterior interosseous arteries, branches of the ulnar.

Locate the 4th ventricle of the brain.

Floor is formed by medulla and pons, borders by inferior and superior peduncles of cerebellum, with middle peduncles at lateral angles; roof is formed by valve of Vieussens, or superior medullary velum, above, inferior medullary velum and tela choroidea inferior below.

Locate and briefly describe the gall-bladder.

Is placed upon under surface of right lobe of liver, in so-

called fissure for gall-bladder; fundus projects beyond anterior border of liver. Is a pear-shaped sac covered by peritoneum, having a rounded end called the fundus, and a constricted posterior extremity known as the neck, which is continued into the cystic duct. Its wall is composed of fibrous and muscular tissue, and it is lined with mucous membrane, which is thrown into corkscrew-like folds at the neck and beginning of the cystic duct.

Describe the esophagus as to (a) location, (b) dimensions, (c) arterial supply.

Is located behind trachea, and in posterior mediastinum, extending from lower end of pharynx to cardiac end of stomach at esophageal orifice of diaphragm. It is 10 inches long; its arterial supply is by branches from the inferior thyroid (thyroid axis of subclavian), thoracic aorta, gastric (coeliac axis), left phrenic.

Describe the rectum as to structure, length and contained glands.

Extends from third piece of sacrum to anus, curved forward. From third piece of sacrum to tip of coccyx is partially covered by peritoneum. Its walls consist of peritoneum or fibrous tissue externally, within which is muscular coat of longitudinal and circular fibres; then comes submucosa supporting mucous membrane, the latter forming fixed, transverse folds (plicae recti, or valves of Houston), two or three in number, extending transversely around portion of rectum. Glands are of mucous variety.

How is the eye supplied with blood?

By the ophthalmic artery, forming ciliary branches and arteria centralis retinæ.

What is the circle of Willis?

An arterial anastomosis at base of brain, formed by internal carotid arteries as follows: Each internal carotid sends forward the anterior cerebral, which is connected with the oppo-

site anterior cerebral by the anterior communicating; it furthermore sends backward the posterior communicating which meets the posterior cerebral, which is a branch of the basilar.

Name and bound the ventricles of the brain.

The lateral ventricles (first and second) are bounded above by corpus callosum; below by intraventricular portion of corpus striatum, taenia semicircularis, choroid plexus, optic thalamus, posterior pillar of fornix, corpus fimbriatum; internally by septum lucidum. Third is bounded above by velum interpositum; below by gray matter at base of brain, *i. e.*, lamina cinerea, tuber cinereum, corpora albicantia, posterior perforated space and tegmenta of crura cerebri; laterally by optic thalami; anteriorly by lamina cinerea and anterior pillars of fornix; posteriorly by posterior commissure and pineal gland (epiphysis cerebri). Fourth ventricle is bounded above by valve of Vieussens (superior medullary velum), in the middle by epithelial lining and pia; below by inferior medullary velum; floor is formed above by pons, below by medulla; sides are formed by superior, middle and inferior cerebellar peduncles.

Describe the sympathetic nerve, naming and locating the principal ganglia.

Consists of a double chain of ganglia extending along either side of vertebral column anteriorly, connected by branches with each other and with spinal nerves (rami communicantes), furnishing branches to blood vessels (vasomotor nerves) and forming plexuses—three prevertebral plexuses and numerous secondary plexuses around arteries. Principal ganglia are ophthalmic, in back part of orbit; spheno-palatine, in spheno-maxillary fossa; submaxillary, upon submaxillary gland; semilunar, upon aorta around coeliac axis.

Give the origin, insertion and action of any one of the

following muscles: occipito-frontalis, deltoid, gastrocnemius.

Deltoid arises from outer third anterior border of clavicle, outer margin of acromion, lower border of spine of scapula, entire length, and is inserted into deltoid impression upon outer surface of middle of shaft of humerus. Action, to abduct arm to horizontal position. Nerve, circumflex.

What arteries unite to form the basilar artery?

The two vertebrals.

Describe the tongue.

Consists of intrinsic and extrinsic muscles. Intrinsic are different divisions of lingualis (superior, inferior, transverse and vertical); extrinsic are geniohyoglossus, hyoglossus, styloglossus, palatoglossus. Tongue is supported by hyoid bone, is covered by mucous membrane thickly set with papillæ, viz., circumvallate at base, fungiform and filiform upon dorsum and margin. Nerves: Motor, hypoglossal; sensory and gustatory, glosso-pharyngeal, lingual, chorda tympani.

Describe the pia mater.

Innermost of three meninges, is closely applied to central nervous system, supporting blood vessels, dipping down into sulci and passing into general ventricular cavity of encephalon to develop choroid plexuses—vascular fringes found in lateral, third and fourth ventricles.

Describe the bones of the hand with their divisions and articulations.

Carpus, metacarpus, phalanges. Eight carpal bones: Scaphoid, semilunar, cuneiform, pisiform, trapezium, trapezoid, os magnum, unciform. Five metacarpal bones; fourteen phalanges. Carpal articulate with each other and with bases of metacarpals; scaphoid and semilunar articulate with radius; cuneiform with triangular interarticular cartilage between it and ulna; metacarpals articulate with each other at their bases and with first phalanges at their heads; phalanges articulate with each other and with metacarpals.

Describe the hip-joint.

Enarthrodial, or ball-and-socket joint, formed by acetabulum and head of femur, surrounded by capsule, most important and strongest part of which is found upon the anterior aspect of the joint, extending between anterior inferior spine of ilium and anterior intertrochanteric line (spiral line of femur), and is known as the "Y" ligament (ilio-femoral). This ligament prevents hyperextension of thigh upon pelvis, or falling backward of trunk. Capsule is attached to innominate bone around margin of acetabulum and to neck of femur; ligamentum teres is attached to head of femur and to bottom of acetabulum. Movements permitted: Flexion, extension, abduction, adduction, rotation and circumduction.

Name five muscles of the shoulder and arm. Give the origin, insertion and action of any one of the five.

Deltoid, coraco-brachialis, biceps, triceps, teres major. Biceps takes origin by two heads, one from coracoid process of scapula, the other from upper margin of glenoid fossa, this tendon passing through shoulder-joint to reach bicipital groove; insertion is into deep fascia of forearm by semilunar (bicipital) fascia, and into bicipital tuberosity of radius; action is to flex forearm upon arm, and to supinate hand.

Give the origin, course and branches of any one of the following arteries: brachial, temporal, left common carotid.

Left common carotid arises from arch of aorta, courses upward and outward in line drawn from sterno-clavicular joint to mastoid, dividing at level of upper border of thyroid cartilage into its only branches, external and internal carotids.

Describe the hemispheres and lobes of the brain.

The cerebral hemispheres are ovoid, convex upon superior and lateral surfaces, partially separated from each other by longitudinal fissure, but connected by corpus callosum. Frontal lobe occupies anterior fossa of cranial cavity, separated from parietal lobe by fissure of Rolando, and from

anterior part of temporal lobe by Sylvian fissure; parietal lobe is bounded by fissure of Rolando anteriorly, parieto-occipital fissure posteriorly, Sylvian fissure inferiorly, great longitudinal fissure superiorly; occipital lobe is found behind parieto-occipital fissure; temporal lobe is below fissure Sylvius, and rests in middle cranial fossa.

Where in the topography of the abdomen is the sigmoid flexure located? The appendix vermiformis?

(a) In left inguinal and hypogastric regions. (b) In right inguinal region.

Give the surgical anatomy of femoral hernia.

Neck of sac is at femoral, or crural, ring formed by Gimbernat's ligament on inner side, femoral vein on outer, Poupart's ligament in front, and horizontal ramus of pubic bone behind; is closed by septum crurale; crural canal is narrow interval between femoral vein and femoral sheath on inner side of vein, and extends from crural ring above to upper margin of saphenous opening below. Saphenous opening is closed by cribriform fascia.

Describe the esophagus.

Extends from lower margin of cricoid cartilage to stomach, is ten inches long, situated behind trachea in neck and in posterior mediastinum in thorax; curves forward to esophageal opening in diaphragm, through which it passes, accompanied by pneumogastric nerves; wall consists of external longitudinal and internal circular muscle fibres, a submucosa and a mucous membrane, which is thrown into longitudinal folds, and is made up of stratified epithelial cells.

Describe the formation of the teeth.

The teeth are composed of three substances—the enamel, the dentine and the cementum. The enamel covers the exposed part of the tooth, the crown of the tooth. The cementum covers the part of the tooth within the alveolus of the jaw. The junction of the enamel with the cementum

is called the neck of the tooth. The bulk of the tooth is made up of the dentine, which extends from the root to the crown. Each tooth contains a cavity, the pulp cavity, which communicates with the exterior through a small aperture at the apex of the root, the apical foramen. The cavity contains a soft connective tissue—the pulp, rich in vessels and nerves. The fang, or root, of the tooth has a fibrous investment called the peridental membrane, or periosteum.

Give a brief description of the facial nerve.

The 7th cranial nerve, after passing through facial canal (aqueductus Fallopii) of temporal bone, emerges at the stylo-mastoid foramen, and enters substance of parotid gland. Here it divides into two sets of branches, temporo-facial and cervicô-facial, supplying muscles of expression. Its chorda tympani branch traverses inner surface of membrana tympani, after leaving main trunk in facial canal, and emerging through one end of the Gasserian fissure unites with lingual branch of 5th and accompanies it to submaxillary gland and ganglion and anterior ⅔ of mucous membrane of tongue.

Describe the elbow-joint.

Is a ginglymus, or hinge-joint, made up of lower end of humerus and upper ends of radius and ulna; head of radius articulates with capitellum, and greater sigmoid cavity of ulna with trochlear surface of humerus. Its capsule is divided into anterior and posterior, internal and external lateral ligaments. It permits of flexion and extension. It is lubricated by synovial membrane lining its capsule.

Describe the superior vena cava.

Is formed by union of right and left innominate (jugulo-cephalic) veins, just below cartilage of 1st rib (close to right border of sternum); is nearly three inches long and terminates in right auricle; it receives vena azygos major.

Describe the temporo-maxillary articulation, mentioning the ligaments.

Bony parts are glenoid fossa and articulating eminence of

temporal bone, and condyle of mandible; ligaments form a capsule, much stronger externally and posteriorly; external lateral ligament extends between tubercle of zygoma and neck of condyle; associated ligamentous bands are sphenomandibular and stylo-mandibular; an interarticular cartilage contained within the joint cavity has tendon of insertion of external pterygoid muscle attached to it. Movements permitted are depression and elevation of jaw around a transverse axis, and a sliding forward of both sides, protruding chin, or of one side at a time, producing a triturating movement.

Describe the maxillary sinus (or antrum of Highmore).

Is a triangular cavity contained in body of maxilla, lined with mucous membrane and communicating with middle meatus of nose through one or two small openings; apex of cavity is formed by malar process of maxilla; base is formed by outer wall of nose; in its posterior wall are posterior dental canals for posterior dental vessels and nerves to the teeth; in floor are usually seen several elevations, corresponding to roots of 1st and 2d molar teeth.

Describe the aorta.

Springs from left ventricle, anteriorly, extends upward to upper border of right 2d costal cartilage, then arches backward to left and descends through thorax, resting upon vertebral bodies, passes through aortic opening in diaphragm and courses through abdominal cavity as far as body of 4th lumbar vertebra.

Branches are: Two coronary from ascending portion; innominate, left common carotid and left subclavian from arch; bronchial, intercostal, pericardiac, esophageal and posterior mediastinal from thoracic portion; 2 phrenic, lumbar, sacra media (parietal branches), celiac axis (gastric, hepatic, splenic), superior mesenteric, inferior mesenteric (single branches from front), suprarenal, renal, spermatic (or ovarian) (lateral paired branches) from abdominal portion.

Describe the trachea and give its anatomical relations.

It extends from the larynx to the bronchi, and consists of a series of transversely directed, incomplete rings of cartilage united by an elastic membrane which contains involuntary muscle-fibre posteriorly, where the cartilaginous ring is deficient; it is lined with a mucous membrane which is covered with ciliated columnar epithelial cells.

The trachea rests upon the esophagus, being flattened posteriorly; in the groove between these two structures is the recurrent laryngeal nerve, upon each side; the common carotid artery, internal jugular vein and pneumogastric nerve are close to it at its lower portion, while the isthmus of the thyroid body crosses it upon its second and third rings, and the lobes of the same rest upon it laterally.

Describe the pulmonary veins.

They are four in number, usually, 2 for each lung, and return arterial blood from lungs to left auricle of heart.

Describe the spinal column.

It consists of 33 separate vertebræ, distributed as follows: 7 cervical, 12 thoracic, 5 lumbar, 5 sacral, 4 coccygeal. Sacral and coccygeal coalesce early in life by ossification of intervertebral substances; cervical segment possesses curve with convexity forward, thoracic with convexity backward, lumbar with convexity forward, sacral with convexity backward; line of gravity passes through chords of these curves. Special or peculiar vertebræ are: Atlas, axis, 7th cervical (vertebra prominens); ribs articulate with thoracic series; ilia articulate with sacrum. Spinal column contains neural canal for spinal cord.

Give the minute anatomy of the skin.

The skin consists of the cutis vera, formed of fibrous tissue, the superficial layer being raised into numerous papillæ. This is the vascular layer of the skin. The end bulbs of the sensory nerves are found here also. Covering the cutis vera is the epidermis, formed of numerous layers of epithelium.

There are four strata of the epithelium: The outer, horny, or stratum corneum; the stratum lucidum; the stratum granulosum, and the inner or stratum mucosum.

Give a general description of the alimentary canal, naming its successive divisions.

Its parts, in order, are: Mouth, pharynx, esophagus, stomach, small intestine (duodenum, jejuno-ileum), large intestine (cecum, ascending, transverse, descending and sigmoid colons, rectum and anal canal).

Mouth is composed of upper and lower jaws covered by cheek walls, with buccal orifice directed transversely; contains tongue, at base of which are fauces with anterior and posterior pillars and tonsils.

Pharynx joins esophagus at lower border of cricoid cartilage; esophagus is 10 inches long and passes through diaphragm to be continued into stomach.

Stomach occupies epigastric and left hypochondriac regions and presents a cardiac and a pyloric extremity and a greater and lesser curvature. Its wall consists of 4 coats, viz., serous, muscular, areolar and mucous.

BOSTON MEDICAL LIBRARY MAR 7 1910

Duodenum is fixed and curved around head of pancreas; common bile and pancreatic ducts open into it; jejuno-ileum, attached to posterior abdominal wall by mesentery, extends for 20 feet, or more, to ileo-cecal junction, where it joins large intestine; vermiform appendix is attached to cecum (usually inner side), below ileo-cecal valve; ascending colon passes to liver, forms hepatic flexure; transverse colon, with great omentum attached, crosses to spleen and forms splenic flexure; descending colon reaches left iliac fossa and is continued into sigmoid which curves around into pelvis, resting on sacrum; rectum curves forward and anal canal, guarded by internal (involuntary) and external (voluntary) sphincters, opens downward and slightly backward.

State the origin and exit of the pneumogastric nerve.

Superficial origin, from side of medulla in groove between olivary and restiform bodies; exit, through jugular foramen.

Describe the mastoid portion of the temporal bone.

Mastoid bone is placed behind, is rough and convex externally and projects downward and forward as mastoid process; beneath are digastric fossa for posterior belly of digastric muscle, and occipital groove for occipital artery; within substance of mastoid are mastoid cells, the largest of which is called mastoid antrum, which communicates with middle ear; upon cerebral surface of mastoid is sigmoid groove for lateral sinus.

Describe the lateral sinuses.

Right and left lateral sinuses commence at internal occipital protuberance, right being formed by superior longitudinal sinus, left by straight sinus; are located in attached margin of tentorium, grooving occipital, parietal, mastoid and occipital bone again, leaving cranial cavity through jugular foramen, just outside of which they unite with inferior petrosal sinus to form internal jugular vein.

Give the origin and insertion of the muscles which form the anterior triangles of the neck.

The anterior common triangle is bounded above by the lower border of the mandible and a line extending backward from the angle of the mandible to the mastoid process of the temporal bone; in front, by the median line of the neck; behind, by the anterior border of the sterno-mastoid muscle. This common triangle is divided into the submaxillary, superior carotid and inferior carotid triangles, by the posterior belly of the digastric muscle above and the anterior belly of the omo-hyoid below.

Sterno-mastoid muscle: Origin, from anterior surface of upper part of manubrium sterni and inner third of anterior border of clavicle; insertion, into mastoid process of temporal and outer half of superior curved line of occipital bone.

Omo-hyoid muscle: Origin, from upper border of scapula to inner side of suprascapular notch; insertion, into body of hyoid bone.

Digastric muscle: Origin of posterior belly is from digastric fossa of mastoid portion of temporal bone, and of anterior belly from lower border of mandible close to symphysis; insertion, into central tendon, which is attached to body and greater cornu of hyoid bone.

Name and describe the course of the arteries supplying the hand.

Radial and ulnar arteries. Course of radial artery is from just below bend of elbow down radial border of forearm to outer side of wrist, where it turns over on to dorsum of hand, passes down through proximal end of first interosseous space to reach palm, now passing transversely across deep part of palm to anastomose with deep communicating branch of ulnar artery.

Course of ulnar artery is from near head of radius in a curve over to ulnar border of forearm, thence along ulnar border to radial side of pisiform bone, where it divides into a superficial branch, to form superficial palmar arch and a deep branch to complete deep arch.

Locate and describe the ovaries.

The ovaries are located ordinarily close to lateral part of true pelvic brim, attached to posterior layer of broad ligament. They somewhat resemble a broad almond, are 1½ inches in length, whitish in color, with an uneven, puckered surface, and consist of a covering of germinal epithelium, and a stroma which encloses ovisacs, vessels and nerves.

Locate and describe the principal convolutions of the brain.

Ascending frontal convolution bounds the fissure of Rolando anteriorly, and belongs to the frontal lobe; ascending parietal convolution bounds the fissure of Rolando posteriorly, and is a part of the parietal lobe. In these convolutions are located important motor nerve-centers, controlling nerves which are distributed to the opposite side of the body.

The cuneus is a convolution belonging to the mesial surface

of the occipital lobe, between the internal parieto-occipital and calcarine fissures; in it are located the cortical centers of sight.

Describe the palmar fascia.

It consists of a central and two lateral portions. Central portion is thick and binds down tendons and protects vessels and nerves; it is narrow above where it is attached to anterior annular ligament; below it is broad and divides into 4 slips for the four fingers, these being attached to under surface of skin at base of fingers, to sides of metacarpo-phalangeal joints and to sides of metacarpal bones near their distal ends.

Give the origin and insertion of the muscles of the scapulo-humeral joint.

Supraspinatus, infraspinatus, teres minor, subscapularis, deltoid, biceps and triceps.

Supraspinatus: Origin, from inner ⅔ of supraspinous fossa; insertion, into highest facet of greater tuberosity of humerus, and blending intimately with capsular ligament of shoulder joint.

Infraspinatus: Origin, from inner ⅔ of infraspinous fossa; insertion, into middle facet of greater tuberosity, also blending with capsular ligament.

Teres minor: Origin, from upper ⅔ of axillary border of scapula; insertion, into lowest facet of greater tuberosity, also blending with capsular ligament.

Subscapularis: Origin, from greater part of subscapular fossa; insertion, into lesser tuberosity of humerus, its tendon of insertion also blending closely with capsular ligament.

Deltoid: Origin, from outer ⅓ of anterior border of clavicle, from outer margin of acromion and lower border of spine of scapula; insertion, into rough, triangular area on outer side of shaft of humerus near its middle.

Biceps: Origin, from coracoid process and from upper margin of glenoid cavity (short and long heads, respectively);

insertion, into bicipital tuberosity of radius and by bicipital (or semilunar) fascia, into deep fascia of forearm.

Triceps: Origin, from axillary border of scapula just below glenoid cavity (long or scapular head), and from posterior surface of humerus, one head above, the other below, the musculo-spiral groove (2 short or humeral heads); insertion, into olecranon process of ulna.

Describe the nasal fossae.

Are 2 irregular cavities in middle of face, on either side of median line, separated from each other by mesially placed nasal septum; they extend upward to anterior floor of cranial cavity, and downward to roof of mouth; they open anteriorly by 2 large apertures, the anterior nares, and communicate with naso-pharynx by posterior nares.

Roof is narrow, and formed in center by cribriform plate of ethmoid, anteriorly by nasal bones and nasal spine of frontal, posteriorly by under surface of body of sphenoid. Roof contains apertures in cribriform plate for olfactory nerves; behind are openings leading into sphenoidal sinuses.

Floor is smooth, wider in middle than at either end, and is formed by palate process of maxilla, anteriorly, and by palate process of palate bone posteriorly.

Inner wall consists of septum, which is made up of crest of nasal bones and spine of frontal, by perpendicular plate of ethmoid, by vomer and by rostrum of sphenoid, and below by crests of maxillary and palate bones. A large notch at anterior extremity of bony septum receives the septal cartilage.

Outer wall is formed, in front, by lachrymal bone and nasal process of maxilla; in the middle, by ethmoid, inner surface of maxilla, and inferior turbinated; behind, by vertical plate of palate bone and internal pterygoid plate of sphenoid. The outer wall contains 3 irregular, longitudinal passages, viz., superior, middle and inferior meati; the superior meatus (smallest) is located at upper and back part of nasal fossa, is between superior and middle turbinated bones, and communicates with spheno-maxillary fossa by spheno-palatine

foramen, and with posterior ethmoidal cells by an opening in its outer wall. (Opening for sphenoidal sinus is above and behind superior turbinated bone). Middle meatus is situated between middle and inferior turbinated bones. It contains, anteriorly, the orifice of the infundibulum, by which the middle meatus is placed in communication with the anterior ethmoidal cells and the frontal sinuses; the middle ethmoidal cells and maxillary antrum also open into middle meatus. Inferior meatus is the largest, is formed by inferior turbinated above and floor of nasal fossa below; it contains, under cover of the inferior turbinated, anteriorly, the termination of the naso-lachrymal duct.

Name and locate the accessory sinuses of the face and describe their outlets.

Frontal sinuses, contained between outer and inner tables of frontal bone above supraorbital arch, communicate through infundibulum with anterior ethmoidal cells and middle nasal meatus.

Ethmoidal cells, comprising greater part of lateral mass of ethmoid bone, and divided into anterior, middle and posterior. Anterior and middle ethmoidal cells open into middle nasal meatus; posterior ethmoidal cells open into superior nasal meatus.

Sphenoidal cells (or sinuses) are contained within body of sphenoid bone and communicate with upper, back part of nasal fossa.

Maxillary sinus (antrum of Highmore) is situated in body of maxilla; its outlet is an aperture communicating with middle meatus of nose.

Describe the iris, giving relations, nerve and blood supply.

It is an elastic, contractile diaphragm, forming the anterior extremity of the middle, pigmented and vascular tunic of the eyeball. By its peripheral attached border it is directly continuous with the ciliary body; it is placed in front of the

crystalline lens, and incompletely divides the anterior chamber into two compartments. Near its center is a circular opening, the pupil, which varies greatly in size. In structure the iris consists of a stroma of delicate fibrous and elastic tissue, with perhaps some involuntary muscle fibres. It is supplied by the ciliary nerves. The long and anterior ciliary arteries anastomose and form a vascular circle around the attached margin of the iris, sending branches in toward the pupillary margin.

Describe the course and distribution of the nerves of the palm of the hand.

Median, from outer and inner cords of brachial plexus, accompanies brachial artery, rests upon flexor profundus digitorum in forearm, passes beneath annular ligament into palm. It supplies all anterior forearm muscles except flexor carpi ulnaris and ulnar half of flexor profundus digitorum; cutaneous branches supply palm, thumb, index, middle and half of ring fingers on their palmar aspect and nail-beds, and outer two lumbricales.

Ulnar, from inner cord, descends along inner border of arm, behind inner condyle of humerus, then between flexor carpi ulnaris and flexor profundus, both of which it supplies; it crosses anterior annular ligament with ulnar artery and divides to supply short muscles of little finger, all interossei, inner two lumbricales and flexor brevis and adductor pollicis; cutaneous distribution is to dorsum and palm of hand on ulnar side, and to little finger and ulnar half of ring finger.

Give the origin, insertion and action of any one of the following muscles: digastric, sacrolumbalis, rectus abdominis.

Rectus abdominis takes its origin from body of pubic bone and from anterior ligaments of pubic symphysis of opposite side, is inserted into costal cartilages of 5th, 6th and 7th ribs; contains three transverse lines (lineæ transversæ), which extend in zigzag style across the muscle in its upper part;

action is to flex thorax upon pelvis, or *vice versa,* and to compress abdominal viscera.

Give four principal points of distribution of the pneumogastric or par vagum nerve.

Pharynx (motor), larynx (motor and sensory), heart (superficial and deep cardiac plexuses), stomach (uniting with sympathetic system).

What is contained in the middle mediastinum?

Heart and pericardium, ascending aorta, lower part of superior cava, vena azygos major, both bronchi, pulmonary artery and veins, phrenic nerves.

What anatomical parts are involved in the descent of the testes?

Gubernaculum testes, visceral and parietal layers of peritoneum, transversalis fascia, inguinal canal and rings, internal oblique muscle (cremaster muscle and cremasteric fascia), intercolumnar fascia.

Describe the bones forming the ossa innominata.

Ilium has curved crest extending from anterior superior to posterior spine; internally is iliac fossa (false pelvis, limited below by ileo-pectineal line); externally are superior, middle and inferior gluteal lines; greater sciatic notch is behind, partly formed by ischium; anterior inferior spine for rectus femoris and ilio-femoral (Y) ligament is below anterior superior spine; ilium forms part of true pelvis and two-fifths of acetabulum; fuses with os pubis and ischium at 18th to 20th year; articulates with sacrum by auricular surface.

Ischium has a body above, with spine of ischium projecting backward and inward, and separating greater from lesser sciatic notches; lesser sciatic notch is on ischium below spine; tuberosity of ischium is lowest part, from which ramus ascends toward pubic bone and partially bounds obturator foramen; ischium forms two-fifths of acetabulum and part of true pelvis.

Os pubis has body (articulates with opposite bone, forming symphysis pubis); horizontal and descending ramus, bounding obturator foramen; pubic spine for Poupart's ligament; ilio-pectineal line extending from body along horizontal ramus; on under surface of latter is groove for obturator vessels and nerve.

Describe the sternum, its articulations and the important muscles attached to it.

Consists of manubrium, gladiolus and ensiform appendix; suprasternal notch is above, between clavicles; notches are found along lateral borders for articulation of first seven pairs of ribs (costal cartilages), and at upper outer angles of manubrium for clavicles; transverse ridge (subcutaneous landmark) exists at line of junction of manubrium and gladiolus, marking level of third rib; ensiform varies in size and shape. Important muscles attached are sterno-cleido-mastoid and pectoralis major; rectus abdominis and diaphragm are attached to ensiform.

What portion of the bladder is uncovered by peritoneum?

The anterior wall, which is separated from symphysis pubis by prevesical space (cavum Retzii).

Describe the spinal cord.

Is contained in neural canal, and extends from lower margin of foramen magnum to body of second lumbar vertebra; constitutes 2 per cent. of cerebro-spinal axis; is surrounded by dura, arachnoid and pia; has two enlargements, cervical and lumbar, which mark points of origin of large nerve trunks for upper and lower extremities respectively (brachial and sacral plexuses); white nerve matter surrounds gray, which is arranged like two inverted commas (or capital "H"), connected by transverse band (gray commissure); anterior horn of gray matter contains large multipolar cells continuous with motor nerves, which appear upon surface of cord at antero-lateral aspect; posterior gray horn is continuous with

sensory nerves, which appear upon postero-lateral aspect of cord.

Describe the hyoid bone.

Is U-shaped, placed, with convexity forward, above thyroid cartilage; consists of centrally located body, two greater cornua directed backward and two lesser cornua projecting upward at point of junction of body and greater cornua. Hyoid bone serves for attachment of thyro-hyoid membrane and ligament and stylo-hyoid ligament; of sterno-hyoid, thyro-hyoid, omo-hyoid, genio-hyoid, genio-hyoglossus, hyoglossus, mylo-hyoid, stylo-hyoid and digastric muscles.

Name the articulations of the superior maxillary bone.

Frontal, lachrymal, nasal, malar, palate, ethmoid, inferior turbinal, vomer and opposite maxilla.

Give the origin and distribution of the olfactory nerve.

Olfactory tract appears upon surface of cerebrum at anterior perforated space, extends forward, terminating in olfactory bulb, which rests upon cribriform plate of ethmoid; from under surface of bulb 20 to 30 nerves descend, enter superior nasal meatus, grooving perpendicular plate and superior and middle turbinal processes of ethmoid, and are distributed to nasal mucous membrane covering these parts.

Describe the mammary glands.

Two hemispherical, lobulated glands placed upon anterior thoracic wall over pectoralis major muscle, covering a space from the second to the sixth rib, and from margin of sternum to anterior margin of axilla. Nipple, sensitive and pigmented, projects from center, and contains orifices of lactiferous ducts; areola, also pigmented, surrounds nipple; gland substance is arranged in lobules (10 to 20), each of which is a compound, racemose gland, and all are surrounded and supported by fibrous tissue, forming a capsule.

Describe each of the tunics of the eye and the different parts of each.

Sclerotic is outermost, consisting of bundles of fibrous

tissue closely interlaced, is perforated to nasal side of posterior pole by optic nerve, and is continuous with cornea anteriorly. Six ocular muscles are inserted into it. Cornea is transparent, consists of bundles of fibrous tissue enclosing corneal spaces, in which are lodged corneal corpuscles; is covered by conjunctival epithelium and lined by Descemet's membrane; is richly supplied by sensory nerve fibres, but is non-vascular. Uveal tract consists of choroid, ciliary body and iris, is vascular and pigmented; choroid is perforated by optic nerve behind; ciliary body is made up of ciliary processes and ciliary muscle; iris is placed in front of lens in anterior chamber, and is perforated at its center (pupil). Retina is innermost tunic, made up of nerve cells and fibres, representing an expansion of the optic nerve; macula lutea is point of most acute vision, and is located to temporal side of optic disk, or point of entrance of optic nerve; retina is supplied by arteria centralis retinæ, branch of ophthalmic artery, and drained by central vein of retina into ophthalmic vein.

What are the vesiculae seminales?

Two dilated pouches placed between bladder and rectum, uniting with vasa deferentia to form ejaculatory ducts.

Give the course of the posterior tibial artery.

Extends from lower border of popliteus muscle down leg between superficial and deep layers of muscles to inner side of ankle, where it divides into internal and external plantar branches.

Which of the cranial nerves has the widest distribution?

Pneumogastric (10th).

Describe the origin and distribution of the ninth pair of cranial nerves.

Ninth, or glosso-pharyngeal, nerve has superficial origin from groove between olivary and restiform bodies of medulla; is distributed to pharynx (sensory) and to posterior third of tongue, especially to circumvallate papillæ.

Give the distribution of the radial nerve below the wrist.

To radial half of dorsum of hand, and dorsum of thumb, index, middle and middle-finger half of ring finger, except distal segments of digits, which are supplied by median nerve.

What is the linea alba and how is it formed?

Is the line of fusion of aponeuroses of external and internal oblique and transversalis muscles, extending from ensiform above to symphysis below; just below its center is umbilicus.

Describe the sphincter ani.

Are two in number, internal, or involuntary, and external, or voluntary. Internal is formed by circular fibres of rectal wall; external is attached to tip of coccyx, surrounds anal opening, and is inserted into median line of perineum.

Describe the periosteum.

Is closely adherent to outer surface of bone and consists of two layers, an outer, fibrous layer, and an inner, vascular layer. In young and growing bones the inner is called the osteogenetic layer. Nerves and lymphatics are also present in periosteum.

Give the origin, insertion and action of any one of the following muscles: tibialis anticus, pronator radii teres, gracilis.

Tibialis anticus arises from upper ⅔ of outer surface of shaft and under surface of outer tuberosity of tibia, from interosseous membrane; is inserted into internal cuneiform and first metatarsal bones; action, to flex and invert foot; to strengthen and help maintain antero-posterior arch of foot.

Give a general description of the cerebral veins.

Remarkable for thinness of their walls due to lack of muscular tissue; they have no valves; superficial cerebral veins are lodged in sulci between convolutions, receive blood from substance of brain and terminate in the sinuses, opening into

them in the opposite direction to which blood is flowing; deep cerebral veins drain the ventricles into straight sinus; at base basilar vein drains interpeduncular space and basal ganglia.

Relate the differences between a virgin uterus and the uterus of a multipara.

Uterus of multipara is larger (especially body), arbor vitæ uterinæ of cervix is more or less effaced, external os is irregular, or perhaps stellate, instead of being a smoothly outlined, transversely directed slit.

Describe a hair follicle in its relations to the skin.

A hair follicle is an involution of epidermis, forming a funnel-shaped depression sometimes extending into subcutaneous cellular tissue; is usually placed obliquely and becomes enlarged at bottom to accommodate hair bulb, part of which is vascular papilla derived from dermal lining of follicle; opening into follicle are ducts of one or more sebaceous glands.

What are the Wormian bones?

Bones developed from separate centers of ossification to fill in gaps between certain of the cranial bones; they are found most frequently in lambdoid suture, occasionally occupying position of fontanelles, especially posterior.

Give a general description of the peritoneum. Name the principal organs covered by it.

Is a closed sac (except in female, at orifices of Fallopian tubes) which lines abdominal wall (parietal layer) and partially or completely surrounds viscera (visceral layer), constituting their serous coat; it forms omenta—Gastro-colic, or great omentum, gastro-hepatic, or lesser omentum, and gastro-splenic; it forms mesenteries—Mesentery (proper), of small intestine, mesocolon (ascending, transverse, descending, sigmoid, mesoappendix: principal organs covered by peritoneum are; liver, stomach, spleen, small intestine, large intestine, Fallopian tubes, uterus, bladder.

Describe the thymus gland.

Is first found during second month of intrauterine life, is largest when child is two or three years old, and usually disappears before puberty; is located in anterior mediastinum and lower part of neck, between lungs, in front of heart and great vessels and trachea; consists of two lobes made up of lobules, which are essentially lymphatic in character.

What are the suprarenal capsules and what are their relations to adjacent organs and parts?

Are two in number, one placed upon the upper pole of each kidney; each consists of cortex and medulla with vessels entering and leaving at a hilum; cortex is yellowish in color and contains granular, polyhedral cells arranged in columns; medulla is darker in color, from presence of bloodvessels which are closely related to groups of large cells. Suprarenal bodies are partially covered by peritoneum and are in relation, right with under surface of liver, left with spleen, stomach and pancreas.

Describe the medulla oblongata.

Is a part of encephalon, continuous with spinal cord below and with pons above; it rests upon basilar process of occipital bone, consists of white nerve matter externally and gray matter arranged irregularly internally, the latter appearing upon the surface in floor of fourth ventricle, the lower half of which is formed by upper surface of medulla; upon ventral surface is anterior median fissure, partially obliterated below by decussation of crossed pyramidal tracts; near anterior part of inferior surface are olivary bodies; posterior columns diverge to form calamus scriptorius and to bound fourth ventricle laterally for its lower half; posterolaterally are restiform bodies which can be traced upward into cerebellum, forming inferior peduncles of latter. Cranial nerves from seventh to eleventh inclusive arise from side of medulla, while twelfth appears upon surface in groove between olivary body and anterior pyramid.

Locate and describe the lachrymal gland.

Is located in upper, outer and anterior part of orbit, to inner side of external angular process; is made up of lobules, or clusters of acini, arranged around the ducts, six to twelve in number, which empty into outer part of superior conjunctival fornix.

Describe the lungs.

Each is pyramidal in shape, base resting upon diaphragm, apex extending into superior aperture of thorax, lateral, convex surface being applied to thoracic wall and inner, mesial and irregularly concave surface looking toward mediastinum; each possesses a root, placed upon inner surface, near posterior, thickened margin, and consisting of bronchus, pulmonary artery and vein, bronchial artery, nerves and lymphatics; right lung has three lobes, left has two; each is made up of lobules consisting of a terminal bronchiole, around which are arranged clusters of air cells; each lung is invested by visceral layer of pleura, whose parietal layer lines thoracic wall.

Describe the structure of the knee-joint.

Bones: Femur, tibia, patella; ligaments: Internal and external lateral, ligamentum patellæ, posterior; these are strengthened and supported by aponeuroses of vastus externus and internal antero-laterally, semimembranosus posteriorly; chief internal ligaments are crucial, anterior and posterior; joint contains two semilunar cartilages which are attached to non-articular area upon upper surface of tibia; synovial membrane is extensive and complicated; movements: Flexion, extension, slight rotation.

Bound the popliteal space. Mention its contents.

Above by outer and inner hamstrings, below by outer and inner heads of gastrocnemius muscle, with plantaris upon outer side; contents are: Internal and external popliteal nerves, popliteal vein and popliteal artery, termination of short saphenous vein and small lymphatic glands.

Mention the principal branches of the celiac axis.

Gastric, hepatic and splenic arteries.

What are the nerves of the eyeball?

Optic, motor oculi and ophthalmic division of fifth (both through ophthalmic ganglion) and sympathetic fibres from cavernous plexus (also to ganglion).

Describe the aural labyrinth.

Osseous labyrinth, whose divisions are three semicircular canals posteriorly placed, a vestibule in middle, and cochlea anteriorly, all containing membranous labyrinth upon which terminal filaments of auditory nerve and its special neuro-epithelium are found.

Describe the popliteal artery and give its branches.

Is a continuation downward of femoral from opening in adductor magnus and divides at lower border of popliteus muscle into anterior and posterior tibial arteries; it lies upon femur, posterior ligament of knee-joint, tibia, and fascia covering popliteus muscle; it enters popliteal space at upper inner margin, and bisects it longitudinally; popliteal vein is superficial to it; branches are superior and inferior internal and external articular, azygos articular, sural (muscular to calf), and anterior and posterior tibial.

What are the blood-vessels which supply the arteries called? Whence are the nerves of the arteries derived?

(a) Vasa vasorum. (b) Vasomotor, from sympathetic system.

Mention the varieties of epithelium.

Squamous, columnar, ciliated, glandular, transitional, pigmented, and neuro-epithelium. The first three may occur in a single layer, when it is named "simple;" or, in several layers, when it is called "stratified."

Describe the muscular tissue.

Muscular tissue is of mesodermic origin and consists prin-

cipally of elongated cells (fibrous cells) which have the inherent power of contracting. The muscle fibres contain nuclei and, sometimes, that which corresponds to a cell wall, the sarcolemma. Voluntary and cardiac muscles are striated, due to the arrangement of alternate light and dark discs. Non-striated muscle is involuntary. Microscopically, they may be differentiated as follows:

Striated.	Non-Striated.	Cardiac.
Fibers striated transversely.	No striations	Striated longitudinally and transversely.
Has sarcolemma.	Hyaline sheath.	No sarcolemma.
Nucleus beneath sarcolemma.	Nucleus in center.	Nucleus oval and in center.
Fibers do not branch, except in the tongue.		Fibers short.
		Fibers branch freely.

Describe a Haversian system.

A Haversian system occurs in compact bone and consists of a system of channels through which the nutrient fluids pass. It consists of the following: A centrally placed canal, the Haversian canal, which is surrounded by concentric layers or plates of bone, the lamellæ. Between the plates of bone are irregular clefts, the lacunæ, which communicate with each other and with the Haversian canal by means of radially placed canals—the canaliculi.

Name the humors of the eyeball.

Aqueous humor, contained in anterior chamber, consists of 98.6% water, and small quantities of extractives and proteids; vitreous humor, occupying the large posterior chamber, has about the same composition as aqueous humor.

State the origin of the sensory division of the fifth pair of cranial nerves.

Superficial origin is from under surface of pons, close to anterior border.

What is the function of the third cranial nerve?

To supply with motor influence all ocular muscles except

superior oblique and external rectus, and to furnish motor root to ophthalmic ganglion.

Describe the ramus of the jaw. Mention the muscles and ligaments attached to the ramus of the jaw.

Ramus extends upward and slightly backward, forming angle of jaw by its junction with the body; is surmounted by coronoid process anteriorly and condyle posteriorly, between which is sigmoid notch; upon inner surface is inferior dental foramen.

Muscles and ligaments attached are: Temporal, external and internal pterygoids, masseter; capsular and internal lateral ligament of temporo-mandibular articulation, stylo-mandibular ligament.

Describe the arytenoid cartilages.

Are pyramidal in shape, rest upon upper, posterior part of cricoid cartilage by their bases, have true vocal cord (thyro-arytenoid ligaments) attached to vocal process anteriorly; lateral crico-arytenoid, posterior crico-arytenoid, arytenoid and thyro-arytenoid muscles are also attached. The arytenoid cartilages are covered with mucous membrane and between them is the interarytenoid space.

Give the course and relations of the external jugular vein.

Is formed near angle of jaw by union of temporo-maxillary and posterior auricular veins, runs downward and outward upon sternomastoid muscle and under platysma myoides, to empty into subclavian vein at middle of clavicle.

Mention the branches of the internal iliac artery.

Anterior trunk: Superior, middle and inferior vesical, obturator, middle hemorrhoidal, uterine, vaginal, internal pudic and sciatic. From posterior trunk: Ilio-lumbar, gluteal, lateral sacral.

Give the course of the female ureters.

Rest upon psoas magnus muscles, pass over brim of pelvis

into cavity of same to base of broad ligaments, then ½ inch from cervix uteri, laterally, obliquely forward and inward in anterior vaginal wall to base of bladder.

What nerves form the pharyngeal plexus?

Glosso-pharyngeal, pneumogastric and cervical sympathetic.

What structures are severed in tracheotomy?

Skin, superficial and deep cervical fascia and trachea; perhaps anterior jugular vein, or branches, and thyroid isthmus.

Describe the phrenic nerve.

Is formed by the fourth cervical nerve, chiefly, passes downward upon anterior surface of scalenus anticus muscle, enters superior, then middle mediastinum and perforates diaphragm to supply its under surface.

Describe the ulnar artery as to (a) origin, (b) course, (c) distribution.

(a) Is one of terminal branches of brachial; (b) is beneath superficial flexors of forearm, passes obliquely to ulnar border, having ulnar nerve to ulnar side of it for lower ⅔ of its extent, then curves across palm near lower border of anterior annular ligament (superficial palmar arch), first sending communicating branch to deep arch. (c) Is distributed to structures around internal aspect of elbow, to ulnar side of forearm, to interosseous membrane, anteriorly and posteriorly, and adjacent muscles, and to palm and flexor surface of fingers.

How are the saphenous veins formed? Where do the saphenous veins empty?

Internal saphenous is formed upon dorsal surface of foot and inner border; external saphenous is formed upon dorsum and outer border of foot. Internal saphenous vein empties into femoral at saphenous opening in fascia lata; external saphenous terminates in popliteal vein.

Give the situation of the lymphatic glands of the thorax.

Intercostal spaces posteriorly, anterior and posterior mediastina, around bronchial tubes.

Give the boundaries and mention the contents of the posterior mediastinum.

Is bounded in front by pericardium and roots of lungs, behind by vertebral column and on either side by pleura. It contains descending thoracic aorta, greater and lesser azygos veins, pneumogastric and splanchnic nerves, esophagus, thoracic duct and lymphatic glands.

Describe the internal abdominal ring.

Is oval in shape, long axis directed vertically, located in transversalis fascia ½ inch above Poupart's ligament and midway between anterior superior iliac and pubic spines. Structures of spermatic cord pass through it in male, round ligament in female. Infundibuliform fascia is attached to its margin; deep epigastric artery courses along inner margin.

Give a method by which the fissures of Sylvius and Rolando may be approximately mapped out on the surface of the skull.

Fissure of Sylvius: Draw a line from a point one inch and a quarter horizontally behind external angular process of frontal bone to a point ¾ of an inch below parietal eminence. Fissure of Rolando: From a point ½ inch behind mid-point of line between glabella and external occipital protuberance, draw a line for 3¾ inches over side of head at angle of 67° with median line.

Locate and describe Peyer's glands.

Are located in wall of ilium, more numerous at lower part; are more or less oval bodies collected together; consist of adenoid (lymphoid) tissue.

Describe the tonsils and name some of the arteries which supply them with blood.

Are placed between anterior and posterior palatine arches,

in tonsillar recess, close to base of tongue, vary greatly in size and shape, surface is irregular and marked by numerous depressions leading into crypts in substance of tonsil, and are surrounded by closed follicles of lymphoid tissue. Arteries: Dorsalis linguæ, ascending palatine and tonsillar of facial, descending palatine of internal maxillary, ascending pharyngeal.

Describe the male urethra and state its divisions.

Divided into prostatic, membranous and spongy portions; prostatic passes through prostate gland, has veru montanum and orifices of ejaculatory ducts in its floor, upon either side of which are prostatic sinuses with orifices of prostatic glands; membranous portion is shortest of the three, is contained between the two layers of triangular ligament, and surrounded by compressor urethræ muscle; spongy portion is contained in corpus spongiosum, terminates at meatus urinarius externus (least dilatable part of urethra) and has several depressions in mucous membrane of roof, largest of which, just behind fossa navicularis, which is close to meatus, is named lacuna magna.

What is the origin and course of the pulmonary artery?

Origin is from right ventricle; course is upward and slightly to left to under surface of transverse portion of aortic arch, where it divides into right and left pulmonary arteries for right and left lungs respectively.

Give the names of the principal muscles of the back.

Trapezius, latissimus dorsi, rhomboideus major and minor, erector spinæ.

Locate and describe the rectum.

Extends from third piece of sacrum to anus, with forward curve, is covered by peritoneum in front and on the sides only; longitudinal and circular muscular fibres pronounced; mucous membrane thick, presenting several permanent, transverse folds, plicæ recti, or valves of Houston; is supplied by

superior, middle and inferior hemorrhoidal arteries; is behind bladder and prostate in male and vagina in female.

Where does the abdominal aorta commence and where does it terminate?

Commences at aortic opening in diaphragm upon body of twelfth thoracic vertebra; terminates upon body of fourth lumbar vertebra, just to left of median line.

Where is the foramen ovale of the heart and what purpose does it serve?

In the wall between the auricles; permits passage of blood in the fœtus from right to left auricle, deflecting its course from right ventricle and pulmonary circulation into general circulation.

What are the lymphatic glands?

Parts of lymphatic system consisting of adenoid tissue, enclosed in capsule, having afferent and efferent lymphatic vessels; lymph passes through them.

Describe the changes in the vascular system at birth.

Blood ceases to flow through umbilical vein and ductus venosus into inferior cava; hypogastric arteries become obliterated; foramen ovale closes and blood then does not pass from right to left auricle; ductus arteriosus, connecting pulmonary artery with arch of aorta becomes impervious and pulmonary circulation is actively established.

In the anatomy of the brain what is the corpus callosum? Describe its connections.

The great transverse commissure consisting of fibres which pass from one hemisphere to the other, connecting different parts of the cortex of one with that of the other, is located nearer the base than the top and forms the roof of the lateral ventricles.

Mention a muscle (a) which moves the thumb outward,

(b) which moves the head forward, (c) which moves the foot inward.

(a) Abductor pollicis; (b) sterno-cleido-mastoid (rectus capitis anticus major); (c) tibialis anticus.

What is the composition of intervertebral substance? How much of the spinal column does this substance form?

Is made up of fibro-cartilage; constitutes about ¼ of the spinal column.

Give the boundaries of the anterior mediastinum.

In front by the sternum, behind by the pericardium, laterally by the pleuræ.

What are the ciliary processes in the eye? Where are they placed and what is their average number?

Folds of middle tunic (uveal tract) consisting of connective tissue, blood vessels and pigment; are placed around periphery of lens close to edge, posteriorly, and number about seventy.

State the action of each of the following muscles: masseter, tibialis anticus, gluteus maximus.

Masseter, to bring lower jaw up against upper jaw; tibialis anticus, to flex foot upon leg and elevate and adduct inner border of foot; gluteus maximus, to extend trunk upon thigh, or thigh upon trunk.

PHYSIOLOGY.

Describe the bile-producing and the glycogenic function of the liver.

Bile is produced by the activity of the liver cells chiefly from the blood from the portal vein. It is collected in little canals hollowed between the cells and emptied into the bile capillaries. Through these it is forced on into the bile duct and either passed on into the duodenum during the act of digestion, or stored in the gall bladder until needed.

Glycogen or animal starch is formed by the protoplasmic activity of the liver cells from proteids and carbohydrates. It is deposited in the liver cells and when needed is changed into dextrose by a diastatic ferment found in the blood of the liver. This dextrose is carried out in the blood of the hepatic vein into the general circulation.

Give a dietary for people beyond the age of sixty years.

Food for the aged should be readily digestible and capable of being easily burned up for the maintenance of the heat of the body. Among suitable articles are eggs, milk, rice, properly cooked beef, butter and bread.

What is the function of the cerebellum?

The function of the cerebellum is the co-ordination of muscular movements.

Describe ciliated epithelium and state where it is found most abundantly.

The cells of ciliated epithelium are generally columnar in shape with numerous fine filaments projecting from their free surface. Ciliated epithelium is found most abundantly in the

trachea and bronchi and here sweeps the mucus and small dirt particles toward the mouth.

Give a description of the act of deglutition and mention the muscles brought into action in swallowing.

The swallowing of solids is divided into three stages—buccal, pharyngeal and esophageal. The first is voluntary, the others involuntary. The food is formed into a bolus and pressed backward by the tongue into the pharynx; the nasal cavities being closed, the pharyngeal muscles contract and force it on down to the esophagus. This in turn contracts and by a peristaltic movement forces the bolus into the stomach.

Liquids are not swallowed in this way, but are squirted down the esophagus, with a bulb syringe effect, by the mylohyoid muscle. The muscles involved in deglutition are the mylohyoid, muscles of the tongue, pharyngeal muscles, especially the constrictors and the involuntary muscular fibers of the esophagus.

How is asphyxia produced? What are the causes of death from asphyxia?

It is produced by anything causing a deficiency in the supply of oxygen to the tissues, as edema of lungs, membranous laryngitis, constriction of the trachea.

Death is caused by a deficiency in the amount of oxygen and the accumulation of carbon dioxide in the blood. The respiratory center is probably the first one to be disabled.

Describe (a) chyme, (b) chyle.

Chyme is the acid semi-fluid mass of partially digested food passing from the stomach into the duodenum.

Chyle is the lymph found in the lacteals of the intestines containing the absorbed fat. It is a milky white, alkaline fluid.

Give the process of coagulation of blood.

The fibrin ferment formed by the disintegration of the

white corpuscles acts upon the fibrinogen and converts it, if calcium salts are present, into the insoluble fibrin. The fibrin is formed in little filaments all through the blood and immeshes the blood corpuscles. This forms the clot which gradually begins to contract. A liquid called serum soon exudes and collects over the clot.

Name the functions of the chorda tympani, sufficiently detailing each to clearly define its character.

The chorda tympani contains the vasodilator fibers, but no vasoconstrictor fibers, for the anterior tongue and submaxillary gland. It contains the secretory fibers to the submaxillary gland, and also the taste fibers for the anterior two-thirds of the tongue.

Name the groups of food stuffs constituting the source of muscular energy. Designate the most important and state what stored product is utilized.

Carbohydrates are the most important, but fats and proteids may be used in the production of muscular energy.

Glycogen is the stored product that is utilized.

State the function of the nervus opticus, and explain by description or diagram the distribution of the fibers composing the chiasma and the effect thereof upon vision.

The nervus opticus is the nerve of the special sense, sight.

At the chiasma, the inner half of each optic nerve crosses to the opposite side; therefore, in loss of function of one optic nerve from injury or pressure back of the chiasma, there is blindness of the temporal side of retina of the same eye and of the nasal side of opposite eye. Stimulation of one retina by light causes a reflex contraction of both pupils.

Describe metabolism.

Metabolism is the chemical change going on in organized tissue. There are two divisions—anabolism or building up, and katabolism or tearing down. This chemical change is usually a hydration, dehydration, reduction or oxidation.

In the metabolism of proteids of the tissue, proteid food must be used to repair the loss.

The carbohydrates are the substances most readily broken up to supply heat and energy, the fats being next in order. The salts are needed in the various processes, but especially to combine with the acids, sulphuric and phosphoric, formed in proteid katabolism.

What is the normal proportion of blood in the human body and how is it renewed after hemorrhage?

About one thirteenth of the body weight is blood. The water and other constituents of plasma are renewed from the ingested food. The corpuscles are renewed by the bone marrow, spleen and lymphatic tissues.

State the effects of battery currents on the normal human nerves.

The faradic current stimulates them.

A nerve during the passage of a constant current through it, is said to be in a state of *electrotonus*. There is an increase of excitability at the negative pole or kathode, and decrease of excitability at the positive or anode.

Give the relative food value and ease of digestion of meat, milk, eggs, leguminous fruits.

According to relative food value the order is—meat, eggs, milk and leguminous fruits.

According to relative ease of digestion the order is milk, eggs, meat and leguminous fruits.

What are the effects of removal of the cerebrum in the lower animals?

A decerebrated animal loses all power of voluntary movement, remaining quiescent until some external stimulus brings out a reflex movement. Thus, food may be placed before him, but he will not take it; if it is placed in his mouth, he will swallow it. If turned on his back, he will right himself. He shows no fear.

What conditions are necessary for properly exercising the sense of smell?

For the proper exercise of the sense of smell, the substance must be volatile, the air in the nasal cavity must be in motion, and the olfactory apparatus must be in normal condition.

How would digestion be affected were the ductus communis choledochus obstructed?

In obstruction of the ductus communis choledochus the feces contain large quantities of undigested fats, the stools become hard and fetid, and finally death ensues from absorption of putrefactive products from the intestines.

Give the mechanism of the diaphragm in (a) respiration, (b) hiccough.

During rest or relaxation the diaphragm is domed upward. During inspiration, the muscle contracts, the central tendon is pulled down and thus the vertical diameter of the thorax is increased. During expiration, the muscle relaxes and the diaphragm resumes its domed position.

Hiccough is caused by a sudden spasmodic contraction of the diaphragm, the inspiration thus caused being arrested by a sudden closure of the glottis.

How does the nervous system influence gastric digestion?

Through the vagus the secretion of the stomach is controlled from the central nervous system. The vasomotor nerves of the stomach also influence secretion by controlling the mount of blood to the stomach.

Give the physiology of (a) hunger, (b) thirst.

Hunger is the constitutional need of the body for food with the eccentric symptoms in the epigastrium. The impoverishment and changes in the blood so affect the central nervous system as to cause the sensation.

Thirst is the constitutional need of the body for water

with the eccentric symptom in the pharynx. The lack of water in the blood so affects the nervous system as to cause this dryness of the throat.

Give the foramen of exit, the distribution and the function of the pathetic (fourth cranial) nerve.

The pathetic or trochlear nerve passes out through the sphenoidal fissure and is the motor nerve of the superior oblique.

Give the process of development of the parietal bone.

The parietal bone is formed between membranes and is not preceded by temporary cartilage.

The membrane is formed of an external fibrous layer and an internal layer, which becomes the periosteum and consists of a layer of osteoblasts.

Starting from a point called the center of ossification, little spicules of bone are deposited in all directions in the intercellular substances. As they become more numerous, they completely enclose the osteoblasts, which remain permanently in the bone. This process spreads in all directions and thus the bone is formed.

Explain the physiological circuit essential to a reflex action.

The essentials are an afferent nerve, a nerve center, an efferent nerve and the peripheral organ which it supplies.

Mechanical irritation of the sensory fibers of the vagus in the mucous membrane of the stomach causes an increased flow of saliva by irritation of the salivary center in the medulla and consequent passage of efferent impulses to the salivary glands.

What is the function of the sixth (abducens) nerve?

The abducens is the motor nerve of the external rectus.

Describe the respiratory function of the red blood corpuscles.

When the venous blood reaches the capillaries sur-

rounding the air vesicles of the lung, the hemoglobin found in the red corpuscles rapidly combines with the absorbed oxygen to form oxyhemoglobin. This is carried back to the heart and then into the systemic circulation, finally reaching the capillaries. Here the tissues take the oxygen from the loosely combined oxyhemoglobin. The hemoglobin is then carried back to the lungs to be reoxygenated. The corpuscles also carry small amounts of carbon dioxide from the tissues to the lungs.

Describe the normal pulse; state the factors active in its maintenance, and give the average rate during infancy, youth and adult age.

The pulse is the transmission of the cardiac impulse throughout the arterial system. A normal pulse should be full, of moderate tension, regular and of the right frequency. It is ordinarily examined over the radial artery at the wrist, because in this position there is a hard surface against which we can press the artery.

The factors active in its maintenance are the normal action of the heart and of the vasomotor system.

The average rate during infancy is 130 to 140; during youth 80 to 90; during adult life 70 to 75.

Name the active principles of the digestive secretions and state how each affects the food.

Ptyalin of saliva changes starch into maltose.

Pepsin, when hydrochloric acid is present, changes proteids into proteoses and peptones.

Rennin changes caseinogen into casein.

Amylopsin changes starch into maltose, dextrose, and dextrin.

Steapsin splits up fat into fatty acid and glycerin.

Trypsin, in an alkaline medium, changes proteids into proteoses and peptones.

Invertin changes maltose into dextrose, and saccharose into equal parts of dextrose and levulose.

Bile contains no ferment, but aids the pancreatic secretion in the emulsification of fats.

From what portions of the cortex cerebri do the arm, face and leg receive their motor impulses?

The motor area is along the fissure of Rolando in the ascending frontal, ascending parietal and paracentral convolutions. The leg center is the uppermost, the arm center next, and the face center the lowermost.

Describe the position of the vocal chords during phonation and name the factors concerned.

The chink of the glottis during phonation is narrowed, the arytenoid cartilages are approximated and the vocal cords are stretched. The arytenoid muscle approximates the arytenoid cartilages, and with the help of the lateral crico-arytenoids and the internal part of the thyro-arytenoids closes the glottis. The vocal cords are made tense by the crico-thyroids and external part of the thyro-arytenoids.

Give the origin of normal fat in the human body and name examples of the types of food from which it is elaborated.

The normal fat of the body is derived from food ingested. Any excess of food is stored up as fat. Fat may be elaborated from fats ingested as olein, from carbohydrates as starch, or from proteids as casein.

Describe a complete physiological revolution of the heart.

During diastole the blood from the auricles passes into the ventricles. Toward the end of diastole the auricles contract, forcing the blood remaining in them into their respective ventricles; the ventricles now contract, the auriculo-ventricular valves are closed and the blood is forced into the pulmonary artery and aorta through the open semilunar valves; the ventricles now relax, the semilunar valves closing with a snap and the auriculo-ventricular valves being opened by the force of blood in the auricles and by the negative pressure in the ventricles.

If the cardiac revolution were divided into tenths, the first or systolic sound would occupy four-tenths, the short silence one-tenth, the second or diastolic sound two-tenths, and the long silence three-tenths.

Describe the process of respiration.

Respiration is the function of taking in oxygen and the throwing off carbon dioxide. This exchange of gases takes place in the air vesicles where the blood and atmospheric air are separated by but a single layer of squamous epithelium.

Three factors are concerned in this exchange—the law of pressure of gases, chemical affinity, and the vital activity of the epithelium.

In tissue respiration the oxygen passes through the endothelium forming the capillary wall, into the tissue, where it is used up. The carbon dioxide there formed passes from the tissues into the capillaries and thence to the lungs.

What are the functions of the blood-vessels?

Through the blood-vessels the blood is forced to the various parts of the body, carrying nutritive products to the tissues and waste from the tissues to the organs that excrete it. By their muscular wall they regulate the amount of blood going to various portions of the body, and together with the elastic tissue they contain also reduce the amount of work thrown on the heart. Through the capillary wall osmosis and diapedesis take place.

Name and describe the normal respiratory sounds of the lungs and bronchi.

The vesicular sound is a distant, soft, breezy sound, of low pitch, with the inspiration three or four times longer than expiration. It is caused by air passing through the bronchi, the sound being modified by the air vesicles. The bronchial sound is caused by the air rushing in and out of the bronchi. It is high pitched, loud, tubular in quality, the expiration being to inspiration as seven is to six.

Of the functions of vision, what is understood by accommodation?

By accommodation is meant the increasing of the curvature of the anterior surface of the crystalline lens to focus near objects on the retina.

Describe the action of the kidneys, and give the normal constituents of the urine.

The kidneys are compound tubular glands that pick out from blood certain waste material which passes down the tubules into the pelvis of the kidneys and then into the bladder.

But one constituent of the urine is formed in the kidney and that is hippuric acid.

The water filters through the glomeruli principally, while the urea is picked out by the rodded epithelium of the convoluted tubules. No proper secretory nerves have as yet been found for the kidneys, which seem rather to be controlled by the vasomotor system. The kidneys have possibly an internal secretion also.

The normal constituents of the urine are — water, urea, uric acid, hippuric acid, sodium chloride, potassium and sodium sulphates, conjugate sulphate as indican, earthy and alkaline phosphates, sometimes carbonates and oxalates, and the coloring matters urochrome, urobilin and uroerythrin.

Describe gastric digestion, with special reference to the changes effected upon the types of food.

When the food reaches the stomach the two openings close and the involuntary muscle contracts down on the mass and starts up a churning-like movement, by which fresh portions of food are constantly brought to the surface. At the end of an hour the pyloric orifice gradually relaxes, allowing some of the more liquid chyme to pass into the duodenum, and by the end of three or four hours even the larger pieces of undigested food are forced into the duodenum. During this time the gastric juice is being poured out from the mucous membrane. The act of mastication and deglutition and the

irritation of sensory vagus endings in the stomach by the food act as powerful reflex excitants to this secretion.

The ptyalin of the saliva continues to change starch into maltose until the increasing acidity of the gastric juice stops its action.

The fats are liquified, but it is upon the proteids that the chief action takes place. The rennin changes caseinogen into casein. The pepsin in the presence of the hydrochloric acid changes the proteids into proteoses and peptones.

Describe the process of segmentation of the ovum.

The impregnated ovum first divides into two cells by indirect division or karyokinesis, these again subdivide, continuing until finally a single layer of cells surrounding a central cavity is formed. One group of cells proliferates more rapidly than the other and as a result they become surrounded by the other layer; thus two leaves are formed. Between these a third layer or mesoblast is formed. From this blastoderm the animal is now developed.

What is the relation of the capillaries to the circulation?

The capillaries connect the small arterioles with the smallest veins. They are situated at the periphery.

What precautions should be taken in the ingestion of vegetable foods? Give the reasons for taking these precautions.

Vegetable foods should be well cooked so as to burst the cellulose covering of the starch granules; they should be well chewed so as to break up the cellulose covering. Some fatty food should be taken with them as they are deficient in fats. As some of them contain but little nutritive material, they should be taken in large quantities for obvious reasons.

Describe the process of osmosis and give examples in the human economy.

Osmosis is the diffusion of liquids through a porous membrane.

For osmosis to take place the liquids must be miscible, of different natures, capable of wetting the membrane without acting on it chemically, and the substance must be able to pass through the membrane, that is, be crystalloidal in nature. Heat, increase of pressure and electricity aid osmosis.

The following are examples of osmosis: (1) The passage of some of the plasma through the capillary wall into the tissues. (2) The passage of glucose from the intestine into the poral circulation.

Name the secretions of the alimentary canal and give the functions of each.

Saliva changes starch into maltose and dextrin, dissolves soluble substances, thus allowing them to be tasted, lubricates the bolus of food and aids in speech.

Gastric juice changes caseinogen into casein, and proteids into proteoses and peptones. It also destroys many micro-organisms swallowed in the food.

Pancreatic secretion changes proteids into proteoses and peptones, starch into maltose, dextrose, and dextrin, caseinogen into casein, and splits up, saponifies and emulsifies fats.

Bile neutralizes the acid chyme precipitating the pepsin, aids in the emulsification and absorption of fats, increases peristalsis, and carries off some of the waste thrown out by the liver.

Succus entericus changes maltose into glucose, and saccharose into invert sugar.

The alimentary canal has also the usual protecting and lubricating secretion of mucus.

Describe urea, its occurrence, variations in the quantity excreted and recognition in the voided urine.

Urea, $CO(NH_2)_2$, the great nitrogenous waste, is a crystallizable substance soluble in water, less soluble in alcohol, neutral in reaction and forming with nitric acid urea nitrate. About 500 grains daily are thrown off in the urine by the kidneys. It is formed in the liver ($\frac{8}{9}$) and in the intestines

($\frac{1}{9}$). It varies principally with the amount of nitrogenous food in the diet. Muscular exercise does not increase it to any marked extent. It is recognized by adding nitric acid to a concentrated urine, when urea nitrate separates out in a crystalline mass, also by the hypobromite test.

What is rigor mortis? What is tetanus?

Rigor mortis is the post-mortem rigidity of the muscles due to the *coagulation of the myosinogen.*

Tetanus is a state of continued contraction of a living muscle.

Give the varied functions of the sympathetic nerve.

The function of the sympathetic system is mainly vaso-motor. It also supplies the heart with accelerating fibers, the intestines with inhibitory and some motor fibers; dilates the pupil, and causes a bulging of the eyeball. It also has an influence on the salivary secretion.

How are the phenomena of ventriloquism produced?

Instead of the usual expiratory blast, an inspiratory blast is used in producing the vocal sounds. At the same time the operator directs the attention of the onlookers to some object.

Describe the mechanism of micturition.

Usually it is a mixture of a voluntary and involuntary reflex act. The reflex center is situated in the lumbar cord. Stimulation of this center is ordinarily caused by a full bladder or by the escape of a drop of urine into the urethra, but may be excited by irritation of sensory nerves of other surfaces, as the intestinal mucous membrane by worms. Ordinarily the sphincter of the bladder is inhibited, the muscular wall contracts, and aided by the abdominal and other expiratory muscles forces the urine out through the urethra. There are higher centers that have control over the lower reflex centers.

Name the ferments that are the essential constituents of each digestive fluid.

Ptyalin is found in saliva; pepsin and rennin in gastric juice; amylopsin, steapsin, trypsin and a milk-curdling ferment in the pancreatic juice; invertin in the succus entericus; and the micro-organisms or organized ferments in the intestines. Bile contains no ferment.

What are the functions of the spinal cord?

The spinal cord is the great motor and sensory pathway to and from the periphery. In the anterior horns are found the cells concerned in the muscular reflexes, and also the trophic centers for the muscles. Beside the muscular reflex-centers, the cord contains the following centers: Anospinal, vesicospinal, genitospinal, uterospinal, sweat, minor vasomotor and possibly ciliospinal.

What post-mortem tests should be applied to prove that air has entered the lungs of a supposedly still-born child?

Tie the trachea, take out the lungs and place them in water. If they float, air has entered the lungs. The thorax is not as flat after respiration has started and the diaphragm is displaced further downward. The lungs are brighter in color and are crepitant after air has once entered.

Wherein does the temperature of the body in advanced age differ from its temperature in middle life?

In advanced age the temperature has a tendency to become subnormal from the slightest cause.

Give in language or by drawing the sphygmographic tracing in aortic insufficiency.

In aortic insufficiency there is the so-called "trip hammer pulse." In the sphygmogram there is a very high, quick up stroke and an almost as quick downstroke due to the rapid decrease in pressure caused by the regurgitation. On the downstroke a small dicrotic wave is seen.

What are amyloid foods, proteid foods? Give three examples of each.

The amyloid foods are the carbohydrates in the molecule of which are six or multiple of six atoms of carbon, and hydrogen and oxygen in the proportion to form water. Starch, cane sugar and glycogen and amyloids.

Proteids are highly complex bodies containing carbon, hydrogen, oxygen, nitrogen, sulphur and sometimes phosphorus. Egg albumen, casein and gluten are proteids.

How is cartilage (a) developed, (b) nourished?

Cartilage is developed from the mesoblast. The cells are not branched. By karyokinetic changes they divide and subdivide. Each cell is surrounded by a capsule which helps to form a portion of the matrix. But beside this, other material is deposited in the intercellular spaces.

Cartilage is nourished by the perichondrium except articular cartilage, which is nourished from the underlying bone.

Describe nerve cells and nerve fibers.

The nerve cells are nucleated masses of granular protoplasm with one or more protoplasmic prolongations called dendrons. Passing off from most nerve cells is a long fiber or axis cylinder.

The nerve fibers are either medullated or non-medullated. The medullated fibers consist of an axis cylinder or neuraxon, surrounded by the myelin or white substance of Schwann, which in turn is covered with the neurilemma or sheath of Schwann. An internal layer of protoplasm separates the myelin from the neuraxon, and an external layer separates the myelin from the neurilemma. Here and there along the course of the nerve are found the nodes of Ranvier. The non-medullated fibers contain no myelin.

What experiments have been made to prove the glycogenic function of the liver?

The blood of the portal vein during active digestion of a

carbohydrate meal contains more sugar than the hepatic vein, showing the arrest of dextrose in the liver. The hepatic vein in the intervals of digestion contains twice as much dextrose as that in the blood entering the liver.

If a rabbit that has been fed on carrots is killed and the liver rapidly removed, cut into small pieces and thrown into boiling water, it yields an extract rich in glycogen and almost free of dextrose.

If another animal is treated the same but the liver allowed to stand for some time before making an extract, the extract will contain much dextrose and but little glycogen.

The carbohydrate of blood is dextrose and not glycogen. Under the microscope, glycogen granules are found in the protoplasm of the liver cells.

Give the function of the epiglottis.

The epiglottis is used in vocalization, especially of the lower-pitched tones.

What differences of function exist between the white and gray matter of the encephalon?

The gray matter is composed of cells, which are the terminals that receive sensations, classify the knowledge thus received, and send out impulses.

The white matter is made up of fibers that transmit the impulses, connecting the cells with each other and with the periphery.

Describe the ileocecal function.

The ileocecal valve is composed of two semilunar folds of mucous membrane, containing the circular fibers. When the cecum is distended this valve is closed, and thus regurgitation into the small intestine is prevented.

State the approximate time of eruption of the temporary teeth.

The lower central incisors erupt about the 5th or 6th month, followed rapidly by the other six incisors. About

the 11th or 12th month the first molars appear. From the 18th to 20th month the canines erupt, followed from the 24th to 30th month by the second molars.

State what are, under normal conditions, the (a) adult number of respirations per minute; (b) body temperature; (c) average respiratory capacity.

Respiratory rate is eighteen per minute; the body temperature is 98.4° Fahr.; the average respiratory capacity is 230 cubic inches.

Name two circumstances influencing secretion.

Among circumstances influencing secretion are the supply of blood to the gland and the proper action of the normal reflex excitants.

What is the function of (a) sudoriferous glands; (b) the sebaceous glands?

The function of the sudoriferous glands is to excrete sweat; that of the sebaceous glands to secrete sebum.

Name the principal centers of organic function in the medulla oblongata.

The principal centers in the medulla are the respiratory, cardio-inhibitory, cardio-accelerator, vasomotor, salivation, mastication, deglutition, vomiting and diabetic.

Account for the contraction and dilatation of the pupil.

The contraction and dilatation of the pupil is a reflex phenomenon regulating the amount of light and sharpening the image for near objects.

There are two sets of muscular fibers in the iris—circular or contracting and radiating or dilating.

Give the composition of normal feces.

The feces contain 70 to 80% of water. Of the solid matter there are indigestible substances as cellulose, mucin and keratin; some undigested matter as uncooked starch and elastin; products of microbic digestion as indol, skatol,

phenol, fatty acids and leucin; bacteria; cholesterin; coloring matters, stercobilin; and intestinal debris as cells and mucus. They are alkaline in reaction, quantity, 6 to 8 ounces in 24 hours.

Describe the disturbances of function produced by the excessive imbibition of alcohol.

Excessive imbibition of alcohol causes congestion of the stomach with altered gastric secretion, precipitation of pepsin during gastric digestion, congestion of liver and finally destruction of many of the liver cells. On entering the circulation it acts as an irritant to the whole vascular system and to the kidneys. It also causes subnormal temperature.

How are cells connected?

Cells are connected by the intercellular substances.

What changes take place in the composition of blood as it passes through the kidneys?

During the passage of the blood through the kidneys, these organs pick out of it large quantities of urea, uric acid, sodium chloride, alkaline and earthy phosphates, sodium and potassium sulphates, indican, extractives and water. The blood also becomes venous, losing oxygen and adding more carbon dioxide.

How are the vocal sounds produced?

The vocal sounds are produced by vibrations of the vocal cords, modified in the case of vowels by peculiarities in the shape of the resonating cavities above, mouth, pharynx and nasal cavities. In the case of consonants the vibrations are modified by a more or less complete interference with the outgoing flow of air.

What would be the effect on the saliva and on digestion if Stenson's duct should be divided?

If Stenson's duct should be divided, the other parotid would probably hypertrophy somewhat to make up for the

loss of secretion. There would be comparatively little effect on the saliva or digestion. At first mixed saliva would possibly be less watery and the digestion of starch somewhat retarded.

Describe the physiologic aspect of atavism.

Atavism is the peculiarity of the offspring of taking on the characteristics of the parent.

Certain characteristics, inherent in the ovum and spermatozoon and derived from the parents, cause special development in the certain lines, thus causing the offspring to take on peculiarities of the parents.

Give the extremes of slowness and rapidity of the heart's action which are consistent with physical vigor, and with ability to perform manual labor.

The extremes would probably be from fifty to a hundred beats per minute; nevertheless, no definite extremes can be given.

Give the process of regeneration of uterine mucous membrane following pregnancy.

Following pregnancy the mucous membrane of the uterus is regenerated from the epithelium of the deep glandular layer. Around the mouth of the glands proliferation goes on rapidly, the groups of new cells spreading out and finally coalescing with each other. About the end of the fifth week this new membrane is complete. All cells and shreds of decidual tissue not concerned undergo fatty degeneration and are thrown off through the lochial discharge.

In what manner, physiologically, does a largely distended stomach produce death?

A largely distended stomach may cause death by interference with normal digestion, causing excessive fermentation and auto-intoxication. Or, pressure on the surrounding organs causes interference with the circulation and the functions of the organs. The venous stasis causes hypertrophy

and dilatation of the heart, which finally gives out, death ensuing.

Give the physiological properties of the facial nerve.

The facial nerve is the motor nerve for the muscles of expression of the face.

Describe hemoglobin and mention its derivatives.

Hemoglobin is a proteid-like body, readily crystallizable and containing iron. It readily unites with oxygen and other gases and has a peculiar spectrum. On the addition of an acid or alkali, it is broken up into hematin and globin, a proteid of the globulin group.

Hematin, hematoidin, hemin, hematoporphyrin and methemoglobin are derivatives of hemoglobin.

Define and give the physiologic significance of (a) dyspnoea, (b) dysphagia, (c) apnoea.

Dyspnoea, or difficult rapid breathing, is caused by a deficient supply of oxygen to the tissues.

Dysphagia, or difficult or painful deglutition, may be caused by obstruction in the esophagus, reflex spasm, or by painful affections of the pharynx.

Apnoea, or cessation of breathing, is caused by the blood being overcharged with oxygen, or by a reflex inhibition of the respiratory center.

What prevents digestion of the stomach by its own juices?

The reason that the stomach is not digested by its own juices is not known, so it is said to be due to a vital act. Neither the alkalinity of the mucous membrane, nor the alkalinity of the blood will explain it.

Give the physiology of (a) blushing, (b) pallor, (c) tear shedding.

Blushing is a reflex dilatation of the bloodvessels of the skin. Some emotional disturbance so stimulates the vasodi-

lator center in the medulla as to cause a vasodilatation of the skin vessels.

Pallor is a reflex vasoconstriction of the bloodvessels of the skin. It is caused by a reflex excitation of the vasoconstrictor center in the medulla.

Certain emotions so reflexly stimulate the lachrymal glands through the central nervous system as to cause the glands to secrete more fluid than can be carried off through the nasal duct. The excess runs over the cheeks and is called tears.

What causes (a) circulation of the blood, (b) the beating of the pulse?

The circulation of the blood is caused by the action of the heart, aided by the vasomotor system.

The beating of the pulse is caused by the transmission of the cardiac impulse through the elastic arterial system.

What are the functions of the pancreas?

The pancreas secretes the pancreatic juice. In addition to this, it has an internal secretion, because extirpation of the pancreas causes diabetes.

What substances are absorbed principally in (a) the stomach, (b) the duodenum?

Alcohol, water and soluble salts are absorbed in large quantities by the stomach. The fats, proteids and glucose are absorbed in the duodenum and in the rest of the small intestines.

Describe the conditions within normal physiological limits which increase arterial blood pressure.

Anything that will directly or indirectly cause stimulation of the vasomotor center will cause an increase in arterial pressure.

Among these causes we have digestion, muscular exercise, various emotions, as fear and joy, increased resistance in the capillary system, dyspnoea and asphyxia.

Name the inorganic proximate principles that enter into the formation of the human body.

The inorganic proximate principles entering into the formation of the human body are water and the various salts, as sodium chloride, potassium sulphate, calcium fluoride and magnesium phosphate.

What do you understand by the term nutrition, and what processes are comprised under it?

By nutrition is meant the taking-in of nutrient material, its conversion into living protoplasm, and the throwing-off of waste matter from the cell.

It includes digestion, absorption, metabolism and excretion.

What are the Wolffian bodies? When do they appear and into what organs do they ultimately develop?

The Wolffian bodies are the temporary kidneys of early intra-uterine life, appearing about the third week. In the female they become the parovarium; and in the male, form the globus major, vas efferentia and coni vasculosi.

What is the composition of human milk?

Milk contains 112 parts of solid matter to the thousand. Of these, sixty parts are the carbohydrate, lactose; thirty are fats, olein, palmitin, stearin and butyrin; twenty are proteids, caseinogen, lactalbumin and lacglobulin; and two parts are salts, especially sodium chloride and calcium phosphate.

What are the uses of perspiration?

Through the perspiration we get rid of certain waste products, supplementing somewhat the action of the kidneys. Through it we also throw off large quantities of heat. It also keeps the skin moist.

What conditions increase the amount of solids in the urine?

Increased ingestion of salts will increase the amount of salts excreted.

Diarrhoea, free perspiration and limiting the ingestion of fluids, will cause a relative increase of solids. Excessive muscular exercise will also cause a small increase in the amount of solids.

What are the functions of the pneumogastric nerve?

Among its many functions the pneumogastric is motor and sensory to the larynx, motor to the pharynx and oesophagus, motor, sensory and secretory to the stomach, inhibitory of the heart, motor and sensory to the lungs, and sends more filaments through the sympathetic system to the pancreas, liver and intestines.

How are the sensations of color produced?

According to the Yung-Helmholtz theory there are three sets of retinal fibers, each responding to the stimulation of one of the primary colors, green, red and violet. Stimulation of these in different degrees causes the various shades.

According to the Hering theory there is one set of fibers, while there are three chemical substances found in visual purple. The anabolism of these causes white, red and yellow; katabolism, black, green and blue. Various combinations cause various shades.

Describe the portal circulation; the renal circulation.

The blood collected from the capillaries of the spleen, stomach and intestines by the splenic, gastric, inferior and superior mesenteric veins is carried by the portal vein to the liver. Here this vein breaks up into smaller vessels running between the lobules, called the interlobular vessels. These break into a set of capillaries, called the lobular capillaries, which coalesce to form the intralobular veins. These empty into the sublobular veins, which in turn form the hepatic vein which carries the blood into the inferior vena cava. The hepatic artery supplies especially the capsule of the liver.

In the kidneys we find three sets of capillaries. One

set is that of the vasa recta, short vessels given off from the arterial trunks and supplying the medullary portion. Then we have the arteries of the cortex forming the set of capillaries of the glomeruli. The vessels passing out from the glomeruli are called the efferent vessels, and again break up into a set of capillaries around the convoluted portion of the tubules. The blood is then collected by the renal venules and passes out through the renal vein.

What circumstances and conditions favor gastric digestion?

Among the many circumstances favoring gastric digestion are thorough mastication, slow eating, pleasant taste to the food, swallowing in small mouthfuls, normal amount of condiments, muscular and mental quietude, and a general healthy condition of the various parts of the body.

Describe the physiology of vomiting.

Vomiting is the spasmodic rejection of the contents of the stomach. It may occur from an abnormal condition of the vomiting center in the medulla, or reflexly from the irritation of many nerves, as the glossopharyngeal in the posterior surface of the larynx, or the pneumogastric in the stomach, or from the sight of disgusting objects. disgusting tastes or smells, or from irritation of other mucous membranes, as the uterus.

During the act of vomiting the diaphragm is fixed, the cardiac orifice of the stomach is opened by the longitudinal fibers and the abdominal muscles contract, causing the contents of stomach to be forced into the mouth.

What would be the effect on digestion if the pancreatic duct were obstructed?

As the pancreatic secretion acts on all classes of food, there would be a marked decrease in the whole digestive function, especially on the fats and proteids.

Discuss bacteria in the intestines.

The bacteria found in the intestines may be divided into three groups,—fermentative, chromogenic and pathogenic.

The first class is very useful, forming peptones, dextrose and fatty acids, and breaking up some poisonous principles, as choline, into simpler bodies. Unless putrefaction becomes excessive, it is perfectly normal.

Among other substances formed during microbic digestion are indol, skatol, phenol, carbon dioxide, leucin, tyrosin, hydrogen sulphide and ammonia.

Give the relative activity of absorption in the alimentary canal, the skin and the lungs.

The relative activity of absorption is first through the lungs, then through the alimentary canal, and third through the skin.

Give the process of replacement of temporary by permanent teeth.

As the jaws grow and can accommodate the larger permanent teeth, the little immature permanent teeth budded off from the temporary set begin to grow upward. As they grow, the fangs of the temporary teeth are gradually absorbed, the crown falls off, and then the permanent erupt.

What conditions retard, suspend or prevent the coagulation of blood?

The conditions retarding, suspending or preventing coagulation are—addition of oxalates, proteoses, peptones or leech extract; low temperature; contact with living vascular walls; the covering of the surface with oil; addition of large quantities of neutral salts; excess of carbon dioxide; death by lightning; and the diseased condition, hemophilia.

What is the function of the superior laryngeal nerves?

The superior laryngeal nerves are the motor for the cricothyroid muscles and the sensory for the larynx.

Discuss the effect of the cooking of food as a means of rendering it more digestible.

It is especially on the starchy foods that cooking has a good effect by breaking up the cellulose covering of the starch granules and changing some of the starch into dextrin.

The fats in the cells are also liberated.

Upon the proteids cooking has rather a detrimental effect, especially if the temperature is raised very high. For instance, the uncooked egg albumin is more readily digested than the coagulated cooked albumin.

What agencies induce the flow of lymph to the point of discharge in the veins?

The flow of lymph is induced by the vis a tergo or pressure in the tissues, by muscular action and the play of the numerous lymphatic valves, by muscular tissue in the lymphatic vessels, and by thoracic suction.

Name some of the involuntary muscles and the function with which each is concerned.

The uterus is the organ for the carrying of the developing embryo and foetus. The muscle is used for the expulsion of the foetus at the end of intra-uterine life.

The muscular wall of the intestine is used for mixing and passing on downward the food received from the stomach.

The tunica media of the arteries contains many muscular fibers that control the supply of blood to the various parts of the body.

What do you understand by blood pressure?

Blood pressure is the pressure to which the blood is subjected in the circulatory system. In man it is about 110 millimeters of mercury.

What effect does an excessive starchy diet produce?

It produces excessive flatulency and may lead to an alimentary glycosuria.

Give the mechanism of the organs of hearing.

The sound waves are converged by the auricle, pass through the external auditory meatus, striking then against the membrana tympani, which sets into movement the ossicles, malleus, incus and stapes. The base of the stapes fits into the oval window. Thus the sound waves cause a movement of the ossicles, which in turn, through the base of the stapes, cause vibrations to be set up in the perilymph of the vestibule; then they are conveyed through the scala vestibuli and through the helicotrema to the perilymph of the scala tympani, and out through the round window to be dispersed.

The vibration of the perilymph in the cochlea sets up vibration in the scala media costaining the organs of Corti, which are the special receptive apparatus of hearing.

The impressions received here are carried by the cochlear branch of the auditory nerve to the cerebrum.

What is meant by digestion?

The nutrient material or food ingested has to be so changed that it can be absorbed. This changing of the food is called digestion.

What influence has the nervous system on the process of secretion?

The nervous system controls the process of secretion by the various secretory centers and nerves, and by controlling the amount of blood to the various organs of the body.

Name the refracting media of the eye and the effect that each has on the rays of light.

The refracting media of the eye are the cornea, aqueous humor, crystalline lens, and the vitreous humor.

They all converge the rays of light, the cornea being the most potent, the crystalline lens coming next, then the vitreous and finally the aqueous humor.

What is the location of the center for articulate speech?

The center for articulate speech is in Broca's convolution, the left lower frontal in right-handed people.

How is the sensation of pain produced?

Stimulation of the special endings of the pain nerves in the skin, or stimulation of the trunk of the nerve, causes an impression to be sent to the special area of the brain presiding over pain sensations. When this center is so stimulated we feel pain.

What kinds of food would you recommend in cases of obesity?

The whole diet including water should be restricted and the relative amount of proteids greatly increased in cases of obesity.

Give the reactions of the following fluids and state the cause of the reaction in each case: blood, gastric juice and pancreatic juice.

Blood is alkaline from its contained alkaline phosphates and carbonates.

Gastric juice is acid from the hydrochloric acid in it.

Pancreatic juice is alkaline from the sodium carbonate it contains.

Do variations in the rate and force of respiration affect the heart, and if so, in what manner?

Increase in the rate and force of respiration increases the number and force of the heart-beats. A deep inspiration held for some time will reduce the rate of a rapid heart.

Name the organs of the special senses.

The organs of special sense are the eye, ear, upper portion of nasal cavity, the taste bulbs on the tongue, and the tactile end organs.

Describe the functions of spinal nerves.

The spinal nerves carry the afferent and efferent impulses of the body and of the back of head to and from the central nervous system.

Among the afferent impulses we have those of pain, temperature, tactile, pressure and muscular sense.

Among the efferent, we have the motor, trophic, secretory and vasomotor.

Describe the effect of a transverse section of the spinal cord in the mid-dorsal region.

A transverse dorsal section would cause paralysis of motion and of sensation of the parts below the section, paralysis of bladder and rectum, and exaggerated reflexes of the legs.

What is meant by the condition of tetanus in a muscle?

When a muscle goes into a state of continued contraction, it is said to be tetanized.

Describe the digestion in the stomach of a meal of bread and milk.

The ptyalin of saliva continues for some time in the stomach to change the starch of the bread into maltose. The hydrochloric acid also has some action on the starch. The gluten of the bread is changed by pepsin into gluten peptone. The caseinogen is changed into casein by the rennin, and then the pepsin changes it into casein proteose and peptone.

The lactalbumin and globulin are also changed into proteoses and peptones. The soluble salts are dissolved and the fats melted.

What variations of temperature are found in the different parts of the body? Mention the reasons for such variations.

The highest temperature is found in the blood leaving the liver, and is due to the amount of heat formed in this large gland.

The tip of the nose is said to be the coldest part of the body, due to its exposed position and to the thinness of its walls.

The skin surface is always cooler than the internal organs, due to the radiation of the heat of the blood from the skin, the evaporation of sweat from the skin and the increased amount of heat produced in the internal organs.

Describe the mechanism in the opening and closing of the aortic valve.

The three leaflets of the aortic valve are placed with their concavity toward the aorta. During systole the pressure in the ventricles forces the blood past the aortic valve into the aorta. As the ventricle begins to dilate in diastole the pressure of the blood in the aorta tends to force the blood back into the ventricle. This force fills up the pockets of the aortic leaflets and forces their free edges together, thus closing the orifice.

Define life and death.

"Life is that obscure principle whereby organized beings are peculiarly endowed with certain powers and functions not associated with inorganic matter."

"Death is the cessation of life." (Dorland).

Describe the physiology of rectal feeding.

Small quantities of food, especially if predigested, when placed in the rectum are readily absorbed and will sustain life as long as the rectum does not become so irritable as not to retain the food. The food should preferably be predigested, but even egg albumin can be absorbed.

What tests should be applied to ascertain the integrity of (a) the superficial reflexes, (b) the deep reflexes?

To ascertain the integrity of superficial reflexes we have the plantar reflex or movement of the toes on stroking the sole of the foot; the cremasteric, the retraction of testicle on gently stroking the inside of the thigh; the epigastric, contraction of abdominal muscles on stroking the side of the abdomen; the ciliospinal, dilatation of the pupil on pinching the skin; and many others.

Of the deep reflexes, the knee jerk is the one usually sought after. On tapping the tendon below the patella the quadriceps is thrown into action. We also have a bicipital reflex or contraction of biceps on tapping the tendon at the elbow.

What would be the effect of a transverse section of (a) the anterior root of a spinal nerve, (b) the posterior root of a spinal nerve?

Transverse section of the anterior root would cause motor paralysis of the muscles it supplied, and finally atrophy of the muscles.

Transverse section of the posterior root would cause loss of sensation of the part it supplied.

Describe the physical properties of (a) lymph, (b) chyle.

Lymph is a yellowish, salty, albuminous liquid, with a specific gravity of 1015. On exposure to air it clots and coagulates on heating.

Chyle is simply lymph plus the minute globules of absorbed fat, and is milky white in color.

How does impairment of the function of one of the following affect the other two: (a) the skin, (b) the lungs, (c) the kidneys.

Impairment of the function of the kidneys causes increased activity of the skin; and at times dyspnoea, asthmatic attacks, urinous breath, Cheyne-Stokes breathing, and congestion of lungs.

Describe an epithelial secreting surface.

The mucous membrane of the stomach consists of a layer of columnar epithelium resting on a layer of loose connective tissue, containing some involuntary muscular fibers and many small blood vessels and lymphatics. Dipping down from the epithelial layer are numerous small glands. These glands are lined with cubical epithelium and secrete the gastric juice.

In the glands of the cardiac end and of the fundus, beside the cubical cells, we also find along the sides a number of spheroidal cells. These are the cells that form the hydrochloric acid.

Discuss the action of the gastric juice on carbohydrates and fats.

The gastric juice has no effect on fats, except to melt some of them because of its temperature.

As to the carbohydrates starch is unaffected, but the hydrochloric acid possibly inverts some of the cane sugar present in the food.

Give the composition and uses of blood.

The blood is composed of 60 parts plasma and 40 parts corpuscles.

In a thousand parts of plasma ninety-eight are solid. The bulk of the solid matter is composed of the proteids, serum albumin, serum globulin and fibrinogen. Besides these we have various salts, especially compounds of sodium, calcium, potassium and magnesium in combination with chlorine, phosphorus and carbon dioxide. There are also fats, urea, uric acid, dextrose and cholesterin.

The red corpuscles are composed of water 69%, hemoglobin 29%, and small quantities of other proteids, salts and extractives.

The white corpuscles contain globulin, albumin, nuclein, various salts and the mother body of fibrin ferment.

The blood carries the absorbed food and oxygen to the tissues and carries away waste to the organs excreting them. It also equalizes the temperature of the various parts of the body.

Describe the process of absorption by (a) the blood-vessels, (b) the lymphatics.

The digested food is carried through the columnar epithelium of the intestinal villi by the force of osmosis and the vital activity of the cells, the peptones being changed during their passage into albumins and globulins. The carbohydrates, soluble salts and proteids pass into the capillaries and then on into the portal vein, which carries them to the liver. From here they pass out through the hepatic vein into

the general circulation. The fats are taken up by the lacteals and carried to the receptaculum chyli and then up through the thoracic duct into the left subclavian vein.

Describe the red blood corpuscles. Give the best known and most important function of the red blood corpuscles.

The red corpuscles are non-nucleated, elastic, biconcave discs about one thirty-two hundredth of an inch in diameter. They are yellowish-green when seen under the microscope. In large masses they are red. They carry the oxygen to the tissues. They consist of a stroma in which is imbedded the hemoglobin.

Describe the structure of the arteries. How do arteries exercise their function?

The arteries have three coats—tunica intima, media and adventitia. The intima or internal coat consists of a lining of a single layer of endothelial cells and a layer of yellow elastic tissue. The media or middle coat is composed especially of involuntary muscular fibers arranged transversely to the long axis, but it also contains many elastic fibers. The adventitia or outer coat is made up of a supporting layer of areolar tissue in which are many yellow elastic fibers.

In the media we find many little ganglionic masses, the local vasomotor system. In these the vasomotor nerves end.

The arteries exercise their function on account of being closed tubes, by reason of their contained elastic tissue, and by the action of the vasomotor influence of the nervous system on the muscular fibers.

Describe the fetal circulation.

The blood coming from the placenta through the umbilical vein passes into the inferior vena cava, some of it passing first into the liver by the ductus venosus and then into the inferior vena cava. It is then carried into the right auricle, where it meets the blood returning by the superior vena cava from the head and upper extremities.

The currents do not mix to any extent, but by means of the

Eustachian valve the blood from the inferior vena cava flows through the foramen ovale into the left auricle, where it meets the small amount of blood coming from the lungs and is passed on into the left ventricle and out through the aorta to supply especially the head and arms.

The blood from the superior vena cava passes through the right auricle into the right ventricle and then out through the pulmonary artery. Some of this blood passes to the lungs, but most of it passes through the ductus arteriosus into the descending aorta, where it mixes with the blood from the left ventricle and supplies the lower extremities, a portion passing through the umbilical arteries to the placenta.

Mention the erectile tissues of the body and explain their function.

The erectile tissues of the body are the penis, clitoris, nipples, and according to some, the mucous membrane of nose. They are concerned in the genital sense, increasing the sexual excitement and helping complete orgasm.

What digestive changes take place in (a) the small intestines, (b) the large intestines?

In the small intestines proteids are changed into peptones and even lower bodies, as arginin and leucin; fats are split up, saponified and emulsified; undigested starch is changed into maltose, which in turn is changed into dextrose, and cane sugar is inverted.

In the lower part of the small intestine and in the large intestine microbic digestion is carried on with the formation of putrefaction products, carbon dioxide, methane, hydrogen sulphide, hydrogen, indol, skatol, phenol, butyric acid, valerianic acid, leucin, tyrosin, trimethylamine, and many other products.

Describe the structure of (a) striated muscle, (b) non-striated muscle. Which of these is called voluntary, and why?

Striated muscle is composed of fibers transversely striated.

Each fiber is about one inch long and one five-hundredth of an inch in diameter.

The fibers consist of an outside sheath or sarcolemma, which is filled with a liquid, the sarcoplasm. Imbedded in this we find the muscle columns or sarcostyles. These are divided by a Kraus membrane into sarcomeres, each of which is composed of a central dark portion, the sarcous element, and on either side a lighter portion.

Non-striated muscle is formed of small spindle-shaped nucleated cells, not transversely striated. It has some faint longitudinal striations.

Striated muscle is voluntary, that is, under the control of the will.

Define reflex nervous action. Give examples.

A reflex action is an afferent impulse followed by an efferent impulse independent of the higher cerebral centers. A blow in the solar plexus causes an inhibition of the heart. The testicle retracts when the inner surface of thigh is stroked.

Describe the rods and cones of the retina.

The layer of rods and cones of the retina is the ninth and is separated from the choroid by the tenth or pigment layer. The rods are more abundant than the cones, about five to one, but are absent in the fovea centralis, the cones only being present. In the outer end of the rods the visual purple is found. The cones are shorter than the rods and contain no visual purple. The optic nerve ends in these rods and cones, which are the active receptive organs of sight.

Describe the sphygmograph and state its use.

The sphygmograph or pulse recorder essentially consists of a spring fastened at one end, with a button on the other end to press on the artery, and a system of fine levers so adjusted as to write the movements of the spring on strips of glazed, blackened paper.

How is accommodation in the eye accomplished?

Accommodation is accomplished by the contraction of the ciliary muscle relaxing the suspensory ligament and thus allowing the crystalline lens to become more convex, which it then does on account of its elastic capsule.

How do veins, arteries and capillaries differ as to (a) structure, (b) function?

The arteries have three coats, which contain more muscular and elastic tissue than the veins. The arteries have no valves, while many of the veins have. The capillaries are formed of a single layer of lance-shaped endothelial cells.

The arteries carry the blood from the heart to the capillaries. The veins carry it back to the heart. Through the capillary wall osmosis and diapedesis occur; thus the tissues are nourished and the waste matter is carried off.

What is the function of each class of foods in the nutritive process?

The proteids repair the tissue; the carbohydrates are the body fuel, being easily oxidized; the fats are not so readily oxidized but are used up to form heat, the excess being stored in the adipose tissue; the salts are necessary to keep some of the proteids in solution, to regulate osmosis, to neutralize the acid produced by katabolism, to form bone, and are a necessary ingredient in most of the secretions.

State the origin and the uses of (a) lymph, (b) the bile.

Lymph is the diluted blood plasma that has osmosed through the capillary wall, to which is added lymphocytes formed in the lymphatic glands. It bathes and nourishes the tissues, carries away waste and adds lymphocytes to the blood. The products of some of the ductless glands are emptied into it.

The bile is formed in the liver. Bile neutralizes the acid chyme, precipitating the pepsin, aids in the emulsification and absorption of fats, increases peristalsis, and contains some waste products.

In what manner is the heart-beat influenced by the pneumogastric nerve? What is the average number of heart-beats per minute in (a) a child aged one year, (b) an adult aged seventy years?

Stimulation of the pneumogastric nerve causes a slowing of the heart.

The average number of heart-beats at one year of age is about 115; at seventy years of age, about 70.

Define emulsification, saponification. Illustrate.

Emulsification is the breaking up of a fat into very small particles and holding them in suspension in a liquid in which they will not dissolve, as shaking together bile, water, and olive oil.

Saponification is the replacing of the glycerin of a fat by an alkali, as by the heating together of olein and sodium hydrate to form sodium oleate and glycerin.

What causes an increased flow of bile into the duodenum? What pathologic effects may ensue because of occlusion of the ductus communis choledochus?

The act of digestion causes an increased flow of bile into the duodenum, as will also certain drugs, as calomel and podophyllin, and irritation of the intestinal mucous membrane.

Occlusion of the ductus communis choledochus is followed by jaundice with its tendency to malaise, headaches, anaemia and slowing of the heart's action. It also interferes with the digestion and absorption of fats, allows of an excess of putrefactive substances being formed in the intestines, and also causes constipation.

State the function of the third cranial nerve. What is the effect of division of the third cranial nerve?

The third nerve is the motor nerve for the internal rectus, superior rectus, inferior rectus, inferior oblique, levator palpebrarum, ciliary muscle and the constrictor of the pupil. Sec-

tion of this nerve causes loss of accommodation, ptosis, external or divergent squint and diplopia.

What are the movements of the eyeball? Mention the muscles concerned in each of the movements.

Protrusion—caused by the muscular fibers in the capsule of Tenon.

Retraction—caused by the tight closing of the lids or paralysis of the muscular fibers in the capsule of Tenon.

Upward movement—caused by contraction of superior rectus and inferior oblique.

Downward movement—caused by contraction of inferior rectus and superior oblique.

Inward movement—caused by contraction of internal rectus.

Outward movement—caused by contraction of external rectus.

Rotary movement—caused by contraction of either of the two oblique muscles.

What are the accepted theories as to the origin of (a) the red blood corpuscles, (b) the white corpuscles?

The red corpuscles are formed in the red marrow of bones and in the spleen.

The white corpuscles are formed in the lymphatic system, the spleen and the marrow of bones.

How is the diaphragm affected in expiration? State cause.

The central tendon of the diaphragm is drawn upward into the thorax during expiration by elastic recoil of the lungs, tending to produce a vacuum in the pleural cavity.

Define secretion, excretion, protoplasm, assimilation.

A secretion is that product of glandular activity needed in the various processes of the living organism.

An excretion is that product of glandular activity containing waste of no further use to the organism.

Protoplasm is the living substance surrounding a specially formed element called the nucleus.

Assimilation is the conversion into protoplasm of nutrient material or food ingested.

What are the causes of the apex beat of the heart?

The apex being free it is brought forward to strike against the chest wall by the contraction of the ventricle. The shock of the contracting muscle also contributes to it.

What special use does each of the following serve in the body after ingestion: proteids, fats, carbohydrates, alcohol, tea, and coffee?

Proteids repair the tissues, fats are used for body fuel and as a reserve, carbohydrates are the body fuel, alcohol in small doses is a general stimulant and by irritating the mucous membrane causes an increased flow of gastric juice. Tea and coffee are stimulants, increasing the flow of the various secretions and stimulating peristalsis.

State the functions of the fifth cranial nerve.

The fifth nerve is the sensory nerve of the face, mouth and nasal cavities, and the motor nerve of the muscles of mastication.

What effect, if any, results from the division of (a) a vasoconstrictor nerve, (b) a vasodilator nerve?

Division of a vasoconstrictor nerve causes a vasodilation in the part it supplies.

Division of a vasodilator nerve usually has no effect. If it be in action at the time, a vasoconstriction would follow.

Describe the vermicular movement of the stomach and intestines. What purpose does this movement serve?

The movement of the stomach causes the food there to be thoroughly mixed, the peculiar contraction causing a current down along the fundus to the pylorus and back again along the lesser curvative.

The movement of the intestine is a true peristaltic one, that is, one segment of the intestinal walls contracts after the preceding segments; thus a wave of contraction passes down, mixing and pressing the food on downward.

Differentiate white fibrous tissue and yellow elastic tissue as to (a) structure, (b) distribution.

White fibrous tissue consists of white fibers arranged in parallel bundles, the connective tissue cells also being arranged in this way. Yellow elastic tissue is a connective tissue in which the yellow fibers predominate. These fibers are larger than the white and are bound together with areolar tissue. The white fibrous tissue is found where strength and inelasticity is needed, as in the ligaments and tendons.

The yellow fibrous tissue is found where elasticity is needed, as in the coats of the blood vessels, in the lungs, and vocal cords.

Explain the action of the anospinal center in defecation.

The anospinal center is the reflex center for defecation. Irritation of the mucous membrane of the rectum sends an impression to the anospinal center, which then causes a relaxation of the sphincter muscles and an increase in peristalsis. This center is under the control of the will to a great extent.

How is the venous blood current maintained? What arteries carry venous blood?

The venous flow is maintained by the vis a tergo, or force of the heart carried through the capillaries, by the play of the valves in the veins during muscular movements, and by thoracic and intracardiac action. The pulmonary arteries carry venous blood.

What causes the difference in pitch between male and female voices? What causes the voice of the youth at the period of puberty to "crack"?

The male vocal cords are longer, hence the lower pitched voice.

The cause of the cracking of voice at puberty is the change from the childish treble to the lower adult voice, causing now and then a treble tone to be put in.

What is the function of connective tissue?

The connective tissue acts as a binding, supporting, connecting and protecting tissue for the more delicate tissues and organs.

What is (a) an efferent nerve, (b) an afferent nerve? Illustrate.

An efferent nerve is one carrying impulses from the central nervous system to the various parts of the body. The facial nerve carries motor impulses from the central nervous system to the muscles of expression.

An afferent nerve is one carrying impulses to the central nervous system from the various parts of the body. The optic nerve carries impressions received on the retina to the brain.

Describe the glands and villi of the intestines.

In the intestines we find two sets of glands, Brunner's and Lieberkuhn's.

The glands of Brunner are branched convoluted tubular glands found dipping down in the mucous membrane of the duodenum only.

The crypts of Lieberkuhn are little tubular depressions in the mucous membrane of both the small and large intestines. They are larger in the large intestine. They consist of a basement membrane lined with columnar and goblet-shaped epithelial cells.

The villi are small nipple-like projections from the mucous membrane of the small intestines about one-thirtieth of an inch long.

A villus consists of a mass of adenoid tissue covered with a layer of columnar epithelium resting on a basement membrane. In the center of this adenoid tissue we find a little

lymphatic called a lacteal. We also find in the adenoid tissue many capillaries which coalesce to form the venules of the mesenteric veins.

Describe the movements of the blood corpuscles in the capillaries and explain the phenomena of diapedesis.

The capillaries are on an average just large enough to allow the red corpuscles to pass through. In passing through some of the capillaries they are altered somewhat in shape, but on account of their elastic stroma immediately resume their shape when the pressure is removed. As they have to flow along in single file at juncture of two capillaries to form one, they take alternate turns in passing into it.

The white corpuscles tend to adhere to the wall and do not move as rapidly as the red ones.

In diapedesis the white corpuscle pushes one of its pseudopodia through the cement substance of the cells of the capillary wall, and then pulls the rest of the body through after it.

Mention three varieties of cells according to situation in the body.

Epithelial cells are found in the skin.

White blood corpuscles are found in the blood.

Nerve cells are found in the central nervous system.

What is the mode of production of heat in the body?

Heat is produced by the chemical action going on in the tissues, especially in the muscular and glandular tissues.

Describe cholesterin, giving its origin and function.

Cholesterin is a monatomic alcohol found especially in the nervous tissue, and thrown off in small quantities from the body in bile. It is possibly a waste product of the nervous tissue.

Mention and describe three varieties of cells according to shape.

Involuntary muscular fibers are small spindle-shaped cells,

containing about their center an oval nucleus. They are faintly longitudinally striated.

Squamous epithelial cells are flat scale-like cells, having a small nucleus near their center.

White blood corpuscles are nucleated granular masses of protoplasm, about one twenty-five-hundredth of an inch in diameter. At rest they are globular, but during ameboid movement are irregular in shape.

Mention the ductless glands and give the theory as to the function of any one of them.

The ductless glands are the thyroid, thymus, adrenals, spleen, pituitary body, coccygeal and carotid. Many other organs have also internal secretion.

The adrenal secretion has a marked influence over vasomotor and general muscular tone.

How is the sensation of sound conveyed to the brain?

It is conveyed from the cochlea by the auditory nerve to the medulla, then to the superior olive, through lateral fillet to the posterior quadrigeminal bodies to the cerebral cortex.

What matters are excreted by the skin? How may the function of the skin be affected as to the amount of excretion?

The sweat contains one per cent. of solid matter, in which we find sodium chloride and other inorganic salts, urea, fatty acids and coloring matter.

The function of the skin may be affected physiologically by increased urination and diarrhoea, by reflex irritation of sweat centers, by the emotions, by increase of body temperature calling for more heat dissipation, and by the accumulation of carbon dioxide in the blood. Ingestion of many drugs also affects the excretion.

Mention some of the exercises that injuriously affect the heart. State the reasons for your conclusion.

Among exercises that injuriously affect the heart are

wrestling, long-distance racing, bicycle racing and rowing matches, the bad effect being due to the sudden strain which causes dilatation and hypertrophy of the heart.

State the function of the retina.

The retina is the receptive nervous organ of sight.

What are the physiologic characteristics of protoplasm?

Protoplasm has the power of nutrition, growth, reproduction, movement and response to stimuli.

What is the usual difference in shape between the red corpuscles of the blood in the mammalia and those in the ovipara?

With the exception of the camels, mammalian red corpuscles are non-nucleated, biconcave, circular discs. In the ovipara they are nucleated, oval and biconvex.

State the changes in the diameter of the chest in inspiration and expiration.

In inspiration the vertical diameter is increased by the descent of the diaphragm; the anteroposterior and transverse diameters are increased by the raising and rotation of the ribs anteriorly and laterally.

The reverse occurs during expiration.

The circumference of the chest is increased in forced inspiration from 2 to 5 or 6 inches over forced expiration.

Explain the anatomic and physiologic difference between mucous, serous, and synovial membrane.

Mucous membranes are secreting membranes lining cavities opening into the air and composed of one or more layers of epithelial cells.

Serous membranes are those lining closed sacs belonging to the lymphatic system and composed of a single layer of flat endothelial cells on a basement membrane.

Synovial membranes are those lining closed sacs or bursæ in joints or over tendons. They secrete synovia, which allows free motion by preventing friction.

Describe the physical properties of healthy urine.

Healthy urine is a straw yellow, acid, clear liquid, with a specific gravity of 1015 to 1025, and with a peculiar odor. On standing, a slight sediment collects in the lower part of the liquid.

Describe the changes in form and volume, and in physical and chemical properties, occurring in the contraction of a muscle.

The muscle becomes shorter, but the volume remains the same. It becomes acid in reaction, more oxygen is used up and more carbon dioxide given off, sarcolactic acid is generated, glycogen is used up, and the muscle substances soluble in water are diminished in amount, while those soluble in alcohol are increased.

Locate in the brain, the seat of the special sense of sight, hearing and smell.

Sight has its seat in the gyrus angularis, cuneus, and in the occipital lobes; hearing in the superior temporal; smell in the uncus.

Explain the phenomena and causation of auditory vertigo or Meniere's disease.

It is due to some disturbance or abnormal irritation of the endings of the vestibular branch of the auditory nerve. This branch normally sends impressions to the nucleus fastigii in the cerebellum which help to control the balancing and coordination of the muscles of the body.

How do the striped and unstriped muscular fibers differ in response to stimuli?

The unstriped muscular fibers are much slower in response.

What is the order of occurrence of rigor mortis in the different parts of the body?

Rigor mortis usually begins in the muscles of the eye,

passing to the jaw and neck muscles, and in turn to the chest, arms, abdomen and lower extremities.

What relation does the nervous system bear to the excretion of perspiration?

The nervous system through the sweat centers regulates the excretion of perspiration.

What portion of the cerebrum comprises the motor area?

The motor area is found along the fissure of Rolando in the ascending parietal, ascending frontal and paracentral convolutions and contiguous parts of the superior frontal.

Give the presumptions of survivorship and reasons therefor in the following from Casper: A is killed by a thrust of a saber on the head; B by that of a bayonet in the heart; and C by a shot which has torn open the jugular vein.

If A's injury involved especially the base of the brain the shock of the injury would probably cause instant death.

B would probably be the second to die, probably living at least a half hour until the giving out of the heart from pressure of the blood in the pericardium.

C would be the last to die, as lacerated wounds of even large vessels often stop spontaneously, and his bleeding might be checked by pressure until surgical help arrived.

Define the function of the mucous membrane of the respiratory tract.

The mucous membrane of the respiratory tract secretes a protecting mucus, and because of its ciliated epithelial cells keeps the lungs clear of accumulation of mucus and small dirt particles entering in the inspired air. The vital activity of the squamous cells lining the air vesicles aids in the exchange of the respiratory gases.

In what glands of the body is the function undetermined?

With the exception of being able to say that they are all

probably connected with general metabolism, the functions of the following glands are undetermined: Pituitary body, thymus, coccygeal gland. But little is known about the adrenals and thyroids.

What is the normal ratio of respirations to heart pulsation?

In a healthy adult there are four pulse beats to one respiration.

Give the foramen of exit, the distribution and the function of the oculomotor nerve.

The oculomotor nerve leaves the skull through sphenoidal fissure. It supplies motor filaments to the superior, internal and inferior recti, the inferior oblique, the levator palpebrae, the ciliary muscle and the constricting fibers of the iris.

What office does the Eustachian tube perform?

It equalizes the pressure of the air on the membrana-tympani, thus facilitating hearing.

Define leucomain.

Leucomains are alkaloidal or basic substances formed in the living tissue by metabolism, waste in nature, some of them toxic.

Give the present physiologic conclusions in respect to the presence of the corpus luteum as a sign of pregnancy.

According to Tidy, "there may be pregnancy without the presence of a true corpus luteum, and also bodies indistinguishable from true corpora lutea may be found where there has been no pregnancy." The presence of the true corpus luteum nevertheless is usually a sign of pregnancy.

What effects are produced in the system by the removal of the thyroid gland?

Removal of the thyroid gland is followed by peculiar depraved condition of metabolism called cachexia strumipriva.

Give the principal characteristics of gastric juice in man.

Gastric juice is an acid limpid secretion with a specific gravity of about 1005, quantity ten pints daily. It contains especially pepsin, rennin and hydrochloric acid.

How can fresh blood stains be distinguished from older blood stains?

Fresh blood stains are brighter in color and the clot is flexible; the older stain is darker and the clot is fragile.

Describe color blindness and name the colors which the subject commonly fails to distinguish.

Color blindness is the inability to perceive certain colors. The colors commonly indistinguishable are red and green.

What are the functions of the brain membranes?

The dura mater is tough and protecting, and also acts as internal periosteum to the bones of the head.

The arachnoid is a thin spider-like membrane covered with endothelial cells that secrete cerebrospinal fluid.

The pia mater is a vascular membrane dipping down into the sulci and carrying blood to the cortex.

Name the solids in the urine and state the approximate amount of each voided daily by an adult.

Urea 500 grains; chloride of sodium 180 grains; sulphates (sodium and potassium) 30 grains; phosphate (earthy and alkaline) 45 grains; uric acid 7 grains; hippuric acid 7 grains; and small quantities of various pigments and other organic matter.

Describe the factors which cause the heart sounds.

The first sound is due to muscular contraction and to the closure of the auriculo-ventricular valves, as the blood tends to regurgitate into the auricles during ventricular systole.

The second sound is due to the closure of the semilunar valves, as caused by the blood tending to regurgitate into the ventricles during diastole.

What is the effect of an excessive meat diet?

An excessive meat diet disturbs the general metabolism, causing diseased conditions associated with an increase in uric acid, as gout, rheumatism and migraine.

Explain how the seminal fluid is conveyed to the vesiculae seminales.

It is conveyed to the vesiculae seminales by the vas deferens, which is the prolongation of the tube forming the epididymis. The vas deferens passes up from the testicles through the external and internal abdominal rings and to the vesiculæ seminales on the posterior surface of the bladder.

How and why is hearing affected by rupture of the membrana tympani?

The membrana tympani, on account of its shape and the action of the tensor tympani, is capable of responding to many vibrations, and thus aids in the acuity of hearing.

Describe cell growth.

Cell growth is that peculiarity which living cells have of taking in new material and incorporating it into themselves, thus increasing in size.

Describe the phenomena of (a) asphyxia, (b) syncope, (c) sleep.

Asphyxia is the condition caused by a deficient supply of oxygen. In the complete shutting off of the supply of oxygen we have three stages. First, the stage of marked inspiratory efforts or dyspnoea, lasting about one minute; second, the stage of convulsions with marked expiratory spasms, lasting about one minute; and third, the stage of exhaustion and finally death.

During the first stage the blood pressure begins to rise and heart becomes somewhat slower. During the second stage this rise in blood pressure is well marked and also the slowing of the heart. Toward the end of this stage as the respiratory movements cease unconsciousness ensues, the blood

pressure falls and the heart becomes still slower, until death stops everything.

Syncope is that condition of unconsciousness following a sudden depression of the vasomotor and cardiac nervous mechanism, causing anemia of the brain.

Sleep is a physiological condition of unconsciousness, due to a periodical need of the nervous system of rest. It is also due in part to the absence of external stimuli. It is accompanied by an anemia of the brain.

Name, locate, and give the function of each of the varieties of epithelia.

Epithelium secretes and protects the underlying tissues. Squamous epithelium, found in the mouth, protects the underlying structures. Columnar epithelium, found in the intestinal mucosa, aids in the absorption of digested food products. Ciliated epithelium, found in the bronchial mucosa, forces dust and mucus up into the trachea to be coughed out. Cuboidal epithelium, found in the salivary glands, secretes saliva. Goblet-shaped epithelium, found in the mucous membranes, forms the mucous secretion. Stratified epithelium is composed of several layers, the uppermost generally squamous, and lowermost columnar. It forms the epidermis.

Describe the lymphatic system.

The lymphatic system consists of numerous small thin-walled vessels with many valves, commencing in the tissues as lymph capillaries and emptying into two large vessels that carry the contained lymph to the subclavian veins. In certain places along the course of the lymphatics, as in axilla and groin, are found groups of little glands called lymphatic glands. These consist of a cortical portion and a medulla which is made of lymphoid tissue, in the center of which are a number of cells rapidly undergoing karyokinesis.

All the lymphatics (including the lacteals of the intestine) with the exception of right half of the body from the diaphragm upward, empty into the thoracic duct. This vessel,

about the diameter of a goose quill, empties into the left subclavian vein. The lymphatics of the right side of the body from the diaphragm upward empty through a smaller vessel into the right subclavian vein.

Describe the olfactory apparatus. What part of the olfactory apparatus is the seat of smell?

The nasal cavities are divided into a lower or respiratory portion and an upper or olfactory portion.

We find in the upper portion some broad supporting epithelial cells, and projecting upward from cells between these are little hair-like processes. The olfactory nerve ends in these specialized cells. The olfactory nerve passes from these cells through the olfactory bulbs and backward through three tracts to the cerebrum, ending for the most part in the uncus of the same side.

What is the physiology of the so-called rest cure?

The rest cure corrects faulty metabolism and brings the tissues again to their normal conditions.

How is the descent of the testicle to the scrotum accomplished?

The descent of the testicle is now generally thought to be due simply to the arrangement of the organs due to the process of development and not to the traction of muscular cord, as formerly thought.

Describe the growth and the development of the teeth.

The first step in the formation of the teeth is the downward growth of the epithelium covering the rudimentary jaw. This forms the enamel germ, which develops especially at certain points. A little vascular papilla now grows upward into this enamel germ; thus we have the rudimentary teeth. The adamantoblasts of the enamel germ form the enamel, and the odontoblasts form the dentine which covers in the dental pulp. The crusta petrosa is formed from the cells forming the dental periosteum.

What is the condition of the eyeball in myopia? How may it be corrected?

In myopia the eyeball is too deep, causing the rays of light to be brought to a focus in front of the retina. It is corrected by a concave lens.

Define physiologically the term cell. How are cells reproduced?

A cell is a nucleated mass of protoplasm.

Cells are reproduced by direct division, indirect division or karyokinesis, and endogenous nuclear multiplication.

Describe the physical characteristics of cartilage. What is temporary cartilage, permanent cartilage? Illustrate.

Cartilage is a firm, elastic, white or yellow-white substance.

Temporary cartilage is that which afterward is formed into bone, as the fetal femur.

Permanent cartilage is that which remains as cartilage during life, as articular cartilage.

Describe the white blood corpuscles, giving source, composition and properties.

The white blood corpuscles are nucleated masses of granular protoplasm, about $\frac{1}{2500}$ in. in diameter and capable of amoeboid movement and phagocytic action.

As to the varieties, we find the small lymphocyte, the larger transitional, the polymorpho-nuclear, and eosinophile containing large granules staining readily with eosin. Occasionally a basophile can be found.

The white cells are developed from the lympatic tissues, the spleen and the marrow of bone. Chemically they contain nuclein, a globulin, fat, glycogen and a nucleoproteid.

What changes are produced in the air and in the blood by respiration?

The expired air contains less oxygen and more carbon dioxide, nitrogen, and water than inspired air. It also con-

tains certain volatile organic substances and is warmer than the inspired air.

The blood leaving the lungs contains more oxygen and less carbon dioxide and nitrogen than that entering the lungs.

Define aphonia, aphasia. Give the cause of one of these conditions.

Aphonia is the loss of voice, or the power of phonation.

Aphasia is the inability to give the proper word symbol.

Motor aphasia is due to a lesion of the left lower frontal convolution or of the fibers coming from it.

Describe the normal heart sounds.

The first sound is twice as long as the second, lower in pitch and with a prolonged dull, somewhat booming quality. It is caused by the closure of the auriculo-ventricular valves and the sound of contracting muscular walls of the ventricles. It is heard best at the apex, and is systolic in time.

The second sound follows the first after a short interval. It is short, snapping in quality and is higher pitched than the first. It is caused by the closure of the semilunar valves and is diastolic in time. It is heard best at the base of the heart.

State the physiologic uses of the large intestine.

Into the large intestine the crypts of Lieberkuhn pour in some secretion and the microbic digestion goes on. Although no villi are found here part of the food not already absorbed is taken up. The feces are concentrated and collected in the lower end of the intestine, to be expelled during the act of defecation.

Define (a) tonic muscular contraction, (b) clonic muscular contraction. Give an example of each.

Tonic muscular contraction is a continued contraction, as the action of sphincter ani.

Clonic muscular contraction is an intermittent or remittent muscular contraction as seen in the jerking movements of a convulsion.

Define reserve air, residual air, complemental air, tidal air.

Reserve air is the amount of air that can be expired after an ordinary expiration, about 100 cubic inches.

Residual air is the amount of air left in the lungs after the most forcible expiration, about 100 cubic inches.

Complemental air is the amount of air that can be taken in after an ordinary inspiration, about 100 cubic inches.

Tidal air is the amount of air taken in with each ordinary inspiration, about 30 cubic inches.

What are the respective functions of the anterior and of the posterior cornua of the spinal cord?

The anterior cornua are motor in function and are the trophic centers for the muscles.

The posterior cornua are mostly relay stations on the sensory pathway.

What explanation may be given for enlargement of the spleen in leucocythemia?

The spleen is one of the organs in which white corpuscles are formed.

Give the difference between the temperature of a newborn child and that of an adult, between the temperature of a person intoxicated by alcoholic drink and his temperature after the first stimulating drink of liquor.

Immediately after birth the temperature is somewhat above normal, but soon becomes subnormal. At the end of twenty-four hours it has again reached normal and remains so. A small dose of alcohol causes a slight rise in temperature; large doses, as in one intoxicated, cause a subnormal temperature.

In a healthy man, what time is consumed in the digestion of an ordinary meal of meat, vegetables and bread?

The food remains from two to four hours in the stomach and about six hours in the small intestine. Digestion is practically finished before it leaves the small intestine.

Define human physiology.

Human physiology is the study of the phenomena of the living human body.

Give the causes of muscular fatigue.

Muscular fatigue is caused by the accumulation of waste products in the muscles.

The seat of fatigue, as we ordinarily speak of it, is first in the central nervous system, then in the motor end plates, then the muscle and finally the nerve trunks.

What effect is produced on the heart's action by stimulation of the cardioinhibitory center?

There is a slowing of the heart, or, if the stimulus is great enough, a stoppage of the heart in diastole.

Why does blood remain fluid in the body in life, and coagulate when shed?

The intima has some unknown peculiar action on the blood.

The blood does not clot until the disintegration of the white corpuscles sets free the fibrin ferment.

What conditions produce variations in the normal temperature of the body?

Anything that will disturb the proper balance of heat production and heat dissipation will cause a variation from the normal temperature.

Normal physiological variations are caused by digestion, muscular exercise, menstruation, bathing and excitement.

Drugs, as cocain, atropine, alcohol, acetanilid, may cause variations from the normal; as will also hypodermic injections of proteoses and peptones, shock, toxins of bacteria and exposure to excessive changes in temperature of atmosphere.

Give the nervous mechanism of urination.

The bladder is supplied with nerves from the lower dorsal and upper lumbar nerves and also with branches from the

sympathetic system. The act of urination may be completely involuntary, the reflex center being in the lumbar portion of the spinal cord and set in action by afferent impulses from a distended bladder or from irritation possibly of the mucous membranes. Ordinarily the abdominal muscles aid voluntarily in urination.

There is probably a higher voluntary center and also an inhibitory one.

Describe the human blood.

Blood is a red, alkaline fluid, salty and nauseating in taste, with a peculiar odor. It has a specific gravity of about 1055. It is composed of a liquid portion called plasma, and a solid portion, the red and white corpuscles. In the plasma we find serum albumin and globulin, fibrinogen, various salts, especially sodium, potassium and calcium, and small quantities of dextrose, fats and extractives. The hemoglobin is found in the red corpuscles.

What is the purpose of respiration? Give the mechanism of respiration.

During the act of respiration oxygen is absorbed and carbon dioxide is thrown off.

During inspiration the diaphragm descends, the ribs are elevated and rotated outward; the cavity of the thorax is thus enlarged and the air rushes in to fill up the partial vacuum; the muscles now relax and the elasticity of the chest wall and lungs forces a portion of the air out. These movements are controlled by the respiration center in the medulla.

How is bone nourished?

Bone is nourished by the nutrient arteries through the Haversian system of canals and by the periosteum.

State the function of the anterior spinal nerve roots. How is the function proved?

The anterior roots are motor.

Section of the anterior roots causes motor paralysis of

the parts that they supply. Irritation of the peripheral ends causes contraction of the muscles they supply. Irritation of central ends has no effect; no sensation is felt.

Give illustrations of morbid reflex action.

The vomiting of pregnancy is caused reflexly by irritation of mucous membrane of uterus.

Faulty digestion may cause reflexly palpitation of the heart.

What is the composition of urine? Give the normal reaction and specific gravity of urine.

Urine is composed of 96% water and 4% solids, one-half of which is urea. The other half is made up of phosphates (earthy and alkaline), sulphates of sodium and potassium, chloride of sodium, uric acid, hippuric acid, extractives and the coloring matters—indican, urobilin and urochrome.

The normal reaction of urine is acid and the specific gravity 1020.

Describe the temporary and permanent teeth.

The temporary or milk teeth are twenty in number, ten in each jaw. From the front backward we have in each side of the jaw two incisors, one canine and two molars. The first tooth to erupt is the lower central incisor about the sixth month. This set is complete about the thirtieth month. About the sixth year the jaw has enlarged considerably; as a result there is room for another tooth and the first permanent tooth, the six-year molar, erupts. Then the incisors are erupted, pushing out in front of them the temporary teeth. The last permanent tooth to erupt is the third molar or wisdom tooth, about the twenty-first year.

There are thirty-two permanent teeth, sixteen in each jaw. From the front backward in each side of the jaw we have two incisors, one canine, two bicuspids and three molars. The incisors cut the food, the canines tear it and the molars grind it.

Through what medium is the blood relieved of effete matter and provided with new material?

The blood is relieved of effete materials through the sweat, urine, feces and exchange of respiratory gases in the lungs.

It is provided with new material through the respiratory exchange of gases, from the gastrointestinal tract through the portal vein and lacteals, and from the ductless glands, as the thyroid, spleen, adrenals; also from marrow of bones.

How is normal body temperature regulated and sustained?

It is regulated by the thermotaxic centers of the nervous system, and sustained by metabolism of the tissues, especially the muscular and glandular.

State where in the human economy the following substances are found: fibrin, chondrin, leucin, hippuric acid.

Fibrin is found in clotted blood, chondrin in cartilage, leucin in the intestines, hippuric acid in urine.

What stimuli produce muscular contraction? What is the nervous mechanism of muscular contraction? Illustrate.

Stimuli producing muscular contraction are the normal nervous stimulus, electrical, mechanical, chemical, and thermal.

In the nervous mechanism of muscular contraction, the motor impulse starts from the motor nerve cell, passing down the motor neuraxon to the motor end plates, and here the muscle cells are stimulated to contract. One stimulus would simply cause a muscular twitch, but normally in a muscular act a series of impulses are sent from the nerve centers to keep the muscles in a voluntary tetanus.

In raising the foot the motor impulse starts in the cerebral grey cells of the Rolandic area, passes down to the cells in the anterior horn of the opposite side of the lumbar cord, then out through the sciatic nerve to the motor end plates of the

muscles required to lift the foot, which in turn stimulate the muscular fibers.

Define stammering and state what causes it.

Stammering is a defect of speech due to the spasmodic action of the diaphragm interrupting the flow of air past the vocal cords. The larynx and lips are under control.

Define and describe respiratory rhythm, respiratory sounds.

Respiratory rhythm is the relation between the time of inspiration and expiration. Inspiration is to expiration as five is to six, the expiration being followed by a short pause.

The respiratory sounds are the sounds heard in auscultating the lungs. There are two sounds. One is the vesicular breathing, which is a low-pitched, soft, distant breezy sound, the inspiration being to expiration as three or four is to one, in fact expiration may be a mere puff.

The second is the bronchial breathing, heard over the trachea and primary bronchi. It is high-pitched, blowing or tubular in quality, the expiration being louder, a little longer and higher pitched than inspiration.

What are the functions of the skin and its appendages?

The skin and its appendages protect from drying and other injury the underlying tissues, especially the end organs of the sensory nerves in the skin. The hair prevents friction and also protects sensitive parts from extremes of temperature. On account of the large extent of its surface and also on account of the sweat glands it contains, the skin is a great heat-dissipating organ.

Define myopia, hypermetropia, astigmatism. State the cause of each of these conditions.

Myopia or nearsightedness is a defect in vision in which parallel rays of light are focussed in front of the retina. It is due usually to an increased length in the anteroposterior diameter of the eye.

Hypermetropia or farsightedness is a defect in vision in which parallel rays of light are brought to a focus beyond the retina. It is generally due to a shortening of the anteroposterior diameter of the eye.

Astigmatism is an error of refraction in which rays of light in the various planes are not equally refracted, some of the rays possibly being focussed on the retina, others behind or in front of it. It is generally due to irregularities in the curvature of the cornea, but sometimes of the lens.

What is the physiologic function of the liver?

The liver secretes bile, forms glycogen, urea, uric acid, conjugate sulphates, destroys some of the red corpuscles and in fetal life forms some red corpuscles. It also destroys many poisons taken into the body.

State the manner in which blood circulates through the heart and the lungs, beginning at the right auricle.

The blood passes from the right auricle through the tricuspid valve into the right ventricle; thence through the pulmonary valve into the pulmonary artery, which divides and subdivides, finally ending in the capillaries around the air cells. The blood is re-collected and emptied by the pulmonary veins into the left auricle; then it passes on through the mitral valve into the left ventricle; it is then forced out through the aortic valve into the aorta.

Compare arteries, veins and capillaries in respect to rapidity of the blood stream.

The blood flows in the arteries at about the rate of twelve inches a second, in the veins seven inches a second, and in the capillaries two inches a minute.

Name the excretory glands of the body and the function of each.

The excretory glands are the kidneys, which excrete urine; the sweat glands, which excrete sweat and dissipate heat by sweating; and the liver, which throws off through the bile

some waste matter. The lungs are also excretory organs, throwing off carbon dioxide and nitrogen.

Describe the origin of a tear as the result of pain.

The pain causes reflexly a stimulation of the lachrymal gland, causing an increased secretion. More secretion is poured out than can be carried off by the lachrymal canal, the excess pouring over the cheek as tears.

What is the office of the columnae carneae?

They give strength to the ventricular wall and prevent the auriculo-ventricular valves from being pressed into the auricles.

Describe the physiologic causes of obesity.

The physiologic causes of obesity are overfeeding, especially with carbohydrates, lack of proper exercise, and certain peculiarities of the cells of an individual.

Name some of the bodily states which lessen the alkalinity of the blood.

There is a decrease of alkalinity in rheumatism, gout, migraine, and while living on a diet deficient in the alkaline mineral matters, or living on a proteid diet.

What is the influence of diet on nutrition?

For nutrition to go on properly the diet must contain the various classes of foods in proper proportion. Proteids and salts are absolutely necessary. Nothing but proteids can replace the used-up proteids of tissue. Salts are needed especially to neutralize the acids formed during proteid katabolism, and to form a part in the secretions, like the hydrochloric acid of the gastric juice.

Describe the physiologic process by which the bite of a venomous snake or the hypodermic injection of the virus causes death.

The poison injected under the skin is carried by the lymphatics to the right or left subclavian vein. Having thus

reached the general circulation, it is distributed to the various organs, and so perverts the function of certain ones as to cause death.

Name the bile salts, and state the physiologic function of bile.

The bile salts are sodium glycocholate and sodium taurocholate.

Bile aids in the emulsification and absorption of fats, neutralizes the acid chyme, precipitating the pepsin, increases peristalsis, and contains some waste matter thrown off by the liver.

Describe the offices and the characteristics of the gray matter of the brain.

The gray matter of the cerebral cortex is arranged in six alternate gray and white layers, the most important of which is the deep gray layer of large pyramidal cells.

The gray matter of the cerebrum is the center of sensation, volition and ideation; that is, it receives the sensations, sends out all voluntary impulses and is the part of the nervous system in which thought goes on.

Enumerate the physiologic advantage of natural sleep and state at what period of life the least sleep is required.

Natural sleep allows the fatigued nervous system to regain its tone, causes a relaxation of the vasomotor system, thus giving the heart a chance to rest. In fact, sleep causes a relaxation of all the bodily functions, thus allowing the tissue to recuperate and waste matter to be carried off.

During mature adult life the body can stand the lack of sleep better than at any other time.

HYGIENE.

What principal hygienic direction should be given a patient suffering from tuberculosis?

Always expectorate into or on such appliances as may, with their contents, be disinfected or burned. Avoid kissing.

How can malarial districts be made healthy?

Remove moisture from the locality by surface or sub-soil draining; by planting trees like the eucalyptus, which require much water for their growth; by preventing the development of the mosquito larvæ, through the action of petroleum on water surfaces.

Differentiate between endemic and epidemic diseases.

An endemic disease is one constantly present in a community. An epidemic disease is one which spreads rapidly, attacking many people at the same time.

State the results to animal life of the combustion of fuel in a room without chimney connection or other ventilation.

Carbon monoxide poisoning, suffocation due to excessive quantity of carbon dioxide and diminished amount of oxygen; a systematic poisoning due to breathing products which are the result of partial burning of excretions thrown off in exhalations.

What is the best method of disposing of the bodies of those who have died of yellow fever?

Cremate such bodies.

What is meant by natural and acquired immunity from disease? Give an example of each.

By natural immunity we mean "that inherited trait from immune ancestors which enables an organism to resist the attacks of bacteria and their toxic secretions." Thus, as a rule, the negro race do not contract yellow fever. By acquired immunity we understand that through a previous attack of an infectious disease, or by inoculation with an attenuated virus of that disease, the blood of the person undergoes such changes as to present a non-fertile soil to the organism to whose presence the disease is due. Example, vaccination in preventing small-pox.

What are the principal measures which you would employ for the prevention of the spread of infectious diseases?

Isolate the patient and attendants; disinfect all substances removed from patient's room before their removal; establish the purity of water and food supplies; disinfect the room and contents after patient's removal, and observe a precautionary quarantine.

How would you prepare an artificial food for a new-born infant?

Render cow's milk as alkaline as human milk. Dilute with water to reduce the quantity of casein to what it would be in maternal milk. Fat and sugar are increased by the addition of cream and sugar of milk. To one pint of sterilized water 17¾ drachms of pure commercial sugar of milk are added and dissolved. This sugar water must be kept in a cool place and not be allowed to sour. When feeding time arrives two tablespoonfuls of cream, one of milk, two of lime water, and three of the milk-sugar water are mixed, and as soon as this mixture has been warmed to proper temperature it may be poured into a bottle and the food is ready for use. (Fisher.)

What are the properties of oleomargarin compared with butter made in the usual way?

Butter fat contains nearly 8% of the volatile fats; specific gravity never below 909.8; insoluble fatty acids form about 88 % of the weight of butter fat; melting-point of fat is between 86° and 94° F.; readily and completely soluble in ether.

Oleomargarin fat contains about ½% of the volatile fats; specific gravity never above 904.5; insoluble fatty acids form about 95% of the total weight; melting-point rarely above 82°F.; less soluble in ether and leaves a residue.

State the value of public baths to the health of a large city.

They give facilities to the poor for obtaining personal cleanliness, exerting a protective influence over the development and spread of filth diseases. They encourage the young to learn to swim, and supply an excellent form of exercise, promoting growth and development. When properly used their effects are both tonic and stimulating.

What is sewer gas? How does the inhalation of sewer gas in large quantities affect the system?

Sewer gas is a mixture of a number of gases, among which we find carbonic acid gas, light carburetted hydrogen, nitrogen, hydrogen sulphide, ammonium sulphide with fetid organic matter, the volatile and semi-volatile results of animal and vegetable decompositions.

Sewer gas gaining entrance to house or room may exert a depressing influence upon the occupants, and may occasion vomiting, purging, severe headache, prostration, and through its carriage of germs cause infectious diseases. Yet sewer gas *per se* is sometimes almost innocuous. A chronic form of poisoning from sewer gas gives rise to pallor, langour, frequent headaches, loss of appetite, diarrhœa, generally impaired health and anemia.

Is green wall-paper objectionable; if so, why?

Sometimes, because its color may be due to a compound of copper and arsenic, which after becoming damp dries, and is rubbed or blown from the walls, producing acute or, more often, chronic forms of arsenical poisoning as well as mechanical irritation of fauces, conjunctiva, etc.

Contrast the incubative stages of variola and measles.

The incubative stage of variola is from six to seven days by innoculation, and from ten to fourteen days by infection. In measles it is from seven to ten days by inoculation and from seven to twenty-one days by infection.

What conditions and diseases in animals render their flesh unfit for food?

"The flesh of all animals dead of internal diseases, or which have been killed while suffering from such diseases or animal killed by overdriving. The flesh of animals with contagious diseases that may be transmitted to man. The flesh of animals that have been poisoned. The flesh of animals with severe infectious diseases, as pyemia, etc. Flesh containing parasites that may be transmitted to men. All putrid flesh" (Gerlach).

Discuss detached wards versus many-storied buildings for a public hospital.

Many wards in one building render the maintaining of discipline and supervision easier. Quicker service, ease of communication, greater economy of administration are favored by many wards. Many-storied buildings prevent perfect isolation and ventilation, render diminished supply of sunlight, lead to danger, as in removal, should fire occur; so that the detached ward system seems preferable.

Give a fair average death rate (a) in rural districts, (b) in towns of from 5,000 to 20,000, (c) in cities of over 100,000 inhabitants.

(a) 14, (b) 17, (c) 19 to 22 per thousand.

Mention five preventable diseases.

Tuberculosis, typhoid fever, cholera, yellow fever and malaria.

Give the special hygiene of factories in which women and children are employed.

Each child or woman should be allotted sufficient space to supply 3,000 cubic feet of fresh air an hour by a not greater air movement than that which would change the air three times each hour. The temperature should be kept constant at about 65 degrees Fahr. Means should be employed to quickly remove dust or offensive and dangerous gases. Personal cleanliness should be facilitated by properly equipped wash-rooms. The water-closet fixtures should be ample and of proper construction. An infirmary should be provided for immediate treatment of injuries and suddenly occurring illnesses.

In the selection of a site for a dwelling what is the best sanitary soil, sub-soil and topography?

A light, dry soil, as of gravel or sand, that contains no absorbed filth or sewage, with a nearly constant level of ground water, avoiding clay or impermeable material both in the soil and in the sub-soil. The location should not be in low-lying districts, nor in localities which from the geological formation act as collectors of underground water. The house should not be placed on the top of an elevation where it would be exposed to strong winds. All other conditions being favorable, the house should be built on the side of a hill so that it receives a maximum supply of air and sunlight, and in cold climates preferably with a southern exposure.

What is the bubonic plague? What steps can be taken to limit or extinguish such a scourge?

It is an acute contagious and infectious disease favored by filthy surroundings and at times occurring epidemically. It

is due to a specific micro-organism and is characterized, among other symptoms, by glandular swelling terminating in abscess. Prevention depends upon isolation of the sick, thorough disinfection of the clothing, etc., and surroundings of the patient and the avoidance of overcrowding and filth, and the institution of rigid quarantine to prevent its dissemination.

Name the principal adulterations of wine.

Water, coloring agents (logwood, red beets, coal-tar products), flavoring agents (prunes, peaches, raisins, dates, dried apples), preservatives (salicylic acid, formaldehyde), glycerine, alum and decolorizing agents.

Give some of the requisites for the sanitary construction of house foundations and cellars.

To keep down the level of ground water subdrain if necessary to secure dryness. Coat the foundation inside and out with cement and provide a cement floor for the cellar. Admit plenty of air and sunlight into the cellar.

What is your view concerning the propriety or necessity of inserting vaccine virus in multiple places?

The duration of the protection from small-pox is said to be directly proportionate to the number and size of vaccine vesicles; so vaccinate in at least two different places and let the combined area of vesicle resultant measure over half an inch.

Give the prophylaxis of the filth diseases.

Sanitary inspection of all houses and buildings with immediate abatement of any nuisances. Thorough cleanliness applied to persons, habitations and the community, and to houses of public use. Examination of water and food supplies, with correction of all disease-exciting causes. Sewage and waste removal systems to be placed in perfect operation. Isolation of patients sick with these diseases, and disinfection of rooms and property of such patients, and the establishment

of house, municipal, state or national quarantine. Prevent access of flies and other insects to food and drink.

What is the physical training for a weak heart when no valvular lesions exist?

Beginning with gentle calisthenics, exercise should be taken, preferably in the open air, and increased gradually, such exercise to be supervised by a competent physician. Later on climbing exercises of a very gradual degree of difficulty may be taken.

How many cubic feet or fresh air per hour are required by an adult?

Three thousand cubic feet.

Discuss the theory of hereditary tendencies as applied to tuberculosis.

Children born of tuberculous parents present less power to combat and overcome the attacks of the tubercle bacilli than others of more healthy parents. Some theorists claim that this deficiency of resistance is in part due to an inherited small heart, and lessened circulatory power, thus favoring conditions of passive congestion or low grades of inflammatory processes. Such subjects as a rule show lessened lung expansion, a flattened or a wedge-shaped chest, etc.

Describe the physiological action of alcohol.

Small or therapeutic doses increase the pulse rate and the arterial pressure by directly stimulating the heart. Overdoses directly depress and paralyze the heart muscle. Large doses produce decided lowering of body temperature. It is probable that the use of alcohol diminishes the elimination of CO_2. Alcohol causes a great lessening in the excretion of the products of tissue waste. It is probable that alcohol in not too large quantity is entirely destroyed in the body. In small doses alcohol acts as a cerebral stimulant, while larger doses greatly depress and abolish nervous activity, and check

digestion. The habitual use of alcohol is accompanied by a disposition towards fatty degeneration, particularly of heart muscle, liver and kidneys, and in enlarged and dilated condition of the smaller blood-vessels and a degeneration of all nervous structures.

Does alcohol possess a food action? On what do you base your answer?

Yes. " In the sense that it is destroyed in the system and yields force which is utilized by the organism, and is when in sufficient quantity a retarder of tissue change, checking the excretion of nitrogen " (H. C. Wood). We see this in its administration in typhoid and other long-continued fevers. Yet it is not a true food, since it also exerts toxic effects, which foods do not.

State your views on compulsory vaccination and relate the safeguard that should be employed in all cases of vaccination.

The unprotected individual should be vaccinated as a protection to himself and to those with whom he comes in contact. The virus employed must be free from contamination, and the instruments used should be perfectly sterile, and the operation should be performed on a clean surface. The wound should be adequately protected from irritation by clothing, and from pathogenic germs.

In the pursuit of what trades is there a predisposition to pulmonary diseases?

Trades carried on in over-crowded, poorly ventilated rooms, in damp localities. Trades that give rise to much dust, particularly if such dust be of fine, hard particles, to which file-makers, stone-cutters, grinders, etc., are subjected. Such trades as necessitate cramped positions of the workers preventing proper lung expansion. In vocations giving rise to poisonous or obnoxious vapors, and also where the individual is exposed to sudden changes of temperature.

Under what condition is tyrotoxicon found in milk, cheese and other articles?

Where milk, cheese, ice cream, etc., undergo decomposition in the presence of other organic matter, as rotting wood, mould, etc.

The excavation of streets in cities is frequently followed by the outbreak of disease, such as diphtheria, typhoid fever. What is the cause?

Pathogenic bacteria lie dormant in the soil of cities, and when such soil is exposed to the air, it becomes dried, and its contained bacteria taking on an active existence are liberated and carried by the air to susceptible individuals.

Describe the agency of the ptomaines in inducing diseases and the disorders produced by them.

Ptomaines are alkaloidal bodies resulting from decomposition of nitrogenous substances. When absorbed into the blood they may give rise to fever, headache, torpor, fetid breath. They act like chemical poisons very soon after their introduction into the system. Many of them occasion distinctive trains of symptoms.

How long does a diphtheritic patient remain infective? How may it be proved that this infective period has ceased?

About three weeks after local symptoms cease. Make frequent cultures of material from the affected site, and when such fail to show the specific germ, the patient will no longer be a source of infection.

How may milk be the means of transmitting the germs of typhoid fever?

Through water containing Eberth's bacillus gaining access to the milk, as through diluting the milk, washing milk receptacles in polluted water.

State the period of incubation in (a) vaccinia; (b) parotitis; (c) pertussis; (d) varicella; (e) rotheln.

(a) 3 to 7 days; (b) 14 to 22 days; (c) 2 to 8 days; (d) 4 to 14 days; (e) 12 to 20 days.

Mention the effects of working in phosphorus, as in the manufacture of phosphorus matches. How can the dangers be limited or prevented?

Inhaling phosphorus fumes produces a form of necrosis of the jaw, particularly in such as have imperfect teeth. To avoid its development persons with sound teeth and freedom from abrasion of the interior of the mouth should be employed. The work-room should be large and well ventilated, with special air-shaft to force the fumes away from face of workers, the employees should have short working hours, and frequently use a mouth wash and gargle of lime water or carbonate of sodium. Turpentine and charcoal should be exposed in the room.

What fruits are preferable in cases of habitual constipation?

Apples, prunes, figs, tamarinds, grapes and melons.

Indicate a proper diet in the case of diabetes mellitus, obesity and early convalescence in typhoid fever.

The diabetic should use only a small quantity of carbohydrate foods, with a relatively large quantity of proteid foods and fats. The patient suffering from obesity should use but little fluids or food containing much water. Food containing starch and sugar should be eaten sparingly, and alcoholic liquors and fats must be avoided entirely. He should eat lean meats, mutton, beef, lamb, chicken, eggs, stale bread or toast sparingly, tomatoes, lettuce, celery, asparagus, onions, ripe fruits of an acid nature but no sugar.

In convalescence from typhoid fever the patient should use easily digestible food of a concentrated, nourishing character, of small bulk and without hard or irritating properties, as

soups, broths, uncooked oysters, eggs, rice, wine, milk, calves' foot jelly, etc.

What is the chief unsanitary condition of sea-going vessels?

The presence of bilge water and a dirty hold.

Describe the manner in which antitoxin is prepared.

A virulent culture of the specific micro-organism, or a strong toxin is injected into the cellular tissue of the selected animal, under due precautions of aseptic operation. After the animal has recovered from the symptoms thus produced, another and stronger injection of the specific poison is given. Injection after injection of increasing strength is given at proper intervals, until the animal fails to show any further symptoms of the disease—after an injection. Blood is then taken from the jugular vein of the animal, the greatest care being observed to secure aseptic conditions. This blood received in sterilized flasks, which are then stoppered, is stored in refrigerators until separation of clot and serum occurs. The serum is now tested to determine its value as antitoxin and then, after the addition of a very small proportion of carbolic acid, is placed in small vials, which are then hermetically sealed. Each vial has marked upon it its strength in normal antitoxin units in each cubic centimeter, and usually contains one dose.

Mention some of the objections to curbed or driven wells in streets or houses with respect to the purity of water coming from these wells.

The curbing rarely affords protection to the well water from gases and other emanations from sewers, gas-pipes, drains, etc., and even though a driven piped well may take its water from far below the surface, yet in the streets of cities, with the ever-present sewer and gas pipes, the soil becomes so saturated with deleterious material as to greatly endanger, through water carriage, the water from all forms of wells.

From what disease may immunity be acquired in the case of persons who have once suffered from these diseases? How is knowledge of this fact utilized in the prevention of certain diseases?

Yellow fever, small-pox, scarlet fever, chicken-pox, pertussis, typhus fever, cholera. A partial immunity may result in measles, mumps and in typhoid.

We may prevent some of these diseases by the introduction into the patient's system of the particular antitoxin of the threatened disease.

Describe the effect of a hot and moist climate on the human system, and state the class of diseases this atmosphere is likely to induce.

In hot and moist climates the inhabitants, as a rule, are of small stature and deficient in muscular development; of languid disposition and nervous temperament. The diseases most prevalent are those affecting the liver and gastro-intestinal tract; also various forms of malarial disease and yellow fever.

What occupations are a menace to public health? Why?

Those occupations that emit irritating, poisonous or noxious fumes and gases, from the vitiation of the atmosphere, as in fertilizing plants, chemical manufactories, bone-boiling establishments; also dust, especially if this be of sharp, hard character, as from cement-making, tool-making, the respiratory tract being thereby subjected to irritation.

Mention some of the objections to storage cisterns under ground. What are the objections to rain water as a drink?

They often receive dust and dirt; sewer gas may gain entrance to the water when the " standing waste " or overflow pipe of such a cistern is connected with the drain or soil pipe of a house. Storage cisterns cannot be properly ventilated, and are often difficult to clean.

If the first part of the rain be collected, such water will contain dust, pollen, gases and other matters washed from the air.

Mention some of the diseases to which artisans are especially liable.

Painters, and those working in lead, copper and zinc, may suffer from metallic poisoning; match-makers from phosphorus poisoning; tool-makers and grinders from phthisis; miners from affections of bronchi and lungs; smelters from arsenical poisoning.

Given an opinion as to the sanitary effect of the different methods of heating houses.

The most desirable method is by hot water heating by means of a complete plant with circulation of the hot water through radiators. Next in value to hot water heating is steam heating by radiators or by indirect radiation. The use of open fireplaces in the principal rooms is of great value in securing ventilation, but yields an unequal and insufficient supply of heat. Heating a house by hot air from basement heaters is efficient and gives good results, if the air supplied to the heater for distribution is pure and the house is not too large.

State average weight of feces in 24 hours in a normal man. What proportion is made up of liquid and what of solid contents?

Six ounces, 75 per cent. of which is water.

Name eight principal carbohydrates used as food.

Starch, glucose, saccharose, lactose, dextrin, cellulose, maltose and dextrose.

Name the class of foods which should be given to children between the first and second years of age.

We should supply foods in about the proportion of 2 parts proteid, 3 parts fat, 6 parts carbohydrates, the proteid food preferably milk.

How do forests benefit public health?

Forests act as wind barriers, promote humidity of the air from the widespread surface they offer for evaporation. They afford shade in summer, and aid in decreasing the relative quantity of carbon dioxide in the air, exhaling oxygen to the air.

State in a general way the maximum number of hours that primary pupils in the public schools should be kept at their tasks, and how frequently and in what manner such tasks may be varied and broken.

One-half hour at a given task is sufficient when the character of the mental work should be changed. When an hour's mental application has been enforced, then five or ten minutes should be given to light calisthenics. An intermission of fifteen or twenty minutes in the open air should occur in the course of three hours' study. An intermission of two hours should then be allowed for luncheon and recreation, at the end of which time a similar routine may be followed, as stated above, for two hours.

What abnormal condition of the eye is most common in school children?

Myopia.

What are some of the dangers involved in the domestic use of ice?

Ice may contain pathogenic bacteria, and may, when removed from a sick-room transmit infectious disease to other members of the household.

What is the expectation of life of a professional man in active practice at the age of 45 years?

24.82 years.

Define the term "quarantine;" mention the principal quarantinable diseases, and give the rules for determining the length of time each should be quarantined.

"The adoption of restrictive measures to prevent the in-

troduction of diseases from one country or locality into another '' (Wyman).

Quarantinable diseases include cholera, small-pox, yellow fever, plague, scarlet fever, diptheria, typhus fever, relapsing fever, cerebro-spinal meningitis, leprosy.

In eruptive fevers isolation of the patient (quarantine) is continued for two weeks after the eruption has disappeared except in the case of small-pox where quarantine lasts 30 days.

The quarantine in diptheritic cases does not cease until cultures made from the throat of the patient fail to show the bacillus of diphtheria.

State the best means of disinfecting sputum.

Sputum should be burned or be received into vessels containing strong antiseptic solutions.

What is understood by the germ theory of disease? Mention all diseases whose causes are known to be specific micro-organisms.

The germ theory of disease contends that the exciting cause of each infectious or contagious disease is some specific organism, and that these diseases are communicated only by the transference to and development of the particular parasite or germ within or upon the tissues of the infected individual.

Diseases due to specific micro-organisms are tuberculosis, diphtheria, cholera, typhoid fever, dysentery, pneumonia, glanders, leprosy, anthrax, erysipelas, gonorrhea, relapsing fever and tetanus.

What diseases are incident to school life? How may these diseases be prevented?

The infectious diseases, which should be prevented by early recognition and prompt removal of sick pupils. The room should be disinfected. Curvature of the spine should be corrected or prevented by properly constructed school furniture, and proper admission of light to the room. Myopia should

be prevented by the use of clear, large print in text-books and correction of improper positions in reading and writing and a good supply of light admitted to the school-room to the left of the pupils.

Contagious conjunctivitis, prevented by cleanliness and isolation of the patient.

Chorea, prevented by removal of the afflicted and repression of all the tendencies toward imitation.

What is the value of preventive inoculation in cholera and diphtheria?

Value in cholera not yet fixed. In diphtheria, antitoxin is both curative and prophylactic.

Outline the construction of a camp hospital, especially providing for the care (with least danger to other patients, medical and surgical) of those suffering from contagious diseases.

Obtain purity of internal atmosphere; abundance of pure air and sunlight within the building, facility of administration and discipline. To obtain these requirements select a proper site of soil, not clay, and preferably on hillside, looking southward if in winter; use a simple plan of building, a sufficient number of wards, preferably on the detached or pavilion plan. In wards each patient should have at least 90 square feet of surface space, and 1,200 cubic feet of air space; have provisions for burning all infected material, discharges, etc., to leeward of the hospital and at a suitable distance away.

Can it be proved that the diminished death rate from diphtheria so generally announced is due to the use of diphtheria antitoxin? Give reasons.

Yes. By comparing the death rate in hospitals treating the same class of patients, in the same community, during the same time, the one hospital using diptheric antitoxin, the other depending upon other methods of combating the dis-

ease. Where the antitoxin is used the death rate is much lower.

Give the comparative nutritive value of sterilized or unsterilized cows' milk.

The nutritive value of sterilized milk is less than of milk unsterilized.

What evil consequences frequently result from the excessive use of tobacco?

Catarrhal inflammation of pharynx, tonsils and mouth. Nervous disorders of heart as palpitation, and insomnia also result. Derangements of stomach with loss of appetite, and impairment of vision together with paralysis of optic nerve, nervous tremors, and muscular twitchings may result.

How should a patient who has been rendered unconscious by heat be treated?

If the patient has a strong, full pulse and the face is red and congested, place him in a recumbent position with the head reaised and apply ice until the high temperature falls to about 100 degrees Fahr.

If the patient is pale, with a weak pulse, use stimulants, as ammonia, by inhalation; apply heat to the body and keep head, face and neck cool.

Mention some of the advantages of carefully prepared artificial ice as compared with natural ice.

It may be made from distilled water so as to be absolutely pure. It may be obtained in any size or shape and its texture is more uniform.

What precautions as to food and drink should be observed by those forced to work under the direct rays of the sun in summer weather?

A small quantity of readily digestible food should be eaten before going to work. Liquids of a non-alcoholic character may be used liberally, provided perspiratory function is ac-

tively performed. Very cold drinks should be avoided. Meat should be largely excluded from the diet.

A law to prevent owners of land in the narrow streets of New York City from erecting buildings more than twelve stories in height is being agitated. Give sanitary and hygienic reasons for and against.

Reasons favoring tall buildings: The persons using the upper floors are insured uninterrupted sunshine, good light, a pure air, comparatively free from street dust, and freedom from ground air and water.

Reasons against: Tall buildings prevent proper ventilation of lower buildings, and obscure sunlight from smaller buildings and the street. Fire is difficult to extinguish in tall buildings. Their lower floors are often damp and generally dark, requiring the constant use of artificial illumination. They are, therefore, a menace to the lives of their occupants.

What are the best methods of ventilating dwellings, and what sanitary principles are involved?

The perflating action of wind should be utilized at least once each day for all rooms. One of the best methods employed is the open fireplace, provided such fireplaces be supplied with properly constructed chimney exits. In lieu of this plan fresh air may be admitted through ventilators, or between the upper and lower window-sashes. The object sought in these devices is to admit cold air above the heads of the occupants of the room so that the fresh air may pass through the upper portions of the room and become heated before reaching the occupants. The usual outlet for foul air is the chimney flue, but when this is not present, it may be replaced by an opening for the exit of air placed near the floor of each room. When the incoming air is not heated the outlet should be at the top of the room. During cold weather the rate of interchange of air should not be greater than sufficient to change the air of the room three times an hour. The air which enters should not have a greater velocity than five feet per second, or about 3.4 miles per hour.

What hygienic precautions should be observed in the care of the new-born child?

The room should be kept at a temperature of about 72° Fahr. and well ventilated without draught. The child should be thoroughly cleansed, using a neutral fat to facilitate the removal of all fatty or sebaceous material before washing with warm water and castile soap. The eyes and surrounding parts should in particular be thoroughly cleansed; if possible, without the aid of soap. After thoroughly drying the infant, its navel should be properly dressed. The infant should then be warmly clad, kept dry and clean, and away from noise and strong light.

What hygienic precautions are necessary to insure healthy sleep?

A well-ventilated room, temperature about 60° F. Room and bed should be perfectly clean, and the covers of the bed not too heavy. The head of the person should be slightly elevated. Noise and light should be excluded from sleeping apartments.

What deleterious gases accumulate in improperly ventilated sleeping rooms?

Carbon dioxide; carbon monoxide, if rooms be heated; hydrogen sulphide; ammonium sulphide, and many gases of an organic ammoniacal character.

Does change in climate require any change in food; if so, what?

Yes. In cold climates a greater quantity of food should be consumed than in hot climates. Food that is productive of the greatest number of heat units, as fats and meats, should be partaken of in cold climates. In hot climates the diet should consist almost entirely of well-cooked vegetables and ripe fruits, with the avoidance of alcoholic beverages.

What are some of the dangers of the cold bath?

In those of feeble circulation and at the two extremes of

life, chilling of the surface of the body leading to internal congestion that may result in acute inflammation, particularly of the lungs, kidneys, stomach and bowels. Shock seriously affecting the heart; and the production of a persistently lowered temperature of the body.

What effect has ground air and water on the health?

Ground air is always impure, being contaminated with bacteria, carbon dioxide and often with more poisonous gases. It occasions various degrees of ill-health, varying from slight general malaise to one of the acute infectious diseases or tuberculosis. Ground water from near the surface of polluted soils may be noxious. It causes dampness of the walls of houses, inviting rheumatic diseases and catarrhal inflammations.

What hygienic principles should be observed in infant-feeding?

Feed the child every few hours during the day; and about three times during the night till several months old; then less frequently. If possible let the child receive its natural food from the mother, and in such cases take particular pains to see that the nipples and breasts of the mother are kept dry and clean between the times of nursing. If the infant is to be given artificial feeding, the cow's milk selected must be from a healthy animal, must be diluted with water to give a relatively less proportion of casein, must be sweetened with milk sugar, and have a slight addition of fats in the form of cream added, when it will approach human milk in composition. A definite quantity of milk which should be warmed to the temperature of the body should be given at each feeding.

Define the word " nuisance " in a broad hygienic sense.

" Something which either actually injures, or is likely to injure health, and admits of a remedy either by the individual whose act or omission causes the nuisance, or by the local authority " (Wynter-Blyth).

What should be the height, weight and chest measure of a typical man aged 25 years?

Height 67.8 inches; weight 139 pounds; measurements of chest 34.5 inches.

What injurious influences, if any, do cemeteries exert on the health of persons living in their vicinity?

To most persons the mental effect is depressing. Water passing through the soil of cemeteries may contaminate the water supply of the neighborhood with organic material and micro-organisms. The constant turning of soil of cemeteries may set free imprisoned gases from organic decomposition, and lead to contamination of the surrounding air.

What physical conditions would render the taking of a Turkish bath inadmissible?

Atheromatous arteries generally, diseases of the lungs, and diseases of the heart.

What gases and combination of gases are most efficient as disinfectants?

Formaldehyde, sulphur dioxide, chlorine, ozone.

What care should be employed in exhumations?

The exhumation of those dead of contagious or infectious diseases should not be allowed. When possible, the exhumation should be deferred until cold weather. The presence of all persons except those absolutely needed should be forbidden. As the workmen approach the coffin the earth should have poured upon it a strong watery solution of creolin. The coffin containing the remains should not be opened, but be placed at once in a zinc-lined box and hermetically sealed.

What are the hygienic requirements and the physiological effects of bathing?

The bath should be taken to obtain personal cleanliness, as well as for its stimulation of the peripheral circulation. Bathing should be postponed until at least two hours after a

meal, and should consume only twenty minutes. Never bathe when very hungry, or when the body is overheated. Unless experience has shown that good effects accrue from a cold bath, secure a temperature of about 65 to 75 degrees Fahr. of the water. The bath should be followed by a thorough drying and brisk rubbing. Effects following a bath are removal of dirt and of dead epithelium from the person, stimulation of the functional activities of the skin; a general improvement of the organs of elimination.

How much fresh air is required for normal respiration during 24 hours?

3,000 cubic feet per hour, or 72,000 cubic feet of air in 24 hours.

What is the best sanitary disposition of stable manure in large cities?

The liquid portion of manure should be carried by properly constructed trapped drains into the general sewer. The solid, dried manure, straw, etc., should be placed in well-covered pits, from which it could be removed at proper intervals in covered wagons, and employed in the country as fertilizer; or drain the liquid manure into the sewer and cremate the solid manure.

How may a privy in a city or country be kept while in use from becoming a nuisance?

Have the privy emptied at frequent intervals. At intervals of five to seven days, pour into the privy vault milk of lime (about 20 grains of lime for each gallon of sewage), or strong solution of iron sulphate; or at frequent intervals add clean, dry earth to the privy contents, and provide a ventilating pipe extending high in the air and down into the privy vault.

What explanation can be furnished for the greater prevalence of diphtheria and small-pox in cold than in warm weather?

During cold weather the houses are less perfectly venti-

lated than in warm weather. Rooms are frequently overcrowded, less attention is paid to personal cleanliness and there are more sudden changes in temperature. Such conditions lower the vitality of the body and predispose to disease.

What are the principal adulterations of milk?

Addition of water and abstraction of cream; addition of coloring matter (annatto, caramel); preservatives (borax and boracic acid, salicylic acid, formaldehyde, chromates); gelatine as a thickening for cream.

What changes in food are effected by cooking?

Parasites and germs are destroyed; the food is made more tender to facilitate mastication. The tough fibrous envelope of starch cells is softened, albumin is coagulated, the food is rendered more palatable, and the action of the different digestive fluids is aided.

Give the sanitary dimensions of a school-room for fifty pupils.

A room 15 feet high, 25 feet wide and 40 feet long would allow each pupil 300 cubic feet of space, which is the adequate amount for each child.

Mention eight satisfactory disinfectants and give indications for their use.

Formaldehyde (1 pound of formaline for every 1000 cu. ft. of space), sulphur (3 pounds for every 1000 cu. ft. of space) or bleaching powder (3 pounds for every 5000 cu. ft. of space) to fumigate a room. If sulphur or bleaching powder are used, it is necessary to steam the room before beginning to fumigate. Chloride of lime to disinfect excrementitious matter from typhoid fever, cholera, dysentery, etc. Carbolic acid (5% solution) or moist heat (steam and boiling water) to disinfect clothing. Bichloride of mercury or permanganate of potassium and oxalic acid to disinfect the skin.

What are the most common sources of infection in diphtheria?

By direct contact with the sputum or shreds of membrane from the patient. By inhaling the air in the vicinity of the patient. By fomities, as clothing, books, drinking-cups, etc.

What conditions are essential to a good water supply?

Purity at its source, and adequate subsequent protection from contamination.

What hygienic measures should be observed by the nursing woman?

An abundant diet, avoiding overfeeding; some form of outdoor exercise each day; monotony of life and overwork should be guarded against. Warm clothing, personal cleanliness, abundant sleep, freedom from mental cares, fright or anger are necessary precautions. Each time the child is removed from the breast the nipples should be washed with warm water and thoroughly dried.

What precautions should a physician observe to avoid carrying contagious diseases?

A linen duster and a tightly-fitting linen cap should be worn by the physician in the sick-room, and be removed after leaving the room. Immediately after manipulating the patient the physician should thoroughly wash and disinfect his hands and face. A bath and change of clothing before attending other patients are advisable.

Describe the hygiene of the mouth and teeth.

The teeth should be cleansed after each meal and on rising in the morning, and foreign matter between the teeth should be removed. Acidity of the saliva may be counteracted by weak alkaline mouth washes.

What methods would you suggest for the hygienic care of the skin?

Simple foods: avoiding constipation; daily exercise in the

open air; plenty of sleep (at least eight hours daily); frequent warm baths and a cold sponge bath on rising each morning.

What localities should be sought or avoided by rheumatic patients?

Warm, dry, equable climate should be sought. Alkaline or sulphur thermal springs are recommended. Damp valleys, shores of rivers, sea coasts and places which are much exposed to winds and sudden changes of temperature should be avoided.

Name the kinds of food and the quantity of each for the daily use of the normal man.

4.5 ounces of proteid; 3.5 ounces of fats; 14 ounces of carbohydrates; 1 ounce of salts (Moleschott). Or 118 grains proteids; 56 grains fats; 500 grains carbohydrates (Voit). These quantities represent dry foods. If the diet is stated as so-called solid-food (not water-free) the above quantities must be doubled. 50 to 80 ounces of water in liquid form are also taken into the system.

What is the object of the wet pack, and what unfavorable results may occur from its use?

The cold wet pack is used to lower temperature during fever. The warm wet pack is used to promote elimination of fluid, to relax muscular spasm, to promote sleep, and raise lowered vitality.

The dangers to be guarded against are heart failure or fatigue, or excitement to weak patients. The cold pack may give the patient a nervous chill.

Describe in detail the process of disinfection by formaldehyde (formalin).

Make the room as near air-tight as possible by closing all openings and cracks before beginning the process of disinfection. All mattresses, pillows, clothing, books, etc., should be exposed as fully as possible to the action of the disin-

fectant. Place one pound of formalin for every 1000 cu. ft. of air space in a " Novy " generator. Start the rapid volatilizing of the formaldehyde and allow the room to remain closed for one day.

What hygienic means should be employed by persons prone to " catch cold?"

A cold sponge bath followed by brisk rubbing on arising in the morning; daily muscular exercise in the open air and a liberal (but not excessive) diet, largely of carbohydrates.

Describe the necessary sanitary precautions during the prevalence of an epidemic of Asiatic cholera.

Isolate all patients and attendants; observe strict quarantine of all infected houses or districts; disinfect and remove any accumulations of filth, excreta, etc.; cremate those who have died from this disease. The water supply should be guarded to prevent its contamination; and insist upon householders boiling all water or milk before using the same. All gastric or intestinal diseases should be attended to at once. Restrict or prohibit the use of all fruits or uncooked foods from the district; and use all disinfectant precautions where cases exist, during continuance of case, and after its termination.

What are the sanitary requirements of house plumbing?

All pipes and connections, traps, etc., should be in view or easy of access. Each house must be directly connected by pipe with the common sewer. The pipes in the house must be of iron with leaded joints or screwed couplings. The drainage pipes should be laid with a gradient of at least one inch fall to every four feet of length; the main house drain must be provided with a trap after it has been carried beyond all house connecting pipes. Pipes from water-closet fixtures, bath-tubs, wash-basins and sinks must have traps close to each fixture. Soil pipes must extend open for at least two feet above the roof and air must be admitted to the main trap upon its house-side.

Describe a simple form of ventilating the sick-room.

Place a wooden strip about three inches wide and as long as the window frame under the lower sash; through the space between the top of the lower sash and the bottom of the upper, sufficient air will enter the room without producing a draught.

What precautions should be taken in school-rooms to protect the sight of scholars?

Pupils should not sit facing the windows (the light should come from behind or over left shoulder); blackboards should not have a glossy surface and should not be placed between windows. The walls of the room should be of a neutral tint. Text-books should be printed in clear, large type. Faulty posture in reading and writing should be corrected by the teacher. If toilet accessories are supplied, no child suffering with an inflammatory disease of the eyes should be permitted the use of the general supply. Any imperfection in vision of a pupil should be reported to the parents.

What are the chief sources of contamination to drinking water?

The emptying of sewage into the stream from which the supply is obtained; surface water in settled districts gaining entrance to the supply; sub-soil water, after passing through a filthy soil; drainage from places of burial; and water which has dissolved poisonous minerals.

Describe the several methods of purifying drinking water.

Sedimentation, occurring when collections of water remain at rest for a considerable time, removing, in part, at least, suspended matter.

Sand filtration in which the water flows upon and through prepared beds of sand, gravel and broken stone, packed in separate layers, removes from it not only suspended matter, but also dissolved organic matter and bacteria, through the

action of air (oxygen in the interstices of the filter material, and the action of saprophytic bacteria.

Boiling water will free it of pathogenic bacteria and temporary hardness, but such water, after boiling, should be aerated to fit it for use.

What do you understand by the "dry earth system" as applied to excrementitious matter?

The container under the privy seat contains the dry earth, and after the use of the privy fresh earth is always to be added to the receptacle. From time to time the contents are removed and buried or otherwise disposed of.

Contrast the incubative stages of measles and scarlet fever.

The stage of incubation in measles is from one to three weeks (averaging 12 days); in scarlet fever from one to eight days (average 3 days).

Mention some of the results of tobacco smoking in growing school boys in respect to the circulation, air passages, vision and mental application.

It depresses the circulation and produces palpitation of the heart. It causes low grades of inflammatory processes in the upper air passages, catarrhal conjunctivitis, mental lethargy, with inability to sustained mental application.

What habits of school children tend to produce myopia?

Reading of small imperfect print; faulty positions while reading or writing in which the eyes are not far enough removed from the page; reading or writing in insufficient light, or when fatigued.

What should be the proper temperature for a living room in winter?

72°F. for old or weak persons; 65° F. for the young and vigorous.

What should be the diet of a child over two years of age?

The food should consist principally of milk and bread, with rice, tapioca, some vegetables of easily digestible character, and sparingly of fruit, preferably cooked; but little meat should be allowed, and this preferably mutton.

What hygienic precautions should be observed by a pregnant woman?

Diet should be nutritious; clothing should be loose; moderate outdoor exercise should be taken each day; the marital relations should cease; the action of the skin should be stimulated by warm baths. After the sixth month the urine should be examined every few weeks. Constipation should be corrected by hygienic measures when possible. In late pregnancy the nipples, if necessary, may be developed by judicious manipulation.

What is the most sanitary way of disposing of city garbage?

Burn it, so that all noxious vapors are also consumed.

Describe the effects of a cereal diet.

Many writers assert that, as a rule, such a diet produces a lessened muscular formation, with an increased fat production, and that it also causes a deficient production of red blood corpuscles, with an accompanying loss of oxidation and tissue removal; but it is probable that such a diet is compatible with good health provided it contains enough proteids.

What is the lowest temperature of steam heat at which pus cocci are destroyed?

At 240 degrees Fahr. such organisms are killed in a few minutes, while at 212 degrees Fahr. it requires an exposure to steam of from thirty to forty minutes.

What physical training would you recommend to a person with weak respiration?

Calisthenic exercises without apparatus directed to increas-

ing the extrinsic and intrinsic muscles of respiration, accompanied by deep and slow breathing. This should be followed by a course of light, well-regulated gymnastic work, with dumb-bells, Indian clubs and wands. After a proper interval of several months, progressively difficult mountain-climbing, then running exercises, and finally general apparatus work in a good gymnasium under proper instruction.

Name three tests for detecting impurities in water.

Nessler's test for detecting and estimating ammonia.
Nitrate of silver for detecting and estimating chlorides.
Barium nitrate for detecting and estimating sulphates.

What is the best sanitary plan for the disposal of sewage?

Collect the sewage in large tanks and to it add lime, alum or iron sulphate. Compress the solid materials after their subsidence or precipitation and cremate them. Allow the liquid sewage to flow upon specially prepared filter beds which are subdrained, and the water flowing from these subsoil pipes may then pass into a stream without great danger of adding poisonous material or pathogenic bacteria.

What is the temperature of tepid water, of hot water, of boiling water?

Tepid water 75 to 85 degrees Fahr.
Hot water 100 to 110 degrees Fahr.
Boiling water 212 degrees Fahr.

What diseases are propagated by drinking water? How can their spread be prevented?

Infectious diseases, particularly cholera and typhoid fever; diseases due to gastric and intestinal irritation, as forms of dyspepsia, diarrhœa, dysentery; diseases due to animal parasites; diseases due to metallic poisons.

Prohibit the use of water containing any dissolved metal. Distil the water, or boil it for at least one-half hour, thus purifying it.

Describe in detail the sanitary precautions necessary in typhoid fever.

Expose urine, stools, vomitus and sputum for three hours to the action of a solution of chlorinated lime, of the strength of six ounces to a gallon of water, breaking up all solid masses. Place all towels, napkins and bed linen in a 5 per cent. solution of carbolic acid until convenient to boil the same for half an hour. Secure continuous ventilation of the sickroom. Boil all water and milk before allowing its use by the patient or members of the household. Fumigate the room and contents after the patient leaves it.

What hygienic precautions should be employed about diphtheria?

Isolate the patient; refuse admission to the sick-room of all whose presence is not necessary; attendants should observe the greatest personal cleanliness; all secretions should be collected upon cloths and burned. All articles should be disinfected before being removed from the sick-room. Members of the household should be quarantined.

Mention six desirable factors in the location of a resort for consumptives.

Equable climate, high altitude, dry atmosphere, pure air, abundant sunshine and pine forests are climatic factors for consumptives.

State the accepted belief in respect to the limitation of protection from vaccination.

Five years, when revaccination should be attempted. During a small-pox epidemic it is advisable to revaccinate all individuals who have not been vaccinated within two years.

Mention some of the adulterations in preparations of ground coffee for sale in the shops.

Chicory, peas, roasted cereals and legumes, date stones, acorns, sawdust, etc.

What class of foods should predominate for persons over sixty years of age?

Use eight-tenths the quantity of proteids that the vigorous adult requires; seven-tenths the quantity of carbohydrates; and one and two-tenths times the quantity of fats.

Which in your judgment is to be preferred in vaccination, animal or humanized lymph, and why?

Animal lymph, because in its preparation greater care may be taken to secure its freedom from deleterious additions.

Name some of the nuisances dangerous to health.

Gases and dust of a poisonous or irritating nature arising from many manufacturing industries. Collections of stagnant water, garbage and animal excreta exposed to air; leaking drains or sewers saturating the soil, or allowing the escape of gases. Industries giving rise to great noise or vibration in thickly settled communites.

What is the best means for preventing the access of sewer gas in dwellings?

Place a trap or water seal between the house drain and the sewer and provide an air inlet pipe to open into the drain pipe between this trap and the house. A ventilation pipe should extend from the house drain to a point above the roof.

State the ordinary death rate of each of four cities having respectively a population of more than fifty thousand (50,000).

Dublin, 39.9; St. Petersburg, 31; Berlin, 17; Amsterdam, 17.8 (1897).

Name the diseases the predisposition to which is greatly increased by the habitual use of alcohol.

Diseases of the heart and vascular system, the kidneys, brain and liver, and of the respiratory system, particularly pneumonia and asthma.

Mention methods to be employed for preventing epidemics of yellow fever in the tropics.

Remove at once to high or new ground should the disease appear. Cremate all those who have died of the disease; disinfect and remove all filth and endeavor to destroy all mosquitoes and their larvæ and other insect pests by the use of petroleum, sub-soil drainage of damp places, and filling all stagnant pools with clean dirt.

Name four diseases that are communicable to man through cows' milk.

Typhoid fever, scarlet fever, cholera and tuberculosis.

To what is indigestion from excessive tea drinking attributable. State a formula for the preparation of good tea.

The indigestion is caused chiefly by tannin; also by theobromine.

Pour one pint of boiling water over a dram of the dried tea leaves and allow it to stand without applying further heat for five minutes.

State the advantages of cremation over earth burial.

Complete destruction of specific disease germs. If cremation be well performed no obnoxious gases are given to the air, no gases of putrefaction contaminate the air, and there is no danger of contaminating the water supply through drainage from cemeteries.

What are the respective merits of cotton, wool and silk when used as underwear?

In a variable climate wool is preferable because from a larger amount of air enclosed in its texture it acts as a good non-conductor of heat, retaining the body temperature. As wool is hygroscopic it readily absorbs moisture from which it parts slowly, so preventing surface chill of the individual by too rapid evaporation. Next in order to retain the heat

of the body we rank silk, and least valuable for the retention of body heat is cotton. If it be our purpose to supply a cool garment we would of course reverse this order of arrangement.

If a chemical analysis of water revealed the presence of nitrites and nitrates, would this condemn it for drinking purposes? If so, why?

Yes, particularly if nitrites be present. Organic matter, particularly sewage, is converted first into nitrites, and these into nitrates through the action of bacteria in the soil. These salts would, therefore, indicate a former pollution of the water with probably some of that polluted material still in the water. If nitrates only are present, and it can be shown that the organic matter is of a vegetable origin only, the water need not be condemned.

To what diseases are negroes comparatively insusceptible? In the Middle States to what diseases are negroes more prone than whites?

Dysentery, yellow fever, and diseases incident to exposure to summer heat. Negroes are more prone than whites to contract small-pox, diseases of the respiratory tract, fibroid tumors, keloid growths and venereal diseases.

Give a medical and hygienic plan for the inspection of immigrants who have just arrived at a seaport.

Examine the " Bill of Health " and clinical records of all cases treated during the voyage and the lists of passengers, crew and manifests, and, if desirable, the ship's log. Have crew and passengers mustered and compared with the lists, investigating any discrepancies and make a careful examination of both crew and passengers. If a case of infectious disease has occurred during the voyage, disinfect all exposed baggage and freight and detain such members of the crew and passengers as have been exposed until the incubation period of the disease has passed.

What conditions of ill health make residence in high altitudes dangerous? Why?

Chronic Bright's disease, disease of the heart, emphysema, and old age. High altitudes occasion increased respiratory effort from the rarified condition of the atmosphere, causing increased heart action, and a lessened perspiratory function.

State the physical conditions that make the practice of taking hot baths inadvisable.

Acute inflammatory diseases, tuberculosis, organic diseases of the heart and brain, aneurism, cancer, and all diseases in which stimulation of the circulation is to be avoided.

State some of the sequelae of (a) over-strain, (b) over-exertion, (c) over-training.

(a) Parting of continuity of osseous, ligamentous, muscular to blood-vessel structure leading to fractures, dislocations, rupture of muscles, hernia, rupture of heart muscle, disease of valves of heart or apoplexy.

(b) May produce same conditions as overstrain and in addition cause general muscular relaxation, dyspnea, syncope, etc.

(c) Loss of appetite and of muscular power, successive crops of boils appear, individual loses mental power, as of concentration of thought, and digestive disturbances occur.

What constitutes hard water and soft water?

"Hardness is the capacity a water has for decomposing soap, and depends on the amount of salts of magnesia and calcium in solution." (Harrington.)

Soft water contains little or no dissolved salts and rapidly forms a lather with soap.

Mention the dangers of excessive shade about dwellings.

Excessive shade interferes with the free movement of air, prevents penetration of the sun's rays, promotes dampness which is given off to the air by evaporation. It exerts a depressing mental action, promotes the growth of fungi and

bacteria, and prevents the aspirating action of heat from the sun upon air and moisture in the soils.

What is milk sterilization? How is it performed?

Destruction of micro-organisms in the milk by heat. By continuous heating of the milk, under pressure, for two hours at 248° F.

State the objections usually advanced against vaccination as a preventive of small-pox.

It is urged that it fails to protect from small-pox (which is false), that it may produce blood-poisoning, that constitutional diseases like syphilis, scrofula, etc., may be introduced by the vaccine virus, or in the operation. Also that tetanus may result, and that it is not right to deliberately inoculate a healthy person with the virus of vaccinia or of any disease.

On what generally accepted theory are toxins used for the prevention and cure of disease?

That their presence in the system renders the blood no longer able to support the lives of bacteria that occasion such toxins.

What infectious diseases may be due to impure drinking water?

Typhoid fever, malarial fevers, cholera, relapsing fever, dysentery, parasitic diseases.

Define humidity of the atmosphere. Why should a humid atmosphere cause rheumatic persons and persons suffering with the gout increased sensitiveness?

The term humidity refers to vapor of water in the air. An increased humidity increases sensitiveness of gouty and rheumatic patients by decreasing elimination from the skin of excretory organic matters and uric acid derivatives and thus leading to retention of such poisons in the system.

What constitutes a thorough meat inspection? How should an inspection of milk be conducted?

Meat should be inspected within 24 hours after the animal

is killed. The following points are noted: The quantity of bone, for which 17 to 20 per cent. is to be allowed. The quantity and characted of the fat, noting its color, consistency, and taste. Condition of the flesh. Condition of the marrow. Examination of the lungs, liver, kidneys for detection of infectious disease manifestations. A microscopical examination of the flesh for detection of bacteria of pathogenic character, trichina, tape-worm or other parasites. Where possible, it is well to investigate the surroundings in which the animal has lived and the methods employed for storage and refrigeration.

An inspection of milk takes cognizance of its specific gravity, color, quantity of cream, presence of preservatives, presence or absence of dilution, or addition of coloring matter, determination of total solids, of quantity and quality of ash, of fats, casein, lactose. The microscopical and bacteriological examinations are performed and finally an examination is made of the source, storage and distributing methods.

CHEMISTRY.

What is chemical affinity?

Chemical affinity, or chemism, is that force which combines atoms to form molecules.

Mention three fixed monads, two fixed dyads, one fixed triad and three elements that vary in valency. Illustrate.

Monads; hydrogen, chlorine, and bromine. Hydrogen is the standard of comparison, chlorine and bromine are shown to be monads in their compounds, hydrochloric acid, HCl, hydrobromic acid, HBr, etc. In no known compounds will these elements combine with more than one hydrogen atom.

Dyads; oxygen and calcium, as shown in the compounds, water, H_2O, calcium chloride, $CaCl_2$.

Triad; boron, as shown in the oxide, B_2O_3, two atoms of boron combining with the three bivalent oxygen atoms.

Three elements varying in valency are: Carbon, dyad in CO, tetrad in CO_2; sulphur, tetrad in SO_2, hexad in SO_3; gold, monad in AuCl, triad in $AuCl_3$.

Differentiate mechanical divisibility and chemical divisibility.

Mechanical divisibility, that obtainable by mechanical or physical means, permits, theoretically, the division of matter into its molecules.

Chemical divisibility, that obtainable by chemical means, permits of the division of matter into its atoms.

What are salts and how are they formed? Define neutral salt, acid salt, double salt.

Salts are compounds formed from acids by substituting

metals or basic radicals for part or all of the replaceable hydrogen of the acid.

Neutral salts are those formed from acids by substituting metals or basic radicals for all of the replaceable hydrogen of the acid.

Acid salts are those formed from acids by substituting metals or basic radicals for part of the replaceable hydrogen of the acid.

Double salts are those containing two different metals or basic radicals in their molecule.

Mention five elements found in nature only in combination. Into what groups are elements divided?

Aluminum, potassium, sodium, chlorine and bromine.

Elements may be classified according to their electro-chemical properties, e. g., the electro-negative non-metals, the electro-positive metals; they may be classified according to their analytical properties, e. g., those precipitated by hydrochloric acid, those precipitated by hydrosulphuric acid, etc.; they may be classified according to their atomic weights (the periodic law), thus bringing together in groups elements similar in properties.

Mention five elementary substances commonly used in medicine in a pure or uncombined state.

Oxygen, iodine, sulphur, phosphorus, carbon.

Define reaction, water of crystallization, atomic weight, specific gravity, reagent.

Reaction—the rearrangement of atoms with formation of new compounds effected in a chemical change. Water of crystallization—water necessary to the crystal form. Atomic weight—the relative weight of an atom as compared with the weight of another atom taken as a standard. Specific gravity—the relative weight of a substance as compared with the weight of an equal volume of another substance taken as a standard. Reagent — a substance used to produce a chemical reaction.

Define isomorphous, amorphous, crystalline, galvanic, polarization.

Isomorphous—of the same form, relating in chemistry generally to substances which crystallize in the same form. Amorphous—without form, substances having no regularity of internal structure, not crystalline. Crystalline—substances having a regularity of internal molecular structure producing under proper conditions definite geometrical forms. Galvanic—that pertaining to electricity of chemical origin to current electricity. Polarization—in reference to light, means the breaking up of the light ray into two parts whose planes of vibration are at right angles to each other. Polarization in electrical batteries refers to the accumulation of gas on the plates, thereby interfering with the further production of the electric current.

Describe a method of producing an electric current by chemical action.

In a jar containing water rendered slightly acid with sulphuric acid, place a plate of copper and one of zinc; connect the two plates outside of the liquid by means of a wire and a current of electricity will be developed, "flowing" from the zinc to the copper through the liquid, and from the copper to the zinc through the wire.

Explain the uses of the spectroscope in chemical analysis.

A solid body at a white heat produces a "continuous spectrum." Elementary substances in the state of gas or vapor when highly heated yield characteristic spectra consisting of but one or more bright lines, the position of which is positively fixed for each element. If a strong white light be passed through certain solutions we obtain a continuous spectrum crossed by dark lines—"an absorption spectrum." These facts are made use of in the examination of heated vapors and of certain solutions. In medicine the spectroscope is especially useful in the identification of blood by its absorption spectrum.

Define sublimation, distillation, static electricity, galvanic cell, organic compound.

Sublimation—the vaporization and condensation of a volatile solid. Distillation—the vaporization and condensation of a liquid. Static electricity—that generated by friction. A galvanic cell is an arrangement of elements and fluid for the production of electricity by chemical action. An organic compound is a hydrocarbon or a substance which may be regarded as derived from a hydrocarbon.

Give the chemical name of each of the following: (a) common salt, (b) calomel, (c) sal-ammoniac, (d) plaster of Paris, (e) a principal ingredient of baking powder.

(a) Sodium chloride, (b) mercurous chloride, (c) ammonium chloride, (d) calcium sulphate, (e) sodium bicarbonate.

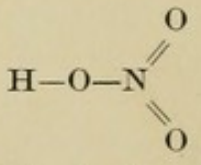
What is lunar caustic? State how lunar caustic is prepared.

Lunar caustic is moulded silver nitrate. To 100 Gm. of silver nitrate in a porcelain dish add 4 Gm. of hydrochloric acid, and melt the mixture at as low a temperature as possible. Stir well and pour the melted mass into suitable moulds.

Write the formulas and the names of five acids, giving the graphic formula of one of them.

Hydrochloric acid, HCl; hydrobromic acid, HBr; nitric acid, HNO_3; sulphuric acid, H_2SO_4; sulphurous acid, H_2SO_3.

The graphic formula for nitric acid is



How may ferric hydrate be hurriedly prepared? When and how should ferric hydrate be used as an antidote?

Ferric hydrate may be prepared by adding ammonia water to a solution of ferric sulphate. Wash the precipitate by decantation and filter through unbleached muslin.

Ferric hydrate is used as an antidote for arsenic. Give freely mixed with water or with milk.

Give the details of a test for arsenic.

The Reinsch test: Acidify with hydrochloric acid, introduce a strip of pure, clean copper foil and boil. If a gray coating form on the copper, remove from the liquid, dry carefully by pressing between folds of filter paper, place the copper at the bottom of an ignition tube, and heat. If the deposit upon the copper be arsenic it will volatilize and will deposit on the cool portion of the tube in octahedral crystals of arsenious oxide.

Mention the physical and the chemical properties of H_2S.

Hydrogen sulphide is a colorless transparent gas, slightly heavier than air, of disagreeable odor, soluble in water. It is an acid, burns with a blue flame, producing water and sulphur dioxide. Used chiefly as a reagent for the precipitation of certain of the heavy metals from their solutions.

Give the symbol, valence, occurrence in nature, physical properties and chemical properties of one of the following: bromine, silicon, copper, antimony, manganese.

Copper, symbol, Cu; valence II, occurs in nature in the free state and as the oxide and sulphide. It is a soft, ductile, red metal with a specific gravity of 8.9 atomic weight 63.1. It is a good conductor of heat and electricity. In dry air it undergoes no change, but in moist air it gradually becomes coated with a film of the basic carbonate. Heated in the air it oxidizes to CuO. It is soluble in hot mineral acids, and is acted upon by many of the vegetable acids.

Mention the halogens. Why are they so called? Give the formulas of three compounds each of which shall contain a different halogen.

The halogens are fluorine, chlorine, bromine and iodine. The name is derived from the Greek, meaning "salt pro-

ducer," and was given because of the saline character of many of the compounds of these elements.

NaCl, sodium chloride; KI, potassium iodide; KBr, potassium bromide.

State the sources of ammonium compounds. Give the composition, the method of preparation and the properties of sal-ammoniac.

Ammonium compounds are derived from the ammoniacal liquor from gas works.

Sal ammoniac is the chloride of ammonium, made by saturating the ammoniacal liquor with hydrochloric acid, evaporating the solution to dryness, and subliming the salt produced. It is a white crystalline substance, salty in taste, odorless, very soluble in water.

Give a test for (a) ferric compounds, (b) ferrous compounds. Write the chemical names and the formulas of three salts of iron used in medicine.

(a) Potassium ferrocyanide gives a dark blue precipitate (Prussian blue). (b) Potassium ferricyanide gives a dark blue precipitate (Turnbull's blue).

Ferric chloride, Fe_2Cl_6 or $FeCl_3$; ferrous carbonate, $FeCO_3$; ferrous sulphate, $FeSO_4$.

Give the history, occurrence, preparation, properties and medicinal uses of chlorine.

Discovered by Scheele in 1774, and was long thought to be a compound. The name was given to it on account of its color. Occurs in nature only in combination, chief compound, sodium chloride or common salt. Prepared by the action of hydrochloric acid on manganese dioxide. Properties: a yellowish-green suffocating gas, heavier than air, soluble in water. Chemically it is an element, symbol, Cl, atomic weight 35.18, a monad in combining power, and has strong affinity for other elements, especially for hydrogen. Chlorine is used as a disinfectant and deodorant; its aqueous solution

has been used locally in scarlet fever, diphtheria, gangrene of the mouth, etc.

Hydrargyri oxidum flavum may be prepared by pouring a solution of mercuric chloride into a solution of sodium hydrate; give the chemical equation.

$$HgCl_2+2NaOH=HgO+2NaCl+H_2O.$$

Mention the oxides of iron and give the formula of one of them.

Ferrous oxide, ferric oxide, and ferro-ferric or magnetic oxide. The formula for ferric oxide is Fe_2O_3.

Give the common name, formula, properties, preparation and uses of zinc sulphate.

White vitriol, $ZnSO_4$, made by dissolving zinc in sulphuric acid and then evaporating the solution. A white, crystalline, freely soluble salt with metallic taste. It is used as an emetic and for its effect upon the nervous system, in chorea, etc., in many cutaneous affections in ointment form, as a collyrium in aqueous solution, and also for injection in gonorrhoea.

Give the formula and method of manufacture of potassium nitrate.

KNO_3. Made by decomposition of sodium nitrate by means of potassium carbonate or chloride.

$$NaNO_3+KCl=NaCl+KNO_3.$$

Give the symbol, atomic weight and valence of five nonmetals.

Chlorine, Cl, 35.2 (35.18), valence I. Oxygen, O, 16 (15.88), valence II. Sulphur, S, 32 (31.83), valence II., IV., VI. Carbon, C, 12 (11.91), valence II., IV. Nitrogen, N, 14 (13.93), valence III., V.

Define amid, anilid, radical.

An amid may be regarded as a substance formed from ammonia by substituting one or more acid radicals for one or more hydrogen atoms.

An anilid is a derivative of anilin, formed by substituting acid radicals for hydrogen.

A radical is an atom or group of atoms forming the basis of a series of compounds, but incapable of existing in the free state.

How may lead enter the system and produce chronic lead poisoning? Give the diagnosis of lead poisoning and mention the chemical antidotes for it.

Lead may be introduced into the system by the drinking of water which has been standing in lead pipes; with food which has been in contact with the metal (tin-foil containing lead, lead glaze on pottery, etc.); by handling of lead compounds (manufacture of paints, painters, etc.); by use of hair dye containing lead, etc. In chronic lead poisoning we have anemia, colic, obstinate constipation, blue line on the gums, "wrist-drop," and palsy. The chemical antidotes are the sulphates of sodium and magnesium, dilute sulphuric acid, etc.

Mention the principal products obtained from petroleum and describe the properties of one of the products mentioned.

By fractional distillation we obtain from petroleum the petroleum ethers, gasoline, benzin, the napthas, kerosene, lubricating oils and paraffin.

Benzin or benzinum is a transparent colorless liquid of characteristic odor, lighter than water, insoluble in water, soluble in 6 parts alcohol, and freely soluble in ether, benzene and oils. Boils at 45° to 60° C., and is highly inflammable.

Describe starch. How may starch be recognized chemically? What substance is formed when diastase or dilute acids act on starch?

A fine white powder or in irregular, angular masses; inodorous and tasteless, insoluble in cold water or alcohol, forming a paste or whitish jelly when boiled with water. It

is recognized chemically by the blue color with iodine test solution.

By the action of diastase starch is converted into maltose and dextrin; by the action of dilute acids, into dextrose and dextrin.

Describe the preparation and uses of gun cotton (pyroxylin).

Pyroxylin is made by steeping cotton in a mixture of nitric and sulphuric acids, then removing and washing with cold water. It is used in making collodium.

How is collodion prepared?

Collodion (collodium, U. S. P.) is made by dissolving pyroxylin in ether and alcohol. Four grams of pyroxylin with 75 Cc. ether are allowed to stand 15 minutes and then 25 Cc. alcohol are added.

What is vinegar chemically? Describe the chemical changes in the manufacture of vinegar.

Vinegar is a dilute (about 4 per cent.) solution of acetic acid with traces of various vegetable extractives. It is produced by the oxidation of alcoholic liquors, wine, cider, etc., under the influence of the acetic acid ferment, mycoderma aceti.

$$C_2H_5OH+O_2=HC_2H_3O_2+H_2O.$$

What is the chemical treatment of alimentary corrosion, caused by mineral acids? Why should the stomach pump be used carefully, if at all, in such cases?

The acid should be neutralized by weak alkalies, preferably by magnesia, with the precaution that if carbonates are used they must be given slowly and in dilute solution to avoid a sudden evolution of gas. The stomach-pump must be used only with greatest caution on account of danger of mechanically injuring the corroded membranes.

Give the chemical treatment of phosphorus poisoning.

Copper sulphate is the chemical antidote. An attempt is

made, also, to oxidize the phosphorus, using for this purpose hydrogen dioxide, ozone, *old* oil of turpentine, etc.

Give the formula and properties of methane and describe its preparation.

Methane, CH_4, known also as marsh gas, is produced in nature by the decomposition of vegetable matter under water. It is a light, colorless, odorless, tasteless, inflammable gas. Burns with a bluish flame and forms an explosive mixture with air. It may be prepared by heating a mixture of sodium acetate, sodium hydroxide and lime. Representing the reaction as taking place between the two sodium compounds we have

$$NaC_2H_3O_2+NaOH=CH_4+Na_2CO_3.$$

What is an alkaloid? Mention an alkaloid of (a) belladonna, (b) cinchona, (c) hyoscyamus.

An alkaloid may be described as an organic, nitrogenous substance, basic in character, capable of combining directly with acids to form salts.

(a) Atropine, (b) quinine, (c) hyoscyamine.

Differentiate chemically cane-sugar and grape-sugar.

Cane sugar, $C_{12}H_{22}O_{11}$, does not reduce Fehling's solution; with Trommer's test a blue solution is obtained, but there is no reduction on boiling.

Grape sugar, $C_6H_{12}O_6$, readily reduces both Fehling's and Trommer's solutions.

Give the symptoms, diagnostic features and treatment of phosphorus poisoning.

Disagreeable taste, thirst, nausea, vomiting, purging, later a jaundiced condition and hemorrhages; sometimes neurotic symptoms, cramps, etc. A fatty degeneration of the organs is produced. Vomited matter may be luminous in the dark.

Treatment.—Copper sulphate as emetic and chemical antidote, magnesium sulphate, animal charcoal, dilute hydrogen dioxide, *old* oil of turpentine.

Define alcohol. Give the approximate percentage of alcohol in (a) light wines, (b) heavy wines, (c) beers, (d) whisky, (e) brandy.

An alcohol may be defined as a compound of a hydrocarbon radical with hydroxyl, e. g., ordinary alcohol, C_2H_5OH.

(a) 6 to 12 per cent., (b) 12 to 25 per cent., (c) average of 4 to 5 per cent., (d) 30 to 60 per cent., (e) 30 to 50 per cent., these percentages being all by volume.

In a thousand parts of human urine what will be the average composition as to (a) water, (b) urea, (c) uric acid, (d) organic matters, (e) chloride of sodium, (f) phosphoric acid, (g) potash and lime.

(a) In 1000 parts by weight of urine there will be about 980 parts water, (b) about 22 parts, (c) 0.4 part, (d) 25 parts, (e) 8 parts, (f) 2 parts (P_2O_5), (g) potash, 2 parts (K_2O), and lime, 0.2 part.

(The above is a most unusual form of stating urinary composition.)

How is chloroform (a) prepared, (b) purified, (c) tested for impurities?

(a) Chloroform may be prepared by the action of bleaching powder on alcohol, or on acetone, or by the action of an alkali on chloral. (b) It is purified by shaking with water and then with pure sulphuric acid; it is then agitated with lime and with dry calcium chloride, and finally redistilled. (c) It should yield no foreign odor on evaporation. Shaken with water, the latter should be neutral to litmus, and should not be affected by addition of silver nitrate or of potassium iodide. Shaken with one-tenth part strong sulphuric acid, the chloroform should remain colorless and the acid should not be more than faintly colored.

What is the range of the specific gravity of normal urine? State what diseased conditions produce (a) an ab-

normally high specific gravity of the urine, (b) a low specific gravity of the urine.

The specific gravity varies generally between 1010 and 1030, with an average of 1020.

(a) Diabetes mellitus, acute nephritis, fever, loss of water by other excretions. (b) Interstitial nephritis, uremia, chronic parenchymatous nephritis, absorption of exudates, etc.

How is carbolic acid prepared? Give the treatment of carbolic acid poisoning.

Carbolic acid or phenol is prepared from coal-tar by fractional distillation with subsequent purification, or it is prepared synthetically from benzene.

Treatment.—Use stomach tube cautiously, chemical antidotes are sodium sulphate, magnesium sulphate, dilute acetic acid (vinegar), and strong alcoholic drinks. Keep body warm and give stimulants.

Mention a secretion of the body that contains (a) cholesterin, (b) pepsin, (c) trypsin, (d) casein, (e) bilirubin.

(a) Bile, (b) gastric juice, (c) pancreatic juice, (d) milk (caseinogen), (e) bile.

What reaction takes place when chloral hydrate is mixed with an alkali? Illustrate.

Chloroform is produced.

Chloral, $CCl_3COH + NaOH$=chloroform, $CHCl_3$+sodium formate, NaCOOH.

Give the chemical reaction of (a) saliva, (b) gastric juice, (c) tears, (d) bile, (e) blood.

(a) Alkaline, (b) acid, (c) neutral, (d) alkaline, (e) alkaline.

Give the chemistry of acetic acid; mention the most important acetates and give a method of preparing one of them.

Acetic acid, $HC_2H_3O_2$, is prepared by the destructive dis-

tillation of wood and also by the oxidation of alcohol. It is a clear, colorless liquid with characteristic odor.

Important acetates are acetate of ammonium, iron and ammonium, lead, potassium, sodium and zinc. Potassium acetate is made by neutralizing acetic acid with potassium carbonate.

Give the formula of (a) common (ethyl) alcohol, (b) sulphuric ether, (c) acetic acid.

(a) C_2H_5OH. (b) $(C_2H_5)_2O$. (c) $HC_2H_3O_2$.

State the non-pathologic causes of abnormal deviations in the urinary specific gravity.

The specific gravity may be increased above the normal average by sleep, by exercise, by perspiration; it may be decreased by drinking of large quantities of liquids, by checking of perspiration, by chilling the surface of the body, etc.

What are (a) albuminoids, (b) proteids? Give examples of each.

(a) Albuminoids are substances of modified proteid nature characteristic of the supporting tissues of the body, e. g., ossein, chondrigen, elastin.

(b) The term proteid is variously used (1) to signify the entire class of carbon, nitrogen, hydrogen, oxygen and sulphur compounds which on decomposition yield ammonium compounds, amides, amido acids, etc., including the albumins and globulins, the derived substances, peptone, etc., the compound protein substances, mucin, hemoglobin, etc., and the albuminoids. (2) It is sometimes used to represent the albumins and the derived and compound albumins, excluding the albuminoids. (3) It is sometimes used to represent the compound albumins alone, mucin, hemoglobin, etc.

Mention four alkaloids of opium.

Morphine, narcotine, papaverine and codeine.

What is the source of uric acid in the economy? Give

the formula and properties of uric acid and mention its chemical tests.

Uric acid is derived in part from the nucleins of the body tissues and in part from similar bodies taken in food. It has the formula $C_5H_4N_4O_3$, and, when pure, is a colorless, crystalline, odorless, tasteless powder, very insoluble in cold water or in most acids, in alcohol or in ether. Soluble in sulphuric acid and in solutions of many of the alkaline salts.

The murexid test.—Moisten with nitric acid, evaporate to dryness, moisten the residue with ammonium hydroxide—a purple-red color is obtained. The silver carbonate test.—Render the urine alkaline with sodium carbonate, moisten a filter paper with the liquid and touch the moist paper with a glass rod carrying a drop of silver nitrate. A gray stain indicates presence of uric acid.

How do human milk and cow's milk differ? What chemical changes take place in milk when it is exposed to atmospheric influences.

Human milk contains rather less total solids, less proteids, more sugar, and less salts than cow's milk. The fat is about the same.

On exposure to air, bacteria are taken up by the milk, and under the influence of the bacterium lactis lactose is changed to lactic acid. This produces a separation of a precipitate of caseinogen (curd). As a result of further decomposition the lactic acid is changed to butyric acid, which may be recognized by its odor.

State the general composition of fats and give the chief constituents of (a) tallow, (b) butter, (c) olive oil.

Fats are compounds of the radical glyceryl (C_3H_5) with the higher acids of the first and second series of hydrocarbons; most abundantly we find the glycerides of palmitic, stearic and oleic acids.

(a) Tallow is characterized chiefly by stearin, the glyceride of stearic acid; (b) butter is characterized by a larger per-

centage of the glycerides of the more volatile acids, butyric, caproic, caprylic, etc.; (c) olive oil is a glyceride of oleic and palmitic acids with arachnidin and cholesterol.

Give the composition and properties of urea.

Urea, $CO(NH_2)_2$, is the chief nitrogenous excrement of mammals. It is a crystalline substance very soluble in water, less soluble in alcohol, insoluble in ether.

What is the usual composition of urinary calculi? Give the test for recognizing the principal ingredient.

Uric acid and urates, calcium, magnesium and ammonium phosphates, and calcium oxalate. Uric acid is frequently the nucleus about which a calculus builds itself, and may therefore be regarded as "the principal ingredient." The test for uric acid is the murexid test: Evaporate with a drop of nitric acid and moisten the residue with ammonium hydroxide. A purple-red color indicates uric acid (or urates).

What chemical reaction takes place when H_2O_2 is applied to sloughing wounds?

It acts as an oxidizing agent, giving off an atom of nascent oxygen which attacks dead tissue, pus, etc. The decomposition of the hydrogen dioxide is accompanied by effervescence.

What is hemoglobin? Name some of its properties and give a chemical test for it.

Hemoglobin is a compound of an iron-holding radical, hemochromogen (hematin), with an albuminous radical, globin. To it the blood owes its color. It combines readily with oxygen, forming oxyhemoglobin, by which oxygen is carried to the tissues. Various derivatives of hemoglobin may be produced by action of reducing agents, etc., and many of the body pigments are derived therefrom. Hemoglobin may be recognized by the guaiacum test: To the fluid add 3-4 drops of freshly prepared tincture of guaiacum resin; float an etherial solution of hydrogen dioxide on the surface of the mixture—in presence of hemoglobin a blue color will develop.

Or the "hemin" test may be used: To a drop of blood on a glass slide add a minute crystal of sodium chloride and two drops of glacial acetic acid and heat slowly to boiling. Cool and examine under the microscope for crystals of hematin hydrochloride.

When testing for albumin in urine, how do you determine between it and other coagulable proteids?

The only proteids coagulated by heat are albumin and globulin; of these albumin is soluble in pure water; globulin is not. Add the urine drop by drop to some clear water in a test-tube; if globulin be present a cloud will form as each drop sinks through the water. Globulin may be separated from albumin by saturation with magnesium sulphate; globulin is precipitated, albumin is not.

When testing for glycosuria with Fehling's solution how do you determine whether the reaction is that of sugar or some other reducing agent?

By applying the fermentation test with yeast, the glucose of diabetic urine ferments readily, while glycuronic acid and other reducing substances which may be present do not ferment.

State the conditions favorable to crystallization.

That the molecules shall be free to move, as they are when the substance is in fluid condition. The substance is melted and slowly cooled, or dissolved in a suitable solvent and then slowly evaporated.

What temperature Fahrenheit is equivalent to a temperature of 28 degrees centigrade? What temperature centigrade is equivalent to a temperature of 120 degrees Fahrenheit?

28 degrees C. $\times$ $^9/_5$ = 50.4 plus 32 equals 82.4 Fahr.

120 degrees Fahrenheit minus 32 equals 88 $\times$ $^5/_9$ equals 48.8 C.

Define atom, molecule.

The atom is the smallest particle into which matter can be divided.

A molecule is the smallest particle into which matter can be divided without altering its characteristic properties.

Give the names of two elements or radicals in each of the following groups:

Univalent.	Bivalent.	Trivalent.	Quadrivalent.
Hydrogen.	Oxygen.	Boron	Carbon.
Chlorine.	Sulphate SO_4.	Aurum.	Platinum.

Illustrate the comparative significance of the following affixes: ous, ic, ite, ate, id.

An oxy-acid of stable composition, or one of great importance to arts and industries, takes the termination ic, as H_2SO_4, sulphuric acid.

If an oxy-acid of the same elements contains less oxygen in its molecule it terminates in ous, as H_2SO_3, sulphurous acid.

The terminations ous and ic may be used also to distinguish between different combinations (not acid) of the same elements, the ous indicating the lower valence (real or apparent) of the positive element, e. g., ferrous sulphate, $FeSO_4$; ferric sulphate, $Fe_2(SO_4)_3$.

Salts formed by replacing the hydrogen of an ic acid by a metal or basic radical have their names terminating in ate, as $ZnSO_4$, zinc sulphate.

Salts formed by replacing the hydrogen of an ous acid have their names ending in ite, as Na_2SO_3, sodium sulphite.

Salts of hydracids have the termination id (or ide).

Compare ozone with oxygen as to (a) occurrence, (b) properties.

(a) Ozone is found in air only under exceptional circumstances, or in minute quantities.

Oxygen occurs in all atmospheric air in the proportion of about 23 per cent. by weight.

(b) Ozone is a very energetic oxidizing agent, acting like

nascent oxygen, and oxidizing substances that resist the action of ordinary oxygen, as silver.

Ozone will not support respiration, acting as an irritant to respiratory membranes.

Ozone supports combustion more vigorously than oxygen.

State the characteristics of the following mineral waters: Chalybeate waters, bitter waters, sulphur waters, effervescent waters, cathartic waters.

A chalybeate water is a mineral water containing dissolved salts of iron, usually basic carbonates. It has a slight tonic action, but may occasion intestinal and stomach disturbance from its irritant action.

Bitter waters may owe their bitter properties to Epsom or Glauber's salts, held in solution, when they exert a laxative action; or a natural water may be bitter from its contact with vegetable substances, acquiring thereby tonic and stomachic properties.

Sulphur waters are those containing dissolved alkaline sulphides, or poly-sulphides, or H_2S. Such waters exert an alterative and often slightly laxative effect, and have a certain value in treating diseases of the skin. The greater value of sulphur waters is found in their use for bathing, in chronic cutaneous affections, in gout, in rheumatism.

Effervescent waters are such as are strongly charged with CO_2 gas. Such waters are useful as sedative and slightly stimulating beverages, e. g., the use of plain soda water in allaying vomiting.

Cathartic waters are such as contain cathartic or laxative salts in solution, e. g., Epsom salts, magnesium sulphate, and Glauber's salts, sodium sulphate. Their effect is not only that of a cathartic, they may assist elimination from other channels, as kidneys, skin, etc.

What is the antidote for nitric acid poisoning?

Oxide of magnesium, commonly called calcined magnesia. Alkaline carbonates, soap, albumin, oils.

Describe the preparation of iodide of potassium. Give the reaction.

Saturate a strong solution of caustic potash in water with iodine. Evaporate to dryness—a mixture of iodide and iodate of potassium is formed, and when this is heated strongly the iodate of potassium parts with its oxygen. Dissolve the resultant mass in water, and from it will crystallize, on evaporation, cubes of potassium iodide.

$$6KHO + 3I_2 = 5KI + KIO_3 + 3H_2O;$$
$$\text{Then } 2KIO_3 + \text{heat} = 2KI + 3O_2.$$

Describe lithium as to (a) occurrence, (b) salts commonly used in medicine, (c) chemistry of its use in so-called rheumatic affections.

(a) Lithium occurs in the mineral silicates and phosphates, and as chloride and carbonate in mineral waters. (b) Salts used in medicine:

Bromide of lithium LiBr	Carbonate of lithium Li_2CO_3
Benzoate of lithium $LiC_7H_5O_2$	Citrate of lithium $Li_3C_6H_5O_7$
Salicylate of lithium $LiC_7H_5O_3$	

(c) It is stated that 25 parts of carbonate of lithium will dissolve one thousand parts uric acid at 100.4° Fahr.; it is administered, therefore, in gout to diminish deposits of uric acid, and to dissolve uric acid calculi.

Mention the important physical, physiologic and chemical properties of ptomains.

Ptomains are alkaloidal substances produced by the action of bacteria on decomposing animal and vegetable matter. They resemble the vegetable alkaloids in composition, and in their tests, are basic in character, and like alkaloids may be poisonous or non-poisonous.

In their poisonous action, after a period of incubation of from two to six hours, there is produced severe gastro-intestinal irritation with great prostration.

What are the chemical constituents of normal urine? Give a test for the recognition of albumin in urine.

Chlorides of calcium, magnesium, sodium, potassium. Phosphates of calcium, magnesium, sodium, potassium. Sulphates of sodium, potassium and organic sulphates, indican, etc. Coloring matters, including urobilin, urochrome, uroerythrin. Urea, uric acid (as urates), creatinine, hippuric acid.

Boil the urine; if it becomes hazy, or a coagulum forms, add a few drops of nitric acid, when, if the urine does not become perfectly transparent, albumin is present.

State the principle underlying the use of antitoxins for the prevention or cure of disease.

Antitoxins are found in the blood serum of animals that have recovered from an infectious disease, and when this serum is injected into other animals, or man, it confers, on its absorption, immunity from that disease.

How may water be decomposed? Illustrate.

By passing a current of galvanic electricity through water, when the hydrogen gas collects in bubbles at the negative electrode and the oxygen gas at the positive electrode; or by passing steam or vaporous water through an iron pipe heated to redness, when the hydrogen gas issues at the distal end of the pipe and oxygen is retained in chemical union with the iron, coating the pipe with Fe_3O_4.

Define and give examples of the three varieties of attraction.

Attraction of gravitation is the force operating between masses of matter, e. g., the attractive force exerted between sun and earth.

Heterogeneous attraction or adhesion refers to surface attraction of unlike substances; thus water adheres to wood.

Homogeneous attraction or cohesion is the force uniting like substances, and operates in the interior of the mass as

well as at the surface; thus cohesion aggregates the molecules of water into visible drops.

How many grams are there in a hectogram? How many scruples are contained in one pound?

One hundred grams equal one hectogram.

Two hundred and eighty-eight (288) scruples one pound troy.

What is the test for the presence of silver, of mercury?

In solution: Silver with hydrochloric acid or with soluble chlorides yields a white precipitate, soluble in ammonium hydroxide, insoluble in nitric acid.

Mercury as mercurosum, in solution, gives a white precipitate with the same reagents, of mercurous chloride, not dissolving, but turned black on addition of ammonium hydroxide.

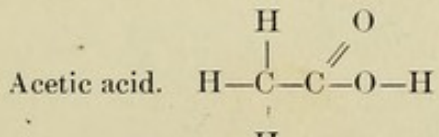
Mercury as mercuricum, gives no precipitate with hydrochloric acid, but gives a white precipitate with ammonium hydroxide and a scarlet precipitate with potassium iodide.

How much water vapor will be formed by the union of 500 cubic centimeters of hydrogen and 250 cubic centimeters of oxygen?

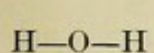
Five hundred cubic centimeters, at standard temperature and pressure.

What is a graphic formula? Give five illustrations.

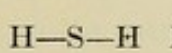
A graphic formula is one showing something of the manner in which the atoms are joined or arranged within the molecule.



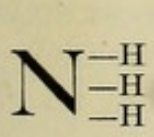
Acetic acid.



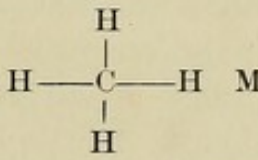
Water.



Hydrogen sulphide.



Ammonia.



Marsh gas.

Give the atomic weight, atomic volume, molecular weight, molecular volume, and density of oxygen.

Atomic weight, 16 (15.88); atomic volume, 1; molecular weight, 32; molecular volume, 2; specific gravity compared with air, 1.1056; specific gravity, or density, compared with hydrogen, 15.88.

Describe the preparation of sulphur and name the oxides of sulphur.

Prepared generally from the native crude sulphur found in volcanic regions, by distilling from the non-volatile impurities.

The oxides are the dioxide, SO_2, the trioxide, SO_3, the sesquioxide, S_2O_3, and the peroxide, S_2O_7.

What is Marsh's test? Describe the appartus employed, and give the conduct of the experiment.

Test for detection of arsenic.

Through the stopper of a glass flask pass:

1. A safety funnel, the lower end reaching to bottom of flask.

2. An outlet tube of glass. To this is to be fitted (a) a tube bent at right angle, lower part dipping into a solution of $AgNO_3$. (b) A tube bent at right angle so placed that the far part of the tube, drawn out to a jet, shall point upwards.

Test: Place chemically pure zinc in flask, cover with dilute sulphuric acid, C. P., in such quantity as will come above lower end of safety funnel.

Hydrogen gas is evolved. Allow gas to pass from the outlet tube, to which attach tube (a), the lower end of which is immersed in nitrate of silver solution.

Heat the outlet tube at a point between flask and silver solution. At expiration of half hour should there be no brown or gray-black stain found on outlet tube where heated, or no precipitate (black) found in silver solution, and no yellow precipitate formed when to a little of silver solution is added

ammonium hydroxide, the zinc and acid used are free from arsenic.

Pour into safety funnel the solution suspected to contain arsenic, when, should arsenic be present, a black stain forms on outlet tube, a black precipitate appears in silver solution, and this solution yields yellow precipitate of arsenite of silver when to it we add ammonium hydroxide.

Now substitute tube (b) for tube (a); ignite the gas, a whitish flame appears; if much arsenic, a garlic odor or white halo surrounds flame.

Hold cold white surface, as piece of porcelain, in flame—a brown or black stain of metallic character readily dissolving in solution of chlorinated lime or chlorinated soda, indicates presence of arsenic.

What is olefiant gas? Name some of its properties.

Olefiant gas, or ethylene, C_2H_4, heavy carburetted hydrogen.

A colorless gas, feeble ethereal, slightly pungent odor, density 14 compared with hydrogen. Almost insoluble in water.

Can be liquefied, and is then used to produce low temperature on its evaporation. Is inflammable, burning in air with brilliant flame, forms an explosive mixture with air or oxygen. It is largely to the presence of this gas that illuminating gas yields light.

What is meant by the destructive distillation of wood, and what are some of the principal products of such a process?

Heating wood in a retort in absence of air and collecting and cooling resultant vapors.

Methyl alcohol, pyroligneous acid, acetic acid, creosote, carbolic acid, etc.

Name and differentiate the three classes of sugars.

Monosaccharids or glucoses, with the formula, $C_6H_{12}O_6$; disaccharids or sucroses, $C_{12}H_{22}O_{11}$; polysaccharids or amyloses, $(C_6H_{10}O_5)^n$. Chemically the glucoses are aldehydes

and ketones, the amyloses and sucroses are anhydrides of the glucoses.

What is acetous fermentation?

Brought about by presence of the mycoderma aceti, it causes the souring of alcoholic liquors. It practically consists in the oxidation of alcohol, producing acetic acid.

$$C_2H_5OH + O_2 = C_2H_4O_2 + H_2O.$$

How are chlorides chemically recognized in urinalysis?

By their yielding a white precipitate of chloride of silver on the addition of a solution of silver nitrate to the urine after acidifying with nitric acid.

Complete the following equation and write the name of each resulting compound under its formula:

$$C_2HCl_3O + NaOH =$$

$$C_2HCl_3O + NaHO = CHCl_3 + NaCHO_2$$

Chloral. Chloroform sodium formate.

$$Pb(NO_3)_2 + K_2CrO_4 =$$

$$Pb(NO_3)_2 + K_2CrO_4 = PbCrO_4 + 2KNO_3$$

Lead chromate potassium nitrate.

Describe two experiments showing the difference between chemical and mechanical action.

Mix 32 grains sulphur and 56 grains iron filings; a magnet will remove all of the iron, or carbon disulphide will dissolve all of the sulphur. This mixing of sulphur and iron is a mechanical act, in which iron and sulphur still preserve their properties. Apply heat to such a mixture; a temperature much higher than the degree of heat applied will develop, due to chemical union of sulphur and iron, and a magnet will no longer attract the iron, nor will carbon disulphide have solvent action. This is a chemical action resulting in formation of a new substance, iron sulphide, in which the properties of iron and sulphur no longer exist.

Dissolve sugar in water. No heat is evolved; each drop of water shows characteristic sweetness of sugar; has been no

chemical change, but a physical or mechanical one. Dissolve sugar in sulphuric acid, obtain black liquid containing no characteristic sweetness; sugar has entirely disappeared. This experiment is an illustration of chemical action.

If potassium be thrown on water, what is the name and formula of the resulting compound?

Potassium hydroxide, KOH.

What are the general methods by which crystals may be obtained?

Evaporation from solution, solidification after fusion, and by sublimation.

Discuss arsenic and mention its properties, uses and compounds.

Arsenic, symbol As, atomic weight 74.4, valence III., V., found in nature chiefly as sulphide, associated with the sulphides of zinc, iron, bismuth, etc. The metal is steel-gray, generally crystalline, with a metallic lustre. Used in pyrotechny, in making shot, and in pigments.

Forms a compound with hydrogen, AsH_3, a very poisonous gas. With oxygen it forms the trioxide, As_2O_3, and the pentoxide, As_2O_5, the first named being the most important compound, often receiving the name of arsenic. It occurs in a heavy white powder, or transparent vitreous, or opaque, porcelain-like masses slightly soluble in water.

Other compounds recognized by the pharmacopœia are the iodide, sodium arsenate, and potassium arsenite, the latter being a constituent of Fowler's solution.

The arsenical compounds are used as alterative tonics in phthisis, malarial cachexia, cancer pastes, skin diseases, in dentistry, etc.

What is an anesthetic?

A substance used to produce partial or complete unconsciousness, and thus allay pain of operative procedures and produce muscular relaxation.

How much water would be required to yield 100 grams of hydrogen?

Nine hundred grams of water would yield 100 grams hydrogen.

Compare the physical properties of chlorine, bromine, iodine and fluorine.

Chlorine, a heavy green gas; bromine, a heavy dark red volatile liquid; iodine, scale-like blue-black volatile solid; fluorine, a light yellow practically colorless gas.

All dissolve in water in varying degrees. Bromine yields orange-colored vapor; iodine, violet vapor.

Define evaporation, filtration.

Evaporation is the conversion of a volatile liquid into a vapor. This process takes place at all temperatures.

Filtration is the act of passing a liquid through a porous material, the solid suspended matters being retained.

Name the constituents of the atmosphere. Give the composition by weight and by volume.

	Weight.	Volume.
Oxygen	23	20.93
Nitrogen	77	79.07

Water vapor, .5 to 1.4. Carbon dioxide, .04.

Traces of ammonia and other nitrogen compounds.

Several rare gases, argon, etc., of which but little is known.

Name bodily conditions effecting an increase in the elimination of urine and also those producing a decrease.

In health urine is increased in amount where from any cause the perspiratory function or alvine discharges are lessened, as from chill of the surface, cold bathing, etc. The ingestion of much fluid, as drink or watery foods. In health urine is decreased by excessive perspiration, diarrhœa, etc.

In disease urine is increased in diabetes mellitus, in chronic inflammation of kidneys, etc. Often at crisis of a severe disease, in hysteria and in other nervous disorders. In disease

urine is decreased when by high fever, in acute inflammation of kidneys, and in severe infectious diseases.

Name three common kinds of spirituous liquors and describe their manufacture.

Spirituous liquors are divided into three classes, (a) distilled, including whisky, brandy, etc.; (b) fermented, including wines; and (c) malt liquors, including the beers.

The distilled spirits are made by distilling fermented liquors; brandy from wine, whisky from corn or rye or other grain, rum from molasses, etc. The wines are made by fermenting grape and other fruit juices. The beers are made by fermenting an infusion of malted barley and hops.

Give the chemistry of photography.

A plate is prepared with an emulsion of a silver salt in gelatine, and on exposure to light this silver salt undergoes reduction. After exposure the plate is treated with a "developer" by which the reduced silver salt is still further reduced, to the metal, and the remaining silver salt is then removed by washing in a solution of sodium hyposulphite. From this negative placed upon a paper prepared in much the same manner as the plate the prints are obtained.

Complete the following equations and write the name of each resulting compound under its formula:

$$Ca(OH)_2 + CO_2 = CaCO_3 + H_2O$$

Calcium carbonate water.

$$NaC_2H_3O_2 + NaOH = CH_4 + Na_2CO_3$$

Marsh gas sodium carbonate.

What is meant by atomic weight?

The atomic weight of an element is the relative weight of its atom as compared with the weight of an atom of hydrogen.

Explain the difference between a solid and a liquid.

In a solid cohesion binds the molecules so closely together that they have no freedom of movement; the substance preserves a fixed form.

A liquid has its molecules less tightly bound together, so that they may flow readily. Cohesion and repellent force are about equal. A liquid has no fixed form, save that of the containing vessel.

What is a gas?

The molecules making up a gas are self-repellent, each molecule striving to pass as far from its neighbors as possible. The repellent force of heat has overcome the force of cohesion.

What is water chemically considered?

Water is the monoxide of hydrogen. Its composition by weight, 18 pounds of water contains 2 pounds of hydrogen and 16 pounds of oxygen. By volume two quarts of water vapor contain two quarts of hydrogen and one quart of oxygen. Water may act as an electro-positive or basic body, as in its union with SO_3, to form H_2SO_4. Or it may act as an electro-negative or acidulous body, as in its union with K_2O, to form 2KHO.

How would you determine the specific gravity of a liquid?

Use a hydrometer: An instrument of glass, cylindrical in shape, weighted below, and terminating above in an upright stem, upon which are engraved lines indicating degrees.

Place this instrument in the liquid to be examined, and note to which mark or degree the instrument sinks. This degree denotes the specific gravity of the liquid compared with water.

What is organic chemistry?

The chemistry of the hydrocarbons and their derivatives.

What is the purpose of litmus paper in urinalysis?

For determining if the urine be acid, alkaline or neutral in reaction, also whether the acidity be marked or slight, and whether the alkalinity be of fixed or volatile character.

How is excess of uric acid shown in the urine?

By a ring of whitish color forming above the point of con-

tact in the urine when urine is floated on nitric acid in a test-tube; such ring disappears when gently heated.

What effect is produced in mixing air with a blast flame as practiced with an ordinary blow-pipe?

The air so dilutes the gas as to bring every particle of the gas in complete contact with the oxygen of the air, thus occasioning perfect and complete combustion of the gas. The air also directs the flame to a desired point.

What metallic element is constantly present in the coloring matter of the blood?

Iron.

Explain the process of combustion.

Combustion is chemical union taking place between two or more substances, accompanied by the evolution of heat and light.

Name the lightest of all known elements.

Hydrogen.

Give the symbols of antimony, silver, gold, iron and zinc.

Antimony, Sb; silver, Ag; gold, Au; iron, Fe; zinc, Zn.

How would you prepare hydrogen?

Place zinc in a flask provided with a safety funnel, the lower end of which reaches to the bottom of the flask. Through a second opening in the stopper of the flask pass an exit tube, the lower end of which just enters the flask. Then pour into the flask through the funnel dilute sulphuric acid. Hydrogen gas is formed, and escapes through the exit tube.

What acid contains chlorine as an important element?

Hydrochloric acid, HCl.

How does wine differ chemically from brandy?

Wine contains from 6 per cent. to 25 per cent. of alcohol;

brandy from 30 per cent. to 50 per cent. Wine is a product of fermentation of fruit juices; brandy results from distilling the fermented product of fruit juices. Wine contains a number of compound volatile ethers that are not present in brandy.

What is the substance (or substances) from which ordinary alcohol is derived?

Potato starch and grains.

What element constitutes four-fifths of the air?

Nitrogén.

Explain the principle of the Bunsen burner.

The Bunsen burner is supplied near its base with apertures for the ready admission of air and its mixture with the gas. Each particle of gas is thus supplied with sufficient air to obtain perfect combustion.

What is the essential element of all acids?

Hydrogen.

Name three elements in the potassium group.

Potassium, sodium, lithium.

Is sulphurous acid a solid, a liquid or a gas at ordinary temperature?

It is a liquid resulting when SO_2 is dissolved in water.

What is albumin?

It is a complex, colloidal, proteid body composed of H, C, O, N, and S, occurring in both vegetable and animal structures.

Name the principal sources of bromine.

Natural mineral waters containing magnesium bromide in solution, and sea water.

Give the name and formula of a compound of sulphur and hydrogen.

Hydrogen sulphide, H_2S.

What is the meaning of the sesqui in chemical nomenclature?

It means one and a half, and refers to the ratio between combining elements. Example: Fe_2O_3, sesqui-oxide of iron.

Where does potassium occur?

In rocks, soil, etc., in form of silicates, and in sea water, etc., in form of chlorides and sulphates.

Define and give an example of each of the following: (a) Binary compound, (b) acid, (c) hydrate, (d) salt.

(a) A compound containing two elements, as AgCl. (b) An acid is a salt of hydrogen; it has a sour taste, turns litmus red, has corrosive action, when concentrated, upon tissues, unites with and neutralizes bases, forming salts and water. Example, nitric acid, HNO_3. (c) A hydrate is a compound of a metal or basic radical with hydroxyl, OH. Example, potassium hydrate, KOH. (d) A salt is a substance formed by the replacement of all or part of the hydrogen of an acid by a metal or basic radical. Example, potassium sulphate, K_2SO_4.

What are the laws governing combination of elements?

1. All chemical compounds are definite in their composition; the ratio of the elements forming them is constant.

2. If one element unites with another in more than one proportion, such proportions will be multiples or submultiples of each other.

3. The proportion by weight in which any two elements will unite with a third element represents that proportion in which they would unite with each other if they could so combine.

What is a chemical reagent?

A substance having an active chemical effect upon other chemical substances. A substance which by its contact with another substance creates new compounds.

Mention a pentad element and explain the name.

Nitrogen.

A pentad element is one the atom of which requires five monad atoms to fully satisfy its capacity for chemical union.

Explain the terms (a) amorphous, (b) alkali, (c) water of crystallization, (d) nascent state.

(a) Amorphous means without form, non-crystalline. (b) Alkali, a body possessing the strongest of basic or electro-positive properties, usually referring to oxides and hydroxides of alkali-metals or metals of the alkaline earths. (c) Water of crystallization is water necessary to the crystal form. (d) Nascent state, or newly born, refers to matter in its atomic form, or before the individual atoms freed from a compound have united to form molecules.

What are the properties and uses of glucose?

A white or yellowish-white, sweetish substance, freely soluble in water, possessing not quite the sweetening power of cane-sugar. Glucose is found in fruits, in honey, and in small amount in the various fluids of the body. It is made from cornstarch by treatment with dilute acids. It has food value and is used as a substitute for cane-sugar.

What is the difference between nitric oxide (NO) and air?

Nitric oxide is a compound of nitrogen and oxygen, air is a mixture of the same elements.

Give equation for the production of ammonia from ammonium chloride and calcium hydroxide.

$$2NH_4Cl + Ca(OH)_2 = 2NH_3 + 2H_2O + CaCl_2.$$

How was salicylic acid originally derived? How is it now manufactured? What are its properties?

It was originally obtained from oil of gaultheria. It is now manufactured by passing CO_2 into a heated retort containing sodium carbolate, $C_6H_5ONa + CO_2 = C_6H_4(OH)CO.ONa$, and decomposing this sodium salt with HCl.

It occurs in fine white needle-shaped crystals, permanent in air, of sweetish taste, acid reaction, soluble in 450 parts of cold water, soluble in 2 parts alcohol; solution produces intense violet color with ferric salts.

Used as a food preservative, is antiseptic and antirheumatic.

Describe the method of preparing H by the action of Na on H_2O. Write the formula for the reaction and find how many grams of H 82 grams of Na would make by this process. (The atomic weight of H is 1, of O 16, of Na 23.)

Place a piece of clean-scraped sodium in a combustion spoon and cover it with a cage of gauze wire to hold it in place. Fill a cylindrical glass jar completely full of water and invert mouth down in the pneumatic trough.

Plunge combustion spoon containing Na quickly under water, below the mouth of the glass jar; the Na at once decomposes water, and bubbles of hydrogen gas rise in the jar.

$$Na + H_2O = NaOH + H$$
$$23 + 18 = 40 + 1$$
23 grams of Na = 1 gram H
$$23 : 1 :: 82 : X = 3.565 + \text{ of H.}$$

Give a brief description of three experiments illustrating the properties of oxygen.

Plunge a smouldering piece of charcoal in a jar of oxygen and the charcoal kindles, burning brilliantly.

Heat a watch spring at one end until red-hot, then plunge into jar of oxygen, and the steel spring burns with great brilliancy.

Place a piece of phosphorus in a test-tube, cover it with water, warm slightly, and then by means of a long glass tube direct a jet of oxygen upon the phosphorus; the latter will catch fire, burning beneath the surface of the water.

What is the source of phenacetin?

It is an anilid, made from anilin, a product of coal-tar.

Give the occurrence in nature of phosphorus; of chlorine.

Phosphorus occurs in nature as phosphate of calcium in the mineral apatite, and as phosphate of calcium and of magnesium in bones. Chlorine occurs in nature chemically combined with metals, as NaCl, AgCl, etc. As NaCl it is found in sea water, river water, and in most natural waters, in mineral deposits, as rock salt, and in the tissues and fluids of animals and plants.

What are the chemical names of (a) borax, (b) marble, (c) blue vitriol?

(a) Sodium tetra-borate, or sodium pyro-borate. (b) Calcium carbonate. (c) Copper sulphate.

Define positive element, negative element. Illustrate each.

A positive element is one which, on the decomposition of a compound by electrolysis, will go to the negative electrode.

A negative element is one which, on the decomposition of a compound by electrolysis will go to the positive electrode.

Iron, gold and hydrogen are positive elements. Oxygen, sulphur and chlorine are negative elements.

Mention the halogens and state in what respects they exhibit marked similarity.

Chlorine, bromine, iodine, fluorine.

All are monads, all electro-negative, all form hydrogen acids, all possess bleaching or disinfectant action, all combine with metals. Except fluorine, all form oxy-acids and oxy-salts.

Mention the properties of hydrogen.

Hydrogen, symbol H, atomic weight 1, valence I, is a colorless, odorless, tasteless gas. The lightest of the well-known elements. Practically insoluble in water, burns with a colorless flame, yielding more heat in its burning than any equal weight of any other substance. In its combustion in air it forms water. Mixtures of hydrogen with oxygen or air explode when ignited.

Hydrogen is not poisonous, but will not support combustion nor respiration. It is electro-positive. When liquefied it forms a steel-blue liquid that is opaque to the passage of light. It is used as a standard for many scientific determinations.

State (a) the normal specific gravity of urine, (b) the causes of abnormal deviations in the specific gravity of urine.

(a) From 1018 to 1025. (b) Specific gravity is lowered in polyuria, as of diabetes insipidus in chronic interstitial nephritis. In certain nervous disorders, as hysteria, chorea, etc.

Specific gravity is above 1025 in diabetes mellitus, in acute inflammation of kidney, in certain crises in the course of chronic nephritis accompanied by partial suppression of urine. In certain disorders of digestion. In febrile affections.

Mention the principal chemical constituents of bile.

Water, mucus and pigment, glycocholate of sodium, taurocholate of sodium, soaps, fat, lecithin, cholesterin.

State the properties of aluminum and mention its important salts.

A silvery-white metal, sp. gr. 2.67, hard, ductile, malleable, only superficially acted upon on exposure to air, soluble in hydrochloric acid and in alkalies. The official compounds are the hydroxide, sulphate and the double sulphate of potassium and aluminum.

Give the properties of two important compounds of zinc used medicinally.

Zinc sulphate, $ZnSO_4$, a white granular crystalline powder, used as an astringent, soluble in water and used in watery solution for local application. Internally, is used as an emetic, and in diarrhœa, etc. Zinc oxide, a yellowish-white powder, insoluble in water, odorless and tasteless, used in dyspepsia, night sweats, epilepsy, chorea, and, externally, in ointment form.

Give in detail two tests for ascertaining the presence of albumin in the urine.

A long test-tube is three-quarters filled with filtered urine, and the upper portion is heated to boiling. If a cloud or precipitate appears, add a few drops of nitric acid—phosphates will dissolve and any cloudiness remaining will be due to albumin.

Place a 10 per cent. solution of ferrocyanide of potassium in a test-tube and add to it half its volume of acetic acid; mix well. Then run down the side of the tube the suspected urine so that it floats upon the reagent without mixing. If albumen is present there will be impairment in transparency of the liquids, or even an evident precipitation if much albumin be present.

What are compound ethers? Give an example.

Compound ethers are salts of hydrocarbon radicals, e. g., amyl nitrite, $C_5H_{11}NO_2$.

What is glycerin?

Glycerin, $C_3H_5(OH)_3$, a triatomic alcohol obtained by decomposition of the fats, is a bland, heavy liquid of a characteristic sweetish taste, with a marked attraction for water and great solvent powers, particularly for oils, and for many drug substances.

State the preparation, appearance, formula and uses of acetic acid.

Acetic acid, $HC_2H_3O_2$, may be obtained by destructive distillation of wood, being separated and purified from the impure product, pyroligneous acid.

It is a colorless liquid of strong, characteristic pungent odor and a sour or corrosive taste and action. In concentrated form it crystallizes at about 60 degrees F. It is used for softening and removing callous tissues, as a disinfectant, and in preparations of its salts.

What chemical changes take place in the body after death?

The fats undergo gradual decomposition; oxidation of various tissues takes place, sulphuretted hydrogen is produced. Phosphorus leaves its chemical combinations in bone and other tissue to combine with hydrogen, forming PH_3. Nitrogen unites with hydrogen to form NH_3. In general the complex body substances, proteids, etc., split up into simpler compounds.

Define base, basic radical, isomerism.

A base is the oxide or hydroxide of a metal or basic radical. It is a substance which in solution will neutralize an acid to form salt and water.

A basic radical is an atom, or an unsaturated group of atoms, having an electro-positive condition and an action similar to that of a base.

Isomerism is that property, due to the atomic arrangement, by virtue of which chemical compounds may be composed of the same elements in the same percentage proportion by weight yet be different and distinct substances having different properties.

State the normal reaction of urine. How is the reaction noted? To what is it due?

Reaction acid. By use of litmus paper, which should turn red when moistened with urine. Acidity due chiefly to presence of acid phosphate of sodium.

Define qualitative analysis, quantitative analysis. Illustrate each.

Qualitative analysis seeks to know *what* substances are present in a compound or mixture. Quantitative analysis seeks to know *how much* of a substance is present. We test qualitatively to see if there is any albumin in a sample of urine; we test quantitatively to find out how much albumin is present.

Describe the chemical process for the preparation of alcohol. What percentage of alcohol is found in (a) beer, (b) wine, (c) whiskey, (d) brandy?

Starch is converted into dextrose, and this is then changed by the action of yeast into alcohol and carbon dioxide.

$$2C_6H_{10}O_5 + H_2O = C_6H_{12}O_6 + C_6H_{10}O_5$$

Starch — Dextrose — Dextrin

$$C_6H_{12}O_6 + \text{yeast} = 2C_2H_5OH + 2CO_2.$$

(a) About 5 per cent., (b) 6-25 per cent., (c) 30-60 per cent., (d) 30-50 per cent.

Describe two tests for glucose.

Glucose in solution, if boiled with an alkaline cupric hydrate solution, reduces the copper salt to the red sub-oxide of copper, forming a precipitate.

Glucose in solution placed in the polarizing saccharimeter bends the rays of light towards the right.

What are peptones and how are they produced?

Peptones are dialyzable, feebly acid, proteid products formed by the action of the digestive ferments upon albuminous bodies. They are very soluble in water, and are insoluble in alcohol and ether.

How do globulins differ from albumins?

Globulins are insoluble in water, albumins are soluble. Globulins are precipitated by saturated solutions of NaCl, albumins are not.

Complete the equation: $NaC_2H_3O_2 + NaOH =$.

$$NaC_2H_3O_2 + NaOH = CH_4 + Na_2CO_3.$$

Explain the nomenclature of binary compounds. Which element is to be placed first, and how is the termination of the second to be altered?

Binary compounds are those composed of two elements. The electro-positive or metallic element is named first, the name of the second element terminating in "ide." Examples: Ag_2S, silver sulphide; NaCl, sodium chloride.

Binary acids, HCl, HBr, etc., have the prefix, "hydro," and the suffix, "ic."

Define anhydride, latent heat, gravitation.

An anhydride is a substance minus water; the name is applied most frequently to acidulous oxides that are capable of combining chemically with water to form acids, as SO_3, sulphuric anhydride; N_2O_5, nitric anhydride.

Latent heat is heat not manifesting itself as temperature; it is the equivalent of the energy used up in overcoming molecular attraction.

Gravitation is the force of attraction between masses of matter.

Describe methods for determining atomic weights.

1. Determine the specific gravity of the element when in the gaseous state compared with hydrogen.

2. The product of the atomic weight multiplied by the specific heat being 6.4, divide 6.4 by the ascertained specific heat of the element.

3. Note the weight of an element required to take the place of a given weight of hydrogen in forming a replacement or substitution compound. Thus acetic acid is $HC_2H_3O_2$, and practical demonstration shows that one grain of hydrogen in acetic acid may be replaced by 108 grains of silver to form silver acetate, $AgC_2H_3O_2$; hence one equivalent of silver weighs 108 times that of hydrogen, or one atom of silver weighs 108 compared to the weight of one atom of hydrogen.

Explain the difference between metals and non-metals.

Metals are electro-positive and combine with oxygen to form basic oxides. Non-metals are electro-negative and combine with oxygen to form acid oxides.

Explain the process of manufacturing sulphuric acid on a large scale.

Sulphur or a sulphide is burned in a plentiful supply of air, and the resulting sulphur dioxide gas, SO_2, is carried

into a series of leaden-lined chambers along with vapor of nitric acid and steam. The sulphur dioxide becomes oxidized to sulphur trioxide (SO_3) through the action of the nitric acid vapor and combines chemically with the water (steam) to form sulphuric acid, H_2SO_4.

State the symbol, valence and atomic weight of phosphorus.

Symbol, P; valency, III. and V. Atomic weight, 31.0 (30.77).

What is glycogen? From what is it derived?

Glycogen $(C_6H_{10}O_5)_n$, a carbohydrate of the amylose series, resembles starch, forms opalescent solution in cold water; derived chiefly from the carbohydrates of the food, formed in liver and other body cells.

Give and explain (a) an empiric formula, (b) a rational formula.

(a) The simplest possible expression by formula of the composition of a compound, giving the kind of elements present and the proportionate number of atoms, thus CH_2O is an empiric formula for acetic acid.

(b) A rational formula shows the manner in which the different atoms or radicals combine in order to make one molecule of the body, thus $CH_3CO.OH$. in a rational formula for acetic acid.

What is the chemical antidote for poisoning from lead acetate? Explain the chemical action of this antidote.

A soluble sulphate, as magnesium sulphate (Epsom salts), which in contact with acetate of lead forms an insoluble sulphate of lead.

$$Pb(C_2H_3O_2)_2 + MgSO_4 = PbSO_4 + Mg(C_2H_3O_2)_2.$$

Complete the following equations and give the names of the resulting compounds:

$$HgSO_4 + Hg + 2NaCl =$$
$$FeSO_4 + 2NaHCO_3 =$$

$$HgSO_4 + Hg + 2NaCl = \underset{\text{Calomel}}{Hg_2Cl_2 \text{ (or } 2HgCl)} + \underset{\text{Sodium sulphate}}{Na_2SO_4}$$

$$FeSO_4 + 2NaHCO_3 = \underset{\text{Ferrous carbonate}}{FeCO_3} + \underset{\text{water}}{H_2O} + \underset{\text{Sodium sulphate}}{Na_2SO_4} + \underset{\text{carbon dioxide}}{CO_2}$$

Define chemical action, physical action. Give examples of each.

Chemical action takes place in the interior of the molecule. It is accompanied by the development of heat. When chemical action occurs the identity of the bodies entering into chemical action is lost, and new substances are produced. Chemical action takes place between definite weights of the substances.

Physical action takes place outside of the molecule. It is not necessarily accompanied by the evolution of heat. The substances do not lose their identity. Any quantities of the substances may undergo physical action. Examples: Chemical action, add HCl to marble dust, forming a gas, carbon dioxide, water and chloride of calcium. Physical action, adding water to sugar we do not lose the characteristic properties of the water or of the sugar.

State the chemical changes produced within a galvanic cell while in action.

Cell composed of zinc and copper with dilute sulphuric acid. The acid dissolves zinc, forming a solution of zinc sulphate. The hydrogen of the acid is given off in bubbles, from the copper. Thus the strength of acid is constantly lessened through its decomposition and the formation of sulphate of zinc, until finally all acidity will have disappeared from the battery fluid.

Define distillation, sublimation, destructive distillation. Give examples of each process.

Distillation consists in the passing of a liquid into a vaporous condition when heated to its boiling point, and the subsequent condensation of this vapor again to the liquid form on cooling the vapor. Example: Distillation of water.

Sublimation is the passage of a solid into a vapor on being heated, and the condensation of that vapor again to the solid form on cooling without the substance having undergone decomposition. Example: Subliming iodine, thus obtaining it pure. Destructive distillation is a form of distillation in which the original substance in the retort is destroyed, and from the vapors arising new substances are collected. Example: By the destructive distillation of wood we obtain creosote, pyroligneous acid, etc.

What are the constituents of common illuminating gas? How is it prepared? Why is it poisonous?

Marsh gas, CH_4, olefiant gas, C_2H_4, acetylene gas, C_2H_2, carbon monoxide, carbon dioxide, hydrogen, and traces of nitrogen, and sulphur compounds. It is prepared by the destructive distillation of bituminous coal. Its poisonous effects are largely due to carbon monoxide present.

Illuminating gas is also made by the water gas process, passing air and steam over highly heated carbon, and subsequently enriching by mixing with naphtha vapors.

Describe the preparation and appearance of flowers of sulphur, roll sulphur, precipitated sulphur.

Flowers of sulphur, prepared by subliming sulphur and cooling the vapor. It is yellow in color, and examined by the microscope shows rounded globular masses.

Roll sulphur, of yellow color, in sticks about two feet in length and two inches in diameter. Obtained by pouring melted sulphur into wooden moulds.

Precipitated sulphur, a white or greenish-white powder, is prepared by boiling together sulphur and lime and then

decomposing the compound produced by the addition of hydrochloric acid.

Mention the substances used for disinfection after the prevalence of contagious disease and explain their action.

Sulphur burned, forming SO_2, which acts as a disinfectant through its dehydrating effect upon germ life.

Chlorinated lime in presence of acid and by action of the atmospheric carbon dioxide liberates chlorine gas, and this latter, combining chemically with hydrogen of moisture, sets oxygen free; the oxygen then acts destructively upon disease germs.

Formaldehyde, in solution or as gas, acts as a direct germicide, as do also phenol, mercuric chloride, etc.

What percentage of CO_2 exists normally in the atmosphere? What percentage CO_2 is dangerous to life?

Atmospheric air contains .04 per cent. by volume of CO_2. A greater percentage of CO_2 than 3.0 per cent. by volume would be dangerous to life if the CO_2 were accompanied by impurities from animal respiration. Ten per cent. of CO_2 in air will prove poisonous, although unaccompanied by respiratory impurities.

State the properties of nitric acid.

Nitric acid, HNO_3, specific gravity of strong acid, 1.4, colorless liquid, fuming in air, highly corrosive, stains upon tissues or fabrics, not discharged by the use of ammonium hydroxide. It turns litmus red, will dissolve most of the metals, parts readily with its oxygen, forming nitrous acid.

Define and describe sugars. How do glucoses differ from saccharoses? What kind of sugar is found in diabetic urine?

Sugars are organic compounds called carbohydrates; all consist of C, H, and O, with six, or a multiple of six, atoms of carbon and twice as many H atoms as O atoms. They occur in vegetable and animal structures. Glucoses are repre-

sented by the formula $C_6H_{12}O_6$; they reduce cupric hydrate to the red cuprous oxide. They crystallize with difficulty; they are less sweet than cane-sugar.

Saccharoses, formula $C_{12}H_{22}O_{11}$, include the true sugars, cane-sugar, lactose, maltose. They may be regarded as anhydrides of the glucoses. They readily crystallize, and possess maximum saccharin effect.

Glucose is found in diabetic urine.

Give the chemical name and properties of (a) calomel, (b) corrosive sublimate. Mention two easily applied tests that will distinguish one from the other.

(a) Calomel, mercurous chloride Hg_2Cl_2 or HgCl. Is a laxative, may by continued use cause constitutional poisoning; occurs as an impalpable, insoluble powder. When added to lime water a black mixture results.

(b) Corrosive sublimate, mercuric chloride, $HgCl_2$ is an alterative, anti-syphilitic, antiseptic and highly poisonous substance. It occurs in heavy white crystals, soluble in 13 parts of water, and in 3 parts of alcohol. When added to lime-water a yellow mixture results.

Give the chemical name of iodoform. How is iodoform made?

Iodoform is tri-iodomethane, CHI_3. It is made by the action of iodine and potassium hydroxide on ethyl alcohol.

State the atomic theory.

All matter is composed of minute particles called molecules, and each molecule is made up of indivisible parts called atoms; these latter in their union to form molecules unite in fixed quantities by weight and in obedience to fixed laws.

Give the properties and uses of bromine.

Bromine, Br, atomic weight 80.0 (79.36), valence I, is a heavy red-brown volatile liquid, specific gravity 2.99. It vaporizes at all temperatures, giving rise to reddish-brown fumes. It is slightly soluble in water, soluble in alcohol and

in ether, is caustic, and its vapor is irrespirable. It combines with many metals to form binary salts, called bromides, e. g. NaBr, KBr, AgBr. Used as a disinfectant, for cleaning foul wounds, and, in its salts, internally as medicine.

State the valence of the following radicals: (CN), (HO), (NO_2), (CO), (HC).

CN, monad; HO, monad; NO_2, monad; CO, dyad; HC, triad.

Give the names and formulas of three sodium salts.

Sodium bromide NaBr. Sodium chloride NaCl. Sodium iodide NaI.

How is ferric chloride made? Give the chemical equations.

Dissolve iron in aqua regia, or ferric oxide in hydrochloric acid.

$$Fe_2 + 6HCl + 2HNO_3 = Fe_2Cl_6 + N_2O_2 + 4H_2O.$$
$$Fe_2O_3 + 6HCl = Fe_2Cl_6 + 3H_2O.$$

Give in detail a test for arsenic in a mixture of food taken from the stomach.

To the stomach contents add an equal weight of a mixture of HCl (1 part) and water (3 parts). Digest on a water-bath and add small quantities of potassium chlorate until the organic matter is destroyed. Then filter, drive off the chlorine by passing CO_2 gas, and reduce the arsenic compound to the arsenous by passing SO_2 gas.

Heat to drive off any excess of sulphurous acid, then through the resulting liquid pass hydrogen sulphide gas for several hours. Collect this precipitate, and to it add ammonium hydrate. Test the dissolved portion or filtrate for arsenic by Marsh's test.

Define allotropism.

Allotropism refers to elements occurring in more than one form, as, for instance, carbon in charcoal, graphite and diamond.

Give the average amount and the composition of normal urine voided by an adult in 24 hours.

Amount 50 ounces

Solids	1000 grains		
Urea	500 "	chlorides (KNa)	170 grains
Uric acid	10 "	sulphates (KCa)	40 "
Hippuric acid	15 "	phosphates (KNa)	45 "
Creatinine	15 "	" (MgCa)	30 "

Pigment, mucus, xanthine, other extractives.

Mention five alkaloids. Give the derivation of each.

Strychnine from nux vomica; morphine from opium; quinine from cinchona bark; cocaine from erythroxylon coca; atropine from belladonna.

Complete the following equations:

$$CH_3I + HKS =$$
$$CS_2 + 2H_2O + 6Cu =$$
$$CH_3I + HKS = CH_3HS + KI$$
$$CS_2 + 2H_2O + 6Cu = 2H_2S + CO_4 + 6Cu.$$

State the properties of potassium. Mention ten potassium compounds of importance in medicine. Give formulae.

Potassium, K, at. wt. 39.0 (38.86), valence I, is a soft white metal, slight bluish tint, decomposes water at all temperatures. It is one of the strongest electro-positive elements, is of monad valency, is lighter than water, fuses below a red heat.

Compounds of importance in medicine are: Potassium iodide, KI; nitrate, KNO_3; carbonate, K_2CO_3; bromide, KBr; chlorate, $KClO_3$; chloride, KCl; sulphate, K_2SO_4; bi-carbonate, $KHCO_3$; cyanide, KCN; and antimonial tartrate, $KSbO\text{-}C_4H_4O_6$.

Give a method of determining the specific gravity of a solid substance insoluble in water.

Weigh substance in air, then immerse in water and weigh again; divide weight in air by loss in weight in water. Ex-

ample: Gold weighs 10 grains in air, in water weighs 9½ grains, loss equals half a grain, then 10, weight in air, divided by one-half, or the loss of weight when in water, equals 20, the specific gravity (approximate) of gold.

Give the chemical name, properties and uses of tartar emetic.

Tartar emetic is potassium antimonyl tartrate. Formula: $KSbOC_4H_4O_6$.

It occurs in crystals or as a white soluble powder, chars when heated. Used as an emetic and as a nauseating and sedative expectorant, is very poisonous.

In what part of the body is sulphur found?

Sulphur exists in practically all tissues and fluids of the body in the form of sulphates or in combination in the substances of albuminoid nature.

What kind of albumin in morbus Brightii? What property renders it readily detectable?

Serum albumen.

It is readily detected through its coagulability by heat or acid.

How is chlorinated lime made? What is the principal use of chlorinated lime?

By passing chlorine gas over slaked lime.

$$Ca(OH)_2 + Cl_2 = CaClOCl + H_2O.$$

Its chief uses are as a bleaching agent and a disinfectant. Chlorinated lime liberates chlorine when in contact with an acid or with the atmospheric carbon dioxide.

What is the difference between an alcohol and a phenol? Illustrate.

Phenols differ from alcohols in:

1st. Not forming aldehydes and acids on oxidation.

2d. In not dividing into water and hydrocarbons under the influence of dehydrating agents.

3d. In not reacting with acids to form ethers.

Phenols form more stable compounds than do alcohols with the metallic elements.

What are carbohydrates? Into what three groups are these compounds usually divided?

Carbohydrates are organic compounds, composed of C, H, O, in which the H and O exist in the relative proportions in which they are present in water and the carbon atoms in groups of six.

Polysaccharids or amyloses, monosaccharids or glucoses, disaccharids or sucroses.

Give the formula, uses and properties of hydrogen dioxide.

H_2O_2. Used as a disinfectant, bleaching and oxidizing agent.

It is usually sold in a watery solution containing from 10 to 12 volumes of true hydrogen dioxide or about 3 per cent. by weight. True hydrogen dioxide is a thick, syrup-like liquid obtained through the evaporation of its watery solutions over strong sulphuric acid in a vacuum. It readily parts with an atom of oxygen, particularly if brought in contact with organic matter, and it is this nascent oxygen that effects the bleaching, disinfectant action, etc.

Give the formula and properties of each of two oxides of carbon, explaining the effect of each on animal life.

Carbon monoxide, CO. A gas almost insoluble in water, no odor, burns with blue flame to form carbon dioxide, is lighter than air. It acts as a direct poisonous agent to animals, uniting with the hemoglobin of the blood, and thus destroying the oxygen-carrying power of the red corpuscles.

Carbon-dioxide, CO_2, is a colorless gas, heavier than air, no odor, soluble in water, a normal constituent of air. It is not a direct poison when inhaled, unless in quantities constituting over 10 per cent. of the inhaled air. It is, how-

ever, not capable of supporting life. It does not burn, nor does it support combustion.

Describe the preparation of nitrous oxide, writing the reaction. State the properties and use of nitrous oxide.

Nitrous oxide results when ammonium nitrate is heated in a retort at temperatures between 460° to 490° F.

$$NH_4NO_3 + \text{heat} = N_2O + 2H_2O.$$

It is a colorless gas, slightly sweetish taste, has no odor. It is soluble in water, heavier than air. It readily supports combustion, owing to its decomposition by the heat of the burning body. It does not burn. It is used for the production of general anesthesia of a short duration.

Describe phosphorus as to (a) derivation, (b) properties, (c) commercial uses, (d) medicinal uses, (e) medicinal preparations.

(a) From the mineral apatite or from bones, the latter containing tri-calcium phosphate.

(b) In its usual form is a yellow wax-like solid, occurring also in red, black and white allotropic forms.

Yellow phosphorus is spontaneously inflammable in air, especially if it be finally divided, has an odor of garlic, is highly poisonous, is insoluble in water, but dissolves in oils, in carbon disulphide, slightly soluble in hot alcohol, etc. It glows in the dark, it melts and will take fire below the boiling-point of water.

(c) Making matches, insecticides. Is used in certain metal alloys to give closer grain and prevent oxidation in the alloy, as in phosphor bronze.

(d) Used medicinally in doses of 1-100th of a grain in nerve disorders.

(e) Medicinal preparations—phosphorus, phosphoric acid dilute, the phosphates, hypophosphites and phosphides.

Give the names and formulas of the various gaseous compounds capable of producing general anesthesia.

Nitrous oxide, N_2O; chloroform, $CHCl_3$; ether, $(C_2H_5)_2O$.

A few other substances are used for the production of anesthesia, but they have not as general a use nor are they generally as satisfactory.

Describe a method of detecting the presence of lead salts in water.

Concentrate the water to small bulk, add a few drops of ammonium sulphide—a black or brownish-black precipitate or coloration insoluble in dilute hydrochloric acid indicates the presence of lead.

How may the presence and amount of urea be determined?

Make a fresh solution of hypobromite of sodium by dissolving 100 grams of caustic soda in 250 cubic centimeters of water, and when cold adding 25 grams of bromine.

Place this solution in the closed arm of a Doremus' ureometer. Now add one cubic centimeter of urine, so that it may mix with the hypobromite solution in the long arm of the apparatus. The urea is decomposed, its components are absorbed with the exception of nitrogen gas, which, passing to the upper portion of the tube, depresses the column of liquid downward. The space occupied by the nitrogen gas indicates the quantity of urea in the sample.

Mention a chemical antidote for sulphuric acid and explain the action of this antidote.

Magnesium oxide. It chemically combines with sulphuric acid to form sulphate of magnesium. This action is accompanied by the evolution of but little heat and no gas, and all corrosive properties of the acid entirely disappear in the neutralization which it undergoes.

What is fermentation and how is it produced? What are enzymes?

Fermentation is the decomposition of a non-nitrogenous body by a ferment. For its production we require a ferment, moisture, presence of air (generally), and a temperature not exceeding 100° to 110° F.

Enzymes are soluble or unorganized ferments acting like yeast and other organized ferments. They are of both vegetable and animal origin. Those of animal origin are found in digestive fluids, as pepsin in gastric juice, ptyalin in saliva.

Differentiate chemically sucrose, glucose, lactose and maltose.

Sucrose, $C_{12}H_{22}O_{11}$, does not reduce alkaline cupric solutions and does not ferment with yeast.

Glucose, $C_6H_{12}O_6$, reduces alkaline cupric solutions and ferments with yeast.

Lactose, $C_{12}H_{22}O_{11}.H_2O$, reduces alkaline cupric solutions and does not ferment with yeast.

Maltose, $C_{12}H_{22}O_{11}.H_2O$, does not reduce Barford's reagent (acetic acid solution of copper acetate), otherwise is similar to glucose.

Complete the following equations:

$FeCl_3 + 3NH_4OH =$

$MgCl_2 + NH_4Cl + Na_3PO_4 =$.

$FeCl_3 + 3NH_4OH = Fe(OH)_3 + 3NH_4Cl.$

$MgCl_2 + NH_4Cl + Na_3PO_4 = NH_4MgPO_4 + 3NaCl.$

Describe oxygen as to occurrence, preparation, physical properties, chemical properties, office in the body.

Oxygen, O, atomic weight 16 (15.88) valence II, occurs in free state, forming about one-fifth of the atmosphere. It is found chemically combined with $\frac{1}{8}$ of its weight of hydrogen in water and is present in many mineral and organic compounds. It is the most widely distributed of elementary substances.

Prepared by heating a mixture of potassium chlorate and manganese dioxide. Physically, oxygen is a colorless, tasteless, odorless gas, slightly heavier than air. It is soluble to the extent of 3 per cent. in water.

Chemically, oxygen supports combustion, does not burn, is strongly electro-negative, is of dyad valency, combines chemically with all elements excepting fluorine and argon.

It supports animal life; it is carried by the red blood corpuscles to every cell of the body, upon which it acts destructively to allow of regeneration of tissues.

It is used remedially where from any cause respiration is impaired or prevented.

What is chlorine? How is it prepared? How is chlorine administered medicinally through the mouth?

A yellowish-green gas with suffocating odor, about 2½ times the weight of air, soluble in water. Administered medicinally in aqueous solution known in pharmacy as liquor chlori compositus, containing about 0.4 per cent. chlorine.

Prepared by heating a mixture of manganese dioxide and hydrochloric acid, and collecting the gas evolved by displacement.

$$MnO_2 + 4HCl = MnCl_2 + 2H_2O + Cl_2.$$

Define alloy, amalgam. Give an example of each.

An alloy is a combination of two or more metals. Example: Brass, an alloy of zinc and copper. An amalgam is an alloy in which one of the metals is mercury. Example: Tin amalgam, composed of tin and mercury, used in making of mirrors.

How is hydrogen sulphide formed in nature? How is hydrogen sulphide prepared in the laboratory?

It results, in nature, from the decomposition of organic matter containing sulphur in the presence of moisture. Example: The rotting of an egg gives rise to hydrogen sulphide from the union of the sulphur in the albumen with the hydrogen of water. Also found in certain volcanic gases and in some mineral waters.

Hydrogen sulphide may be prepared in the laboratory by adding dilute sulphuric acid to ferrous sulphide, as

$$FeS + H_2SO_4 = FeSO_4 + H_2S.$$

Explain the significance of the following prefixes: Hydro, sub, hyper, nitro, bi.

Hydro as a prefix is used in the naming of hydracids, e. g. Hydrochloric acid, HCl.

Sub as a prefix is the equivalent of the suffix "ous," signifying a lower valence (real or apparent) of the positive element in a binary compound than is indicated by the suffix "ic." It is also used in indicating certain basic salts, *e. g.*, subnitrate of bismuth, $BiONO_3$.

Hyper as a prefix is used especially in indicating a greater relative amount of oxygen than is contained in another compound of the same elements.

Nitro indicates the presence in a compound of the radical NO_2, as $C_6H_5NO_2$, nitrobenzene.

Bi indicates two atoms of the element so designated in chemical combination with another element, as CS_2, bi-sulphide of carbon.

Mention the metals whose salts are often taken as poisons.

Silver, lead, mercury, arsenicum, antimony, copper, tin, zinc, barium.

What is common salt? State where and how common salt is obtained, and give the chemistry of its use for freezing purposes.

Sodium chloride, NaCl. Obtained by evaporation of sea water, and from salt deposits.

When salt is mixed with snow or ice it occasions a rapid melting—heat is rendered latent, such heat being extracted from neighboring bodies.

Explain the formation of a vesical calculus having a uric acid nucleus.

An aggregation of uric acid crystals, from their sharp angular character irritate the vesical mucous lining, so that they become surrounded with mucus, and then, from inflammation produced, we may have decomposition of urine, with accompanying deposition of alkaline urates, or phosphates, around the original mass.

Give two tests for morphine.

Touch the suspected alkaloid with nitric acid, and if it be morphine it dissolves, yielding an orange-red liquid that soon fades to yellow.

To morphine add neutral ferric chloride solution—a blue color is produced.

When are substances said to (a) isomeric, (b) metameric, (c) polymeric?

Substances are isomeric when they are made up of the same elements in the same percentage proportion.

Two or more bodies are metameric when composed of the same elements in the same percentage composition and when they have the same molecular weight.

Polymeric bodies are composed of the same elements in the same percentage composition but with different molecular weights.

Write a reaction for making barium sulphate from sodium sulphate. How many grams of sodium sulphate are required to yield 2.33 grams of barium sulphate by this process? (Atomic weight of barium equals 37.)

$Na_2SO_4 + BaCl_2 = BaSO_4 + 2NaCl$.

$142Na_2SO_4$ make 233 of $BaSO_4$.

If 233 grams of barium sulphate require 142 grams of sodium sulphate, then $233 : 142 :: 2.33 : X$, or 1.42.

Result, 1.42 grams of sodium sulphate required.

Describe and illustrate (a) monobasic acid, (b) dibasic acid, (c) tribasic acid.

(a) An acid containing one atom of hydrogen capable of being replaced by a metal or an electro-positive radical, as $HC_2H_3O_2$, acetic acid; $AgC_2H_3O_2$, argentic acetate.

(b) An acid which contains two replaceable hydrogen atoms in each molecule, as H_2SO_4, sulphuric acid; Na_2SO_4, sodium sulphate.

(c) An acid which contains three replaceable hydrogen

atoms in each molecule, as H_3PO_4, phosphoric acid; Na_3PO_4, normal sodium phosphate.

Write chemical equations showing two methods of obtaining hydrogen.

$$Zn + H_2SO_4 = ZnSO_4 + H_2.$$
$$Zn + 2KOH = K_2ZnO_2 + H_2.$$

What is the meaning of the words monad, tetrad and pentad? Give an example of each.

Monad refers to an element or compound radical whose power of combination is the same as that of hydrogen. Thus chlorine is a monad, one atom of H uniting with one atom of chlorine.

Tetrad is an element or compound radical exhibiting a combining power four times that possessed by hydrogen. Example: Carbon, as in marsh gas, CH_4.

A pentad has a combining power equal to five times that of hydrogen. Example: Phosphorus, in its compound phosphorus pentachloride, PCl_5.

Describe cyanogen and its principal compounds.

Cyanogen, symbol, Cy or CN.

This body is an organic compound radical composed of equal volumes of carbon and nitrogen vapors. It is a colorless, inflammable gas, soluble in water. It exists in a divided form in many vegetable structures, is electro-negative or acidulous, of monad valency, and resembles chlorine in chemical compounds which it forms.

Important compounds: Hydrocyanic acid, HCN. A very volatile liquid with characteristic odor used in dilute aqueous solution. Very poisonous. KCN, potassium cyanide, a white, deliquescent, poisonous solid. Potassium ferro-cyanide and potassium ferri-cyanide have considerable use in arts and manufactures and as chemical reagents. Nickel, silver and gold cyanides are all used for electro-plating purposes.

What are the source and principal properties of vaseline?

Vaseline is obtained by purifying the residue, after distilling the more volatile substances from petroleum.

It is a more or less fluorescent, unctuous solid, melting at from 104 to 125 degrees Fahr. It is almost odorless and tasteless.

Give the general characteristics of the aluminum group of elements.

Metals of aluminum group include aluminum, indium, gallium, and others still less common. They form compounds of the type MCl_3 or M_2O_3. Their oxides are weak bases; their sulphates, with the sulphates of alkali metals, form double salts called alums. which crystallize in the regular isometric system.

The oxides and hydroxides are insoluble in water, as are also the phosphates and carbonates.

Give a typical example of each of the following classes of mineral waters: (a) Saline cathartic, (b) alkaline, (c) sulphurous.

(a) Epsom spring water (England), containing magnesium sulphate.

(b) Vichy, containing sodium bicarbonate.

(c) Richfield spring, containing hydrogen sulphide.

Describe one of the processes by which HCl and N may be prepared.

HCl is prepared by heating sulphuric acid with common salt and passing the evolved gas into water.

N is prepared by passing air over incandescent copper, the metal uniting with the oxygen present.

Explain the difference between the Fahrenheit, centigrade and Reaumur thermometers.

The freezing-point of water in the Fahrenheit scale is placed at 32 degrees, while in the Centigrade and Reaumur scales

this point is made zero. The boiling-point in the Fahrenheit scale is 212 degrees, the Centigrade scale 100 degrees, Reaumur 80 degrees. Between the freezing and boiling points of water in the F. scale we have 180 degrees, in C. scale 100, in R. 80. Hence each degree F. would correspond to $^5/_9$ of a degree C. and $^4/_9$ of a degree R.

What is litmus? Explain its uses in urinalysis.

Litmus is a vegetable substance obtained from a species of lichen.

In urinalysis we use it generally in the form of litmus paper (paper impregnated with an aqueous solution of litmus) to determine the reaction of urine. Blue litmus is reddened by acids; red litmus is turned to a blue by alkalies, permanently if the alkalies be fixed, transiently (removable by warming) if the alkali be volatile.

Give the chemical differences between chloral and chloroform.

Chloral is formed from aldehyde by substituting three chlorine atoms for three hydrogen atoms; aldehyde, CH_3COH; chloral, CCl_3COH.

Known chemically as trichloraldehyde.

Chloroform is trichlormethane, or marsh gas, in which three hydrogen atoms have been replaced by chlorine atoms; marsh gas, CH_4; chloroform, $CHCl_3$.

Complete the following equations:

$$CaCl_2 + (NH_4)_2CO_3 =$$
$$CH_4N_2O + 2H_2O =$$

$$CaCl_2 + (NH_4)_2CO_3 = CaCO_3 + 2NH_4Cl.$$
$$CH_4N_2O + 2H_2O = (NH_4)_2CO_3.$$

Define malleability, endosmosis.

Malleability is that property by virtue of which certain metals may be hammered or rolled out into thin sheets. Endosmosis refers to the passage of a liquid of a certain density inward through a porous partition to mix with a liquid of different density.

Give the general characteristics of rain water, well water, river water, and lake water.

Rain water, a soft water, containing gases dissolved from the atmosphere but only a small amount of solids. Well water, character depends upon depth and location of well, upon surrounding conditions, nature of soil, etc. River water depends upon source and exposure to contamination—sewage, manufacturing waste, geological conditions. Lake water is similar to river water, depending upon conditions for its purity or contamination.

Give the method of preparation and the special characteristics of ozone.

It may be prepared by passing electric discharges through moist air or oxygen or by the slow oxidation of moist phosphorus.

Ozone is a bluish gas with irritating effect upon respiratory mucous surfaces; it is an active oxidizing agent.

Test: Paper saturated with a mixture of starch mucilage and potassium iodide solution will be turned blue by contact with ozone.

What is flourine and where is it obtained? State the preparation and the practical uses of hydrofluoric acid.

Fluorine, F., atomic weight 19 (18.9), valence I, a nearly colorless gas, the first one of the halogen series of elements, occurs in nature in combination with metals as fluorides, e. g. calcium fluoride or fluorspar, CaF_2.

Hydrofluoric acid is made by heating calcium fluoride and sulphuric acid in a leaden vessel and passing the evolved gas into water, in which it readily dissolves. Its chief use is as a solvent for glass, used for etching, etc.

What are the constituent parts of boroglycerid and what is its use in medicine?

Boric acid and glycerin. U. S. P. Glyceritum boroglycerini, 31 per cent. boric acid dissolved in glycerin. It is antiseptic and detergent.

What are the properties of lead? What is litharge? Give the toxicology of lead.

Lead, Pb, atomic weight 205 (205.33), valence II; a soft, heavy, bluish-white metal, tarnishes rapidly on exposure to air. Melts at 325° C.; sp. gr. 11.37; oxidizes when heated in air to form yellow oxide of lead or litharge. Soluble in nitric acid, in acetic acid, in very strong hot sulphuric acid.

Litharge is monoxide of lead, PbO.

Lead may occasion acute or chronic poisoning. In acute lead poisoning we have the action of an irritant—vomiting, abdominal cramps, constipation. Chronic lead poisoning, as it occurs in painters or in those constantly exposed to the fumes of lead and its components, is characterized by anemia, obstinate constipation, abdominal colic, paralysis of extensor muscles, producing "wrist-drop" and many obscure nervous symptoms, paralyses, anesthesias, etc. Antidotes: magnesium sulphate and sodium sulphate.

Give the preparation, formula and characteristics of bromide of ammonium.

Ammonium bromide, NH_4Br. Place one pound of bromine in a stone jar, add to it carefully four times its weight of water, then add half ounce at a time, very slowly, one quart of ammonia.

$$6Br + 8NH_3 = 6NH_4Br + N_2.$$

It is a white crystalline salt, saline taste, permanent in air, soluble in water; heated with caustic soda evolves odor of ammonia. Passing chlorine gas through its water solution bromine is disengaged.

Ammonium bromide acts upon the system as a depressant to the motor function of spinal cord. Its chief uses are to produce sleep and allay nervous irritability.

Give a description of the preparation and mention the properties of the principal alcoholic beverage obtained from the fermentation of malted grains.

The brewer "mashes" the ground malt with water, and

heats at about 180 degrees F. for several hours, when such starch has not been already changed by germination of the grain is now converted into dextrin and sugar.

The resulting liquid, "wort," is boiled with hops and the mixture is allowed to stand, yeast is added, and the liquid fermented. Glucose is changed to alcohol, with a further formation in the liquid of traces of lactic, succinic, carbonic and acetic acids, glycerin, etc.

The fermentative process is finally stopped by heating the liquid.

Ale, porter, stout and beer differ only in the selection and proportion of the malt, hops and flavoring material. They vary in alcoholic content from 1 to 10 per cent. with an average of 4 to 5 per cent., ales and stouts being generally richer in both extractives and alcohol than are the beers.

What is the normal amount of uric acid excreted in 24 hours by an adult, and what effect has diet on the quantity so excreted?

From 0.3 to 0.8 grammes in 24 hours. Increased by a diet rich in nitrogen, as of meats, peas, beans, eggs, etc., and by alcoholic beverages.

What is the fever thermometer? How is it made and graded?

A small glass thermometer of a minute capillary bore, with a constriction in the lumen immediately above the mercurial chamber. The mercury, in its expansion, passes up the tube, but on cooling and contracting cannot, by its own weight, fall down past the constricted portion.

The steps of manufacture are calibrating the tube, filling and curing the tube, and finally graduating the finished instrument. The scale is generally from 90 degrees Fahr. to 110 degrees Fahr., each degree being divided into five equal spaces.

What is the relative importance of the element carbon in organic chemistry?

All organic compounds contain carbon. It is the essential element whose presence classes the body as organic.

In testing urine by heat in a case of suspected albuminuria, what substances might be precipitated and so make the test deceptive?

Phosphates of calcium and magnesium.

Describe the chemical process (a) when iron rusts, (b) when wood burns, (c) when silver is tarnished by coal gas.

(a) The rusting of iron is an oxidation process, the final product being ferric hydroxide, $Fe_2(OH)_6$.

(b) Wood burns to form carbon dioxide and water.

(c) Silver, in presence of coal gas, becomes coated with black sulphide of silver, AgS, from the presence in the coal gas of sulphur compounds.

Describe the manufacture of illuminating gas.

Coal gas process: Bituminous coal is subjected to destructive distillation in retorts, the gaseous product being then successively cooled to remove the less volatile tar, washed with water to remove ammonia, and passed through lime to remove the sulphur compounds.

Water gas process: Air and steam, alternately, are passed over red-hot coke or anthracite coal.

$$C_2 + 2H_2O = 2CO + 2H_2.$$

The gas produced is given illuminating value by enriching with naphtha.

Mention the antidotes applicable in cases of poisoning from (a) caustic alkalies, (b) carbolic acid.

(a) Vinegar, lemon juice, oils, fats, mucilaginous drinks.

(b) Soluble sulphates, as sodium or magnesium sulphate, oils, fats, albumin, vinegar, and alcohol.

Where is oxygen found in the human body and what are its important uses in the animal economy?

It is present in all animal tissues and fluids. Oxygen is necessary for the oxidation and removal of existing tissues, with subsequent replacement by new structures. It is only through the ingestion of oxygen, in respiration, that animal life is maintained.

When sulphur is burned in the air, what is the product and what are its uses?

Sulphur dioxide or sulphurous anhydride, SO_2.

It bleaches organic colors, is a disinfectant, and stops or limits fermentation. In the arts it is used for the manufacture of sulphuric acid and other chemical bodies.

Write the formulas for (a) sodium sulphate, (b) potassium nitrate, (c) ammonium chloride.

(a) Na_2SO_4. (b) KNO_3. (c) NH_4Cl.

Describe the method of obtaining H and O by passing an electric current through H_2O, and tell how to determine which gas is O.

Seal two platinum wires in the opposite sides of a glass flask, solder two upright strips of platinum to these entering horizontal wires. Connect one of the entering wires with the positive pole of a galvanic battery of several cells and the other wire with the negative pole. Place in flask water rendered faintly acid with sulphuric acid, and invert two test-tubes, filled with this same acidified water, over the platinum terminals. Pass the current and gas will accumulate in both tubes, the oxygen with half the rapidity of the hydrogen. The gas may be further identified by plunging into it a fragment of glowing wood, which will be kindled to a brilliant flame by the oxygen.

What is effervescence and what is efflorescence?

Effervescence refers to the bubbling off of a gas, *e. g.*, the escape of carbon dioxide on treating a carbonate with an acid.

Efflorescence refers to the loss of water of crystallization which certain crystals undergo when exposed to air. They dry out, become powdery and lose their crystalline form.

What changes take place in alcoholic fermentation?

Glucose is converted into alcohol and carbon dioxide gas:

$$C_6H_{12}O_6 = 2C_2H_5OH + 2CO_2.$$

What is understood by specific gravity, and what precautions are advisable in the use of the urinometer?

(a) By specific gravity of a substance we mean the ratio, or relation by weight, the substance bears to the weight of an equal volume of some substance used as a standard.

(b) The temperature of the liquid to be examined should correspond with the temperature for which the instrument is graduated, otherwise a correction should be made. The instrument should be free of any adhering bubbles. The urinometer tube should be filled to the brim.

Give the chemical name and formula of (a) water, (b) common salt, (c) carbonic acid, (d) nitric acid.

(a) Hydrogen monoxide, H_2O. (b) Sodium chloride, NaCl. (c) Carbonic acid or hydrogen carbonate, H_2CO_3. (d) Nitric acid or hydrogen nitrate, HNO_3.

How does fire-damp explode in mines?

When marsh gas escapes from fissures in coal formations and mixes with air, it explodes with violence on contact with a naked flame or spark, the chemical results being carbon dioxide and water.

If the proportion of air rises to 18 times the volume of marsh gas no explosion occurs.

Demonstrate the fact that air is a mixture, and not a compound.

Pass air through water that has been boiled, and 3 per cent. of the oxygen of the air will be retained dissolved in the water, while less than 1 per cent. of nitrogen will be retained by the water.

What is the chemical antidote in case of poisoning by tartar emetic?

Tannic acid.

What is the formula of sulphuretted hydrogen? What are some of its properties and uses?

Sulphuretted hydrogen, H_2S, is a colorless gas, slightly heavier than air, of a disgusting, characteristic odor. Burns with a blue flame when ignited, forming sulphur dioxide and water.

It is used as a group reagent to precipitate metals of the so-called second analytical group.

Which metal is (a) the least tenacious, (b) the most infusible, (c) the best for electro-magnets, (d) the best for electro-conductors, (e) the most rare?

(a) Mercury; (b) osmium; (c) iron; (d) silver; (e) radium.

Describe the process for the preparation of nitric acid.

Prepared by the action of sulphuric acid on sodium nitrate in glass or cast-iron retorts.

$$NaNO_3 + H_2SO_4 = NaHSO_4 + HNO_3.$$

Give the flame test for barium and strontium.

Moisten a clean platinum wire with hydrochloric acid, and dip it into the powdered barium salt; hold the wire in the Bunsen flame, a green color will be obtained.

Strontium, under like conditions, will give a brilliant red color.

What is the per cent. of each constituent present in sulphuric acid, the atomic weight of sulphur being 32?

The molecular weight of H_2SO_4 is 98. In 98 parts, then, of H_2SO_4 there are, hydrogen 2 parts, sulphur 32 parts, oxygen 64 parts.

In 100 parts there will be, of hydrogen $(2 \div 98) \times 100 = 2.04$ per cent.; of sulphur $(32 \div 98) \times 100 = 32.65$ per cent.; of oxygen $(64 \div 98) \times 100 = 65.31$ per cent.

What are principal constituents of milk?

Water, fats, sugar (lactose), proteids including caseinogen and milk albumin, and mineral salts, chiefly phosphates and chlorides of calcium, magnesium, sodium and potassium.

To what impurity is the occasional toxic effect of bismuth salts due?

Arsenic.

Give the chemical reason why diabetics should abstain from starchy foods.

Because of the conversion of starch into glucose through the action of ptyalin in saliva, and amylopsin in pancreatic juice. Glucose thus formed cannot be broken up into other substances because of loss of power of liver cells to effect the change, so that this glucose passes directly into the blood, from which it is eliminated by the kidneys.

What chemical changes take place as a result of muscular activity?

Oxidation of tissue substance with increased formation and elimination of urea from decomposed nitrogenous structures. Increased rapidity of circulation brings formative material to quickly repair this loss or waste, so that tissues are rapidly destroyed, rapidly replaced, and the waste rapidly removed through exercise.

What is the difference between fermentation and putrefaction?

Fermentation is the decomposition of a complex substance by the action of a ferment.

Putrefaction is the decomposition of nitrogenous bodies by the action of bacteria.

Mention the antidotes applicable in a case of poisoning from iodine.

Starch, mucilaginous drinks, flour, milk, white of egg.

Describe chloral hydrate.

Chloral hydrate, $CCl_3COH.H_2O$.

A colorless, transparent, crystalline solid, pungent odor, acrid taste, very soluble in water. It liquefies if triturated with camphor, phenol, menthol, or thymol. Used as a hypnotic.

Give a chemical explanation of the souring and curdling of milk.

A ferment acts upon the sugar of milk changing it to lactic acid; this lactic acid then produces a sour taste and coagulates the casein.

Name each of the following: (a) H_2SO_2, (b) H_2SO_3, (c) H_2SO_4, (d) $H_2S_2O_3$.

(a) Hyposulphurous acid; (b) sulphurous acid; (c) sulphuric acid; (d) thio-sulphuric acid (from which the class of salts known as hyposulphites is obtained).

What are the chemical constituents of biliary calculi?

Cholesterin, pigments, biliary acids, mucus, epithelium, carbonate of calcium, fats.

Describe your mode of procedure in making a chemical examination of suspected urine.

Ascertain quantity passed in 24 hours and obtain an average specimen. Note color, appearance and odor. Test the reaction with litmus paper and take the specific gravity. Filter the urine and test for albumin by heat or nitric acid tests, and for sugar by Fehling's or Haines' tests. Determine the amount of urea by the hypobromite method. Test for chlorides with acidified silver nitrate, for sulphates with acidified barium chloride, and for phosphates with magnesia mixture. Test for indican by use of concentrated hydrochloric acid.

Describe the theory of the construction of the metric system.

The metre, unit of linear measure, is the one ten-millionth

of a quadrant of a great circle of the earth. The metre is 39.37 inches in length. It is divided into ten equal parts called decimetres.

Each decimetre is divided into ten equal parts called centimetres.

Each centimetre divided into ten parts called millimetres.

Ten metres measure one dekametre; ten dekametres equal one hectometre; ten hectometres equal one kilometre.

A cubic centimetre of distilled water, at four degrees Cent., weighs one gramme, the unit of weight equaling, in the English system, 15.432 troy grains.

The gramme is divided and subdivided, like the metre, into deci-, centi-, milligrammes, and we also have the multiples, deka-, hecto-, kilogrammes, referring respectively to 10, 100 and 1000 grammes.

A cubical vessel with a length of side of one decimetre holds one litre of liquid, the measure of capacity. A litre contains 1000 cubic centimetres, and is nearly equal to the English quart.

Wherein do wine, beer and whiskey differ?

Wine is a fermented fruit juice containing from 6 to 25 per cent. of alcohol, has present as well compound aromatic ethers and other volatile principles.

Beer is a malt liquor containing 4 to 5 per cent. alcohol, with bitters (hops), and extractives (malt).

Whiskey is a distilled liquor containing 30 to 60 per cent. alcohol, containing also aromatic substances.

The skeleton of a man weighs 24 pounds and contains 58 per cent. of calcium phosphate, $Ca_3(PO_4)_2$. Find the weight of phosphorus present. (Atomic weight of Ca, 40; of P, 31.)

There are present in the skeleton 13.92 lbs. of calcium phosphate (58 per cent. of 24 = 13.92).

Calcium phosphate, molecular weight 310, contains 62 of phosphorus.

$310 : 62 :: 13.92 : X = 2.784$ lbs. of phosphorus. Answer.

Distinguish between physics and chemistry.

Physics treats of the phenomena presented to us by bodies or masses of matter as such. Chemistry treats of the composition of matter and of the changes which this composition may undergo.

What is the unit of comparison in determining the specific gravity of liquids? Of gases?

For liquids, pure water at 4° C. and standard barometric pressure (760 millimetres).

For specific gravity of gases we use pure dry atmospheric air at 0° C. and 760 millimetres pressure or pure dry hydrogen at the same (standard) temperature and pressure.

Define qualitative analysis and give a principal method.

Qualitative analysis is that form of analysis which seeks to determine *the kind* of substances present in a compound or mixture.

A common method is to dissolve the substance to be analyzed and then by means of appropriate reagents to precipitate and filter off successively its constituent parts.

Define (a) element, (b) compound, (c) mixture, (d) solution, (e) precipitate.

(a) A substance all of whose atoms are of the same kind. (b) A substance containing at least two different kinds of atoms chemically combined. (c) A mechanical mixture of two or more substances, which substances may be in any proportion and may retain their characteristic properties. (d) A solution is a liquid in which a solid, or a gaseous substance, has been dissolved. (e) A substance made insoluble in the liquid in which it was dissolved, by chemical action.

Which of the elements are gases at ordinary temperature and pressure?

Hydrogen, oxygen, nitrogen, chlorine, fluorine, argon, and a number of elements recently discovered.

Where do Na, Hg, Cu occur in nature? Which occur free?

Copper occurs free in nature, and also in a number of mineral combinations, the sulphide, carbonate, oxide, etc. Mercury occurs free, although but in limited quantity. Sodium occurs principally in union with chlorine as NaCl found in sea water, mineral springs, in natural water, in nearly all plant and animal structures. Mercury is found in nature chiefly in the ore cinnabar, HgS.

Describe hydrochloric acid as to its occurrence.

We find hydrochloric acid present in certain animal fluids, as in gastric juice, and it is found in a few natural mineral waters.

How does each of the following affect litmus paper: (a) H_2O, (b) H_2SO_4, (c) $(NH)_4OH$?

(a) No effect. (b) Turns it red. (c) Turns it blue.

The quantity of urine being insufficient for the urinometer, how would you proceed?

Use a small piknometer, or specific gravity flask; weigh the flask filled with urine and then when filled with pure water. Divide the weight of the urine by the weight of water.

Or, dilute the urine with a measured quantity of water and determine the specific gravity of the dilute mixture by means of the urinometer. From this calculate the true specific gravity, *e. g.*, if 2 parts of water were added to 1 part of urine, and the specific gravity of this mixture were 1005, the true specific gravity of the urine would be 1015.

Distinguish between starch and sugar. By what histologic element is starch converted into sugar?

Starch is colloidal, its formula $C_6H_{10}O_5$. It is soluble in cold water, forms a mucilage in hot water. Turns iodine blue, rotates light to the right, has no sweet taste.

Sugar is crystalline, its formula $C_{12}H_{22}O_{11}$. It is soluble in cold or hot water, it rotates light to the left, it yields no

color with iodine, it possesses a characteristic sweet taste. Starch is converted into sugar (maltose, $C_{12}H_{22}O_{11}$, and glucose, $C_6H_{12}O_6$) by ptyalin and by amylopsin.

Complete the equation $CaCl_2 + Na_2CO_3 =$.

$$CaCl_2 + Na_2CO_3 = CaCO_3 + 2NaCl.$$

Mention the antidotes applicable in cases of poisoning from (a) oxalic acid, (b) copper sulphate.

(a) Magnesia and lime water.
(b) Albumin and ferrocyanide of potassium.

What is chemical decomposition?

Chemical decomposition refers to the breaking up of a compound into simpler substances.

Give an example of a synthetic operation.

The formation of cupric oxide by heating the metal copper in air or oxygen; or, mixing two parts hydrogen and one part oxygen by volume and heating, an explosion occurs and vapor of water is formed.

What are the products of the combustion of ordinary coal?

Principally carbon dioxide. There may also be produced carbon monoxide, sulphur dioxide, water, and other substances resulting from the burning of impurities in the coal.

In composition with what elements are the following most commonly found in nature: (a) Iron, (b) gold, (c) silver, (d) copper, (e) chlorine?

(a) Oxygen or sulphur. (b) Sulphur. (c) Sulphur, tellurium and chlorine. (d) Sulphur, oxygen. (e) Sodium.

Describe the production of oxygen by decomposition of potassium chlorate. Give the formula and equation.

Heat potassium chlorate with or without an addition of manganese dioxide and oxygen will be liberated.

$$2KClO_3 + \text{heat} = 2KCl + 3O_2.$$

Explain an experiment to prove that chemical action may be induced by electricity.

Mix equal volumes of hydrogen and chlorine gases in a tube through the sides of which pass two platinum wires connected with a battery or induction coil. An electric charge being sent through the wires the hydrogen and chlorine combine with explosive violence to form hydrochloric acid.

Name and describe some of the more important potassium salts.

Potassium carbonate, K_2CO_3. May be prepared from wood-ash and from the chloride, a white granular, deliquescent powder, very soluble in water, insoluble in alcohol.

Potassium chlorate, $KClO_3$. Colorless, pearly, plate-like crystals, soluble in 16 parts water, permanent in air, a strong oxidizing agent.

Potassium nitrate, KNO_3. Made by the reaction between sodium nitrate and potassium chloride. Prismatic crystals of cooling, saline taste, slightly hygroscopic in moist air. Soluble in 3.6 parts water, very sparingly soluble in alcohol. A strong oxidizing agent.

Potassium bromide, KBr. White cubical crystals of saline taste, soluble in 1.7 parts water and in 12.5 parts alcohol.

Potassium iodide, KI. Similar to the bromide, soluble in 0.7 part water and in about 12 parts alcohol.

Potassium acetate, $KC_2H_3O_2$. A white powder or in crystaline masses of a satin-like lustre, odorless and having a warming, saline taste. Very deliquescent, soluble in 0.4 part water, and in 2 parts alcohol.

What is the formula for (a) chloroform, (b) sulphuric ether, (c) alcohol?

(a) $CHCl_3$. (b) $(C_2H_5)_2O$. (c) C_2H_5OH.

How would you conduct an autopsy for the purpose of testing for arsenic in the stomach and tissues?

The analytical chemist should be present, if possible, at the

autopsy. Tie both pyloric and cardiac ends of the stomach and place with its contents, in a chemically clean glass jar. Close the jar with a close-fitting glass stopper; seal it, and imprint a design upon the seal in such manner that the design will be broken should the jar be opened. Proceed, in the same manner, to save a portion at least of the liver, the small intestine, portion of large intestine, the spleen, one kidney, the brain. Each of these organs to be kept separately.

Complete the following equations and write the name of each resulting compound under its formula:

$2NaCl + H_2SO_4 =$

$CaCO_3 + 2HCl =$.

$$2NaCl + H_2SO_4 = \underset{\text{Sodium sulphate}}{Na_2SO_4} + \underset{\text{Hydrochloric acid.}}{2HCl.}$$

$$CaCO_3 + 2HCl = \underset{\text{Calcium chloride}}{CaCl_2} + \underset{\text{Carbon dioxide}}{CO_2} + \underset{\text{water.}}{H_2O.}$$

How would you determine, chemically, whether a urinary deposit were composed of urates or phosphates?

Heat would dissolve a deposit of urates, but would not dissolve phosphates.

Nitric acid would dissolve a deposit of phosphates, but would not dissolve urates.

What is dialysis, and how would you construct a dialyzer?

Dialysis is the process of separating crystalloids from colloids when both are in the same solution.

It is performed in a dialyzer, which consists of a glass vessel, the bottom of which is formed of parchment or parchment paper, set in a larger vessel containing distilled water. The mixture is placed in the smaller vessel.

In a short time the crystalloidal substances will have passed through the membrane into the distilled water, where they may be detected, and from which they may be separated by evaporation. The colloidal material remains in the dialyzer, not being able to pass through the membrane.

What is the difference between the mercurous and mercuric chloride?

Mercurous chloride, Hg_2Cl_2 or 2HgCl. A white impalpable, insoluble powder, tasteless, odorless, turned black by ammonium hydroxide. Acts as a laxative. Has but slight poisonous action in single dose.

Mercuric chloride, $HgCl_2$. A white, crystalline, soluble substance, of a sweetish, burning, metallic taste, giving a white precipitate with ammonium hydroxide. Is very poisonous; used externally as an antiseptic, and in concentrated solutions as a disinfectant; internally as an anti-specific, alterative, tonic.

What impurities may be present in sulphuric acid, and how would you detect them?

Lead. Appearing when strong sulphuric acid is diluted with water, as a white precipitate or haziness of sulphate of lead.

Arsenic: Recognized by Marsh's test.

Selenic acid: Showing its presence by communicating to the acid the power of dissolving gold.

Nitric acid, or oxide of nitrogen: Detected by adding to the suspected acid a mixture of strong pure sulphuric acid and phenol, and evaporating in a porcelain dish to dryness, when on heating slightly, should nitrates or nitric acid be present, a pink coloration is observed.

Organic matter in sulphuric acid causes a brown or black coloration.

What is sulphuric ether, and what is its action upon man?

It is the oxide of ethyl, $(C_2H_5)_2O$, or ordinary ether. It is a colorless liquid, lighter than water, readily vaporizing at ordinary temperatures, its vapor being heavier than air and of a characteristic odor. Ether produces in man, or other animals inhaling its vapor, unconsciousness and muscular relaxation, and may occasion death, through a centric paralysis of respiration.

How would you detect the presence of bile in the urine?

Float urine in test-tube, over yellow nitric acid; at point of contact, should bile be present, there will appear a band of colors, green, blue, violet, and red.

Add cane-sugar to urine, and warm a drop or two of this mixture on a white porcelain surface; add a drop of strong sulphuric acid, when, should bile be present, there will appear a play of colors forming in concentric rings, the colors particularly prominent being yellow, red and green.

Give a reliable quantitative test for albumin.

To a measured quantity of urine, add acetic acid to assure its acidity, boil, cool and filter through a weighed filter paper, wash the coagulated material with water containing a few drops of acetic acid, with ether, with alcohol, and again with boiling acidified water. Then dry at 212° F., and again weigh; deduct from this weight, weight of filter paper, and from result calculate the amount of albumin. Clinically albumin is determined by means of Esbach's albuminometer.

What is mucin? How would you recognize it in urine?

Mucin is a compound proteid, occurring in cement substance of connective and epithelial tissues; in bile and in secretions of mucous surfaces.

Test: It is not precipitated from urine by boiling, but is precipitated on the addition to urine of either alcohol, dilute mineral acids, acetic, picric or citric acids. To detect it add acetic acid to form a layer below urine without heating, when at point of contact a poorly defined line of precipitate will appear.

Describe the usual method of determining chemically the presence of blood in the urine.

To urine add a few drops of tr. guaiacum and then ozonized ether; the ether separates and becomes of a fine sapphire-blue should blood be present.

Give a reliable quantitative test for sugar in the urine.

In each of two bottles of about six ounces capacity place four ounces of urine, adding to one of the bottles a small fragment of yeast. Stopper the bottles loosely and place in a warm place, allowing them to remain undisturbed for from 12 to 24 hours and then again take the specific gravity. The loss in specific gravity in urine to which the yeast was added, multiplied by 0.2196, gives the percentage of sugar present.

What is alcohol, and how is it formed?

Alcohol is a compound of a hydrocarbon radical with hydroxyl, e. g., common alcohol, C_2H_5OH, formed by the fermentation of sugar.

How is uric acid recognized chemically?

Uric acid is recognized chemically by the murexid test: Evaporate with a few drops of nitric acid and to the residue add a drop of ammonium hydroxide—a fine purple color is obtained.

Name the antidotes in a case of stramonium poisoning.

Tannic acid, strong infusion of coffee, morphine, physostigmine, pilocarpine.

What is the principal pigment in normal urine?

Urobilin or urochrome.

Give two chemical tests that you would use in water supposed to be contaminated by sewage.

(a) Add to the water a drop or two of dilute sulphuric acid and enough potassium permanganate to give a decided pink color, cover the vessel with a glass plate, and if the pink color disappears inside of 10 minutes the water is probably contaminated.

(b) Estimate the chlorides in the water, using a standard solution of silver nitrate with potassium chromate as an indicator. If the water contains an excessive quantity of chlorides the presence of sewage would be probable.

Give tests for the purity of chloroform.

For Chlorine: Drop the suspected chloroform through a watery solution of potassium iodide in a test-tube. Should the chloroform acquire a pink color, and the supernatant liquid become yellow or brownish in tint, the presence of free chlorine is indicated.

For HCl: Shake the chloroform with water, and after separating pour the water into a clean tube, and rendering it acid with a drop of nitric acid, add silver nitrate solution; should hydrochloric acid or chlorides be present a white precipitate will form.

For hydrocarbons: Evaporate suspected chloroform on clean porcelain surface, when no residue should be left, nor should there be any foreign odor.

For water: Add to the chloroform white anhydrous copper sulphate; should the copper sulphate become blue in color the presence of water would be indicated.

For acidity: By shaking the chloroform with water, pouring off the water and testing it with a drop or two of litmus solution, a red tint would indicate free acid.

Explain the process of bleaching with chlorine.

Chlorine bleaches organic colors only in the presence of moisture. Chlorine unites with the hydrogen of moisture, setting the oxygen free. In bleaching with chlorine we make use of a mixture of chlorinated lime and water. The fabric to be bleached is first "soured" by passing through a dilute acid solution. It is then placed in the bleaching mixture and afterward thoroughly washed with proper reagents to remove any excess of acid, chlorine or lime.

State the most common and convenient antidotes for poisoning by mineral acids. State also the course to be pursued when the poison to be antidoted is unknown.

Convenient antidotes for poisoning by mineral acids are: Calcined magnesia, and alkaline carbonates, as baking soda, chalk, and soap. Then use oils, fats, milk, flour, eggs.

If poison be of unknown character administer an emetic, as mustard and water, or use stomach pump or syphon tube. If reason to suspect poison to be of alkaloidal nature give tannic acid or permanganate of potassium. Milk with white of egg is a generally useful antidote for irritant poisons.

Use ammonia, whiskey or strong coffee as stimulants, and meet symptoms as they arise.

How would you make Fehling's solution?

Prepare in 2 parts. I. 34.639 grammes pure crystalized copper sulphate dissolved in water and diluted to 500 Cc. II. 173 grammes Rochelle salt and 60 grammes sodium hydroxide, dissolved in water and diluted to 500 Cc. For use mix equal volumes of I. and II. Ten Cc. of the mixed solution will be reduced by 0.05 gramme of glucose.

What element composes over half the matter of the earth?

Oxygen.

What is oxidation?

Chemical union with oxygen.

What is ozone?

An allotropic form of oxygen, each molecule consisting of three atoms of oxygen.

What is Paris green?

A double salt of copper metarsenite and copper acetate. $Cu(C_2H_3O_2)_2 . 3Cu(AsO_2)_2$.

What is the chemical name of Rochelle salts?

Potassium sodium tartrate, $KNaC_4H_4O_6$.

What is the chemical designation of the ordinary alcohol of commerce?

Ethyl alcohol.

From what substances is ether obtained?

Ether results from distilling together sulphuric acid and ethyl alcohol.

Name the various states in which matter may exist.

Solid, liquid, gaseous, and Crookes or radiant state.

What is the difference between atomic weight and specific gravity?

Atomic weight is the relative weight of one atom of a substance as compared with the weight of an atom of some other substance taken as a standard. Specific gravity is the relation weight of one volume of a substance as compared with the weight of an equal volume of some other substance taken as a standard.

Name and describe a deliquescent salt.

Potassium carbonate, $K_2C\Theta_3$, a white granular powder, odorless and having a strongly alkaline taste, very deliquescent and very soluble in water, insoluble in alcohol.

Complete the following equations:

(a) $2NH_4Cl + Ca(OH)_2 =$

(b) $2KNO_3 + H_2SO_4 =$.

(a) $2NH_4Cl + Ca(OH)_2 = CaCl_2 + 2NH_3 + 2H_2O$.

(b) $2KNO_3 + H_2SO_4 = K_2SO_4 + 2HNO_3$.

Explain the reaction which occurs when the solution of the two parts of a seidlitz powder are mixed.

Seidlitz powder consists of Rochelle salts, 120 grains; sodium bi-carbonate, 40 grains; these are wrapped in the blue paper.

In the white paper is placed 35 grains of tartaric acid.

$H_2C_4H_4O_6 + 2NaHCO_3 = Na_2C_4H_4O_6 + 2H_2O + 2CO_2$.

To what salts do most cathartic mineral waters owe their virtues?

To magnesium sulphate, or to sodium sulphate.

Explain the construction of the safety lamp used by miners, and state the principle involved.

The flame of the lamp is surrounded by a fine wire gauze, the mesh of which is very small. Each individual mesh con-

tains its film of air, and as air is a poor conductor of heat, the transmitted heat of the flame is decreased below the ignition point.

What is pepsin?

A proteolytic ferment or enzyme obtained from the glandular layer of the fresh stomach of the hog—the principal ferment of gastric juice. A yellowish or greyish-white powder, soluble in water and glycerin, but insoluble in alcohol.

Mention the antidote applicable in case of poisoning from silver nitrate.

Common salt, NaCl.

What is a chemical symbol?

An abbreviation for the name of an element.

What is the chemical composition of ordinary alum?

Alum is a double sulphate of aluminum and potassium. Its formula is $Al_2(SO_4)_3K_2SO_4 . 24H_2O$, or, (U. S. P.), $AlK(SO_4)_2 12H_2O$.

Write the formula of (a) common salt, (b) nitric acid, (c) sulphuric acid, (d) hydrochloric acid, (e). carbonic anhydride.

(a) NaCl; (b) HNO_3; (c) H_2SO_4; (d) HCl; (e) CO_2.

What is the simplest test of the presence of (a) an acid, (b) iodine?

(a) Turns litmus paper red; (b) turns starch mucilage bluish-black.

Complete the following reactions:

$CaCl_2 + Na_2CO_3 =$
$(C_2H_5)HO + C_2H_5HSO_4 =.$
$CaCl_2 + Na_2CO_3 = CaCO_3 + 2NaCl.$
$(C_2H_5)HO + C_2H_5HSO_4 = (C_2H_5)_2O + H_2SO_4.$

Mention a test for ozone. Explain how ozone may be

prepared in the laboratory, and compare its properties with those of oxygen.

Gives a dark blue color to paper that has been wet with iodide of potassium and starch mucilage. Ozone is prepared by subjecting air or oxygen to silent electric discharges, as in the "Siemens" induction tube, or by the slow oxidation of moist phosphorus.

Its properties are similar to those of oxygen, save that it acts more vigorously as an oxidizing agent and in concentrated form is irrespirable.

Name four elements that enter into the formation of organic bodies.

Carbon, hydrogen, oxygen, nitrogen.

What preparation of gun cotton is used in medicine, and what is its solvent?

Pyroxylin. Soluble in 25 parts of a mixture of 3 volumes of ether and 1 volume of alcohol.

How may uric acid be obtained from urine?

By adding to the urine strong hydrochloric acid, when after the mixture has stood from 12 to 24 hours uric acid will appear in minute crystals.

Mention the antidotes applicable in cases of poisoning from zinc chloride.

Albumin, white of egg in milk, magnesia in milk, tannin.

Mention the elements that, under ordinary circumstances, exist as (a) liquids, (b) gases.

(a) Bromine and mercury. (b) Oxygen, hydrogen, nitrogen, chlorine, fluorine, argon.

Give the preparation, formula, properties and uses of potassium cyanide.

Potassium cyanide, KCN. Prepared by saturating potassium hydroxide with hydrocyanic acid. A white amorphous deliquescent salt, easily fusible, and smelling of cyanogen.

Very soluble in water, highly poisonous, used in electroplating, in metallurgy, and medicinally, as a cardiac sedative, as a sedative addition to cough mixtures in gastralgia, reflex headaches, nervous vomiting, etc.

Define valence, radical. Illustrate.

By valence we refer to that property by virtue of which an element or radical will hold in combination a certain number of atoms of another kind. Thus oxygen has a valence of two, as shown in water, H_2O.

A radical is an atom or group of atoms incapable of existing in an uncombined state. E. g. (SO_4) a radical with valence of II. occurring in sulphuric acid, H_2SO_4, and in sulphates.

What is the formula of carbolic acid?

C_6H_5OH.

How may phosphorus be obtained? Describe the allotropic forms of phosphorus.

To bone-ash add sulphuric acid and water; after standing 24 hours decant the liquid, evaporate it to dryness and heat the residue strongly; to this result add sand and charcoal and distil, receiving the resultant phosphorus vapor under water, where it solidifies.

Ordinary phosphorus is a translucent wax-like solid, luminous in the dark, poisonous, insoluble in water, slightly soluble in alcohol, soluble in oils and in carbon disulphide. Red or amorphous phosphorus is a reddish brown amorphous powder, not luminous in the dark, not poisonous, insoluble in oils and in carbon disulphide. There is also a "metallic" form of phosphorus occurring in black, needle-like crystals.

Give the formula and chemical name of each of the following substances, indicating those soluble in water; Nitre, Epsom salts, lunar caustic, aqua fortis, Paris green, gypsum.

Nitre, potassium nitrate, KNO_3, soluble. Epsom salts, mag-

nesium sulphate, $MgSO_4$, soluble. Lunar caustic, silver nitrate, $AgNO_3$, soluble. Aqua fortis, nitric acid, HNO_3, soluble. Paris green, cupric acetometarsenite, $Cu(C_2H_3O_2)_2 : 3Cu(AsO_2)_2$, insoluble. Gypsum, calcium sulphate, $CaSO_4,-2H_2O$, insoluble.

What is the chemical designation of nitroglycerin? How is nitroglycerin manufactured?

Glyceryl trinitrate, $C_3H_5(NO_3)_3$. Nitroglycerin is made by cautiously adding glycerin to a mixture of strong nitric and sulphuric acids.

What are amins? Give an example.

They are substances which result when the hydrogen of ammonia is replaced by hydrocarbon radicals.

Example: When NH_3 has one hydrogen atom replaced by C_2H_5 it forms $NH_2C_2H_5$, ethyl amin.

Define porosity, capillary attraction.

Porosity refers to that essential property of matter by virtue of which spaces called pores exist between the molecules of all substances. Capillary attraction is the exhibition of the property of adhesion, between the molecules of a liquid and the material of a tube, rod or surface wetted by it, shown most characteristically in the rise of liquids in small (capillary) tubes.

How do chemical antidotes and physiologic antidotes differ in action? Illustrate.

A chemical antidote forms an insoluble or harmless substance by combining chemically with the poisonous substance; thus magnesium sulphate is antidotal to soluble salts of lead, as it combines chemically with lead to form the insoluble sulphate. A physiologic antidote acts, not directly upon the poisonous body, but by producing a physiologic action opposed to that which the poison occasions; thus we use atropine as the physiologic antidote to morphine.

Mention two elements of each of the following groups: Univalent, bivalent, trivalent, quadrivalent.

Univalent: Hydrogen and chlorine.
Bivalent: Oxygen and magnesium.
Trivalent: Arsenicum and boron.
Quadrivalent: Silicon and platinum.

What is the difference between analytic methods and synthetic methods in chemistry?

Analytical methods seek to break down compounds into simpler bodies.

Synthetic methods seek to build up compound bodies by the union of simpler ones.

What gases are usually generated during the process of destructive distillation?

If the destructive distillation be of soft coal, we find among the gases resulting hydrogen, marsh gas, olefiant gas, acetylene gas, ammonia, sulphuretted hydrogen, carbon monoxide and carbon dioxide.

Describe sulphur, and mention its important compounds.

Sulphur: symbol S, atomic weight, 32, (31.83), valence II., IV., found free, in volcanic regions, and in combination in form of sulphates and sulphides. It is a lemon-yellow solid element. No taste or odor. It is strongly electro-negative, is non-metallic, resembles oxygen in its chemical combinations. It is insoluble in water, slightly soluble in hot alcohol, freely soluble in carbon disulphide.

Important compounds are, sulphur dioxide, sulphurous acid, sulphuric acid, sulphur iodide, and hydrosulphuric acid. Combined with metals we have many important sulphates, sulphites, and sulphides.

What is boron? Give its principal compounds. What is the chemical importance of boron in medicine?

Boron: symbol, B, atomic weight, 11(10.9) valence III., is a rare, solid, non-metallic element, important because of its

principal compounds, boric acid H_3BO_3, and borax or sodium borate, $Na_2B_4O_7$, both of which are antiseptic, mildly astringent and detergent.

Describe the incandescent electric light, and explain its use as an aid to diagnosis in medical and surgical practice.

The incandescent electric light consists of a thin glass bulb exhausted of air and containing a filament of carbon or platinum wire coiled in semicircle or other design. On passing a current of electricity this filament, because of the resistance it offers, becomes incandescent, thus giving light.

The incandescent electric light has considerable value in medicine and surgery for illuminating passages which cannot be directly lighted; thus we use it in the examination of larynx; in the form of the cystoscope, in the bladder. It is used also to illuminate the interior of the stomach, thus facilitating the examination of this organ.

Give the composition and properties of chloroform.

Chloroform, $CHCl_3$, is a colorless, heavy, volatile liquid, with specific gravity about 1.5 and a characteristic sweetish odor. It is soluble in 200 parts water and freely soluble in alcohol, ether, and oils. Used for producing general anesthesia, and as a solvent.

Complete the following equation and give the resulting compounds:

$$2C_2H_3KO_2 + H_2SO_4 =$$

$$2C_2H_3KO_2 + H_2SO_4 = K_2SO_4 + 2HC_2H_3O_2.$$

Potassium sulphate. Acetic acid.

What organic acids are present in vegetables and fruits?

Citric acid, malic acid, tartaric acid, oxalic acid, gallic acid, tannic acid, etc.

Describe and illustrate the distinction between organic and inorganic compounds.

Inorganic compounds occur in the mineral kingdom, and

may contain any of the elementary forms of matter; the number of atoms in the molecule of inorganic compounds is usually small. Examples: Sodium chloride, magnesium sulphate.

Organic compounds all contain carbon, combined with one or more of the following—oxygen, hydrogen, nitrogen, sulphur and phosphorus—there are frequently many atoms present and the molecules are often complex. Examples: Starch, albumin.

Give the chemical composition of (a) Glauber's salt, (b) Epsom salt.

(a) Sodium sulphate, Na_2SO_4. (b) Magnesium sulphate, $MgSO_4$.

Into what two principal groups are elements divided? Mention five elements that exist uncombined in nature.

Into the electro-positive metals and the electro-negative non-metals. Oxygen, nitrogen, sulphur, gold, silver.

Mention the acid constituent of bile.

Taurocholic and glycocholic acids.

What is hemoglobin? On what does its color depend?

It is the organic coloring principle of red blood corpuscles, a compound of the iron-holding substance hematin and the proteid substance globin.

Its color depends upon its degree of oxidation, oxyhemoglobin in mass giving a scarlet, hemoglobin, a bluish red.

Differentiate nitrates and nitrites. Mention two compounds of each group commonly used in medicine.

Nitrates are salts of nitric acid and contain the radical NO_3. Nitrites are salts of nitrous acid and contain the radical NO_2. Examples: Potassium nitrate, KNO_3, lead nitrate $Pb(NO_2)$. Sodium nitrite, $NaNO_2$, amyl nitrite $C_5H_{11}NO_2$.

What reaction takes place when chloral hydrate is mixed with an alkali? Illustrate.

There results chloroform, a metallic formate and water.

$$CCl_3COH.H_2O + KOH = CHCl_3 + KCOOH + H_2O.$$

What salt of mercury is soluble in water? Give the name and formula of a salt of silver used in medicine.

Mercuric chloride, $HgCl_2$. Silver nitrate, $AgNO_3$.

Describe the test for detecting the presence of strychnine.

Dissolve a crystal of the alkaloid in a drop of strong sulphuric acid on a watch-glass, and drag through the solution by means of a glass rod a fragment of potassium dichromate, a play of colors will be produced—dark violet-blue, purple, cherry-red, and reddish yellow.

What is a hydrocarbon?

A hydrocarbon is an organic compound, the molecule of which consists of carbon and hydrogen atoms only.

What is the faradic current? How is it produced?

The faradic current is an induced current of electricity obtained by use of an induction coil. An induction coil is constructed as follows: A small coil of large diameter wire is surrounded by a coil of longer and much thinner wire. An interrupted current of electricity from a battery is sent through the inner (primary) coil—with each "make" and "break" of this primary current a secondary current is induced in the outer (secondary) coil. This secondary, induced, interrupted current is the Faradic current.

What is synthesis? Mention three coal-tar products extensively used in medicine that are prepared in the chemical laboratory by synthesis.

Synthesis is the act of constructing a compound body from its component parts. Synthetical compounds used in medicine obtained from coal tar include salicylic acid, phenacetine, saccharin.

Differentiate a mass of matter, a chemical compound and an elementary body.

An elementary body is a substance that cannot be reduced to any simpler form, that is, it contains but one kind of atom. A chemical compound is the result of the chemical union of two or more elementary bodies. A mass of matter is an aggregation of either elementary or compound molecules.

Explain the following terms: Chemical reaction, alkaline reaction.

Chemical reaction refers to the interchange of atoms or radicals which occurs during a chemical change. A substance is said to have an alkaline reaction when it changes red litmus to blue.

Describe some method for (a) analysis of water, (b) the synthesis of water.

(a) Pass water in the form of steam through an iron pipe heated to redness,—the oxygen will enter into chemical union with the iron, forming magnetic oxide of iron, Fe_3O_4, and hydrogen will issue from the distal end of the pipe.

(b) Pass dry hydrogen over copper oxide placed in a hard glass tube and heated to redness,—the hydrogen will enter into chemical combination with the oxygen, and vapor of water will issue from the distal end of the tube.

State the chemical properties of carbon. Describe two allotropic forms of carbon.

Carbon: symbol C, atomic weight, 12(11.91), valence. II., IV., an electro-negative solid element. It resists the action of most reagents but, at high temperatures, combines readily with oxygen to form two oxides, carbon monoxide and carbon dioxide. Combines with hydrogen to form many bodies known in organic chemistry as hydrocarbons. It forms binary combinations with most non-metals and with a few metals. It is non-poisonous.

An allotropic form of carbon is graphite; an opaque, grey-

ish-black substance crystallizing in hexagonal plates used as a lubricant, for making crucibles, lead pencils, etc. Diamond, another allotropic form of carbon, occurs in transparent octahedral crystals, of high refracting power, is the hardest substance known, and is insoluble in all liquids.

Mention the principal constituents of muscle.

Water about 75 per cent. and solids about 25 per cent. The characteristic solid is myosinogen belonging to the class of globulins. Other substances are creatine, creatinine, glycogen, glucose, lactic acid, sarcine, adenine, etc. The chief mineral constituent present is potassium phosphate.

How is the air of an apartment tested to determine the presence and amount of carbon dioxide in it?

A measured volume of air is drawn through two weighed tubes; the first, containing calcium chloride, absorbs the moisture, the second, containing potassium hydroxide, absorbs the carbon dioxide. By the increase in weight of the second tube the amount of carbon dioxide in the air may be determined.

Give names and formulas of the salts of iron commonly used in medicine.

Ferrous carbonate, $FeCO_3$; ferrous iodide, FeI_2; ferrous sulphate $FeSO_4$; ferrous lactate, $Fe(C_3H_5O_3)_2$. Ferric chloride, Fe_2Cl_6; ferric hydroxide, $Fe_2(OH)_6$; ferric sulphate, $Fe_2(SO_4)_3$; ferric alum, $Fe_2(SO_4)_3(NH_4)_2SO_4.24H_2O$; ferric nitrate, $Fe_2(NO_3)_6$; ferric phosphate, $Fe_2(PO_4)_2$; ferric pyrophosphate, $Fe_4(P_2O_7)_3$. There are, also, the so-called scale compounds, salts of iron, of iron and ammonium, of iron and potassium and of iron, quinine and strychnine, with citric and tartaric acids.

Mention two salts of mercury commonly used in medicine. Give their formulas.

Mercuric chloride $HgCl_2$.

Mercurous chloride Hg_2Cl_2, or 2HgCl.

What conditions favor putrefaction? What conditions may prevent putrefaction in dead organisms?

Presence of moisture, warmth, and bacteria. Putrefaction may be prevented by the exclusion of bacteria, by exclusion of moisture, by the preservation of low temperatures, and by the use of germicides.

Give source, character and uses of atropine. Describe the symptoms of poisoning by atropine.

Atropine is an alkaloid obtained from belladonna. A white, crystalline powder soluble in 450 parts of water and in 1.46 parts of alcohol. Solutions are alkaline in nature. Typical symptoms produced are dilatation of pupil of eye, dryness of throat, flushing of face, talkative delirium; later paralysis of centric origin. Pulse at first slow, hard; later soft and dicrotic, rapid.

Give the properties of common alum.

It is a white odorless crystalline substance of a sweetish, strongly astringent taste, a mechanical emetic. It is soluble in cold water, more soluble in hot water, insoluble in alcohol.

Heated, it loses its water of crystallization forming the so-called exsiccated alum.

What metallic chemical elements are found in the body in various combinations?

Iron, magnesium calcium, potassium and sodium.

Differentiate hydracids and oxyacids.

A hydracid is an acid containing no oxygen. An oxyacid is an acid containing oxygen.

Give the chemistry of lithium.

Lithium, symbol Li, atomic weight, 7 (6.98), valence I., occurs in nature as the chloride, carbonate, and phosphate. A soft silvery-white metal, sp. gr. 0.589, oxidizes on exposure to air, decomposes water, setting the hydrogen free. A member of the alkali group of metals.

What is the principal source of urea in the human economy?

Urea is the result of the oxidation of nitrogenous tissues; it is the end product of normal nitrogenous metabolism.

Give the formula of ammonium chloride. Describe the method of preparing ammonium chloride.

Ammonium chloride, NH_4Cl. It is prepared by saturating ammonium hydroxide with hydrochloric acid, and evaporating the solution.

Give the chemical name and properties of (a) cream of tartar, (b) plaster of Paris.

(a) Potassium-hydrogen tartrate or potassium bitartrate, $KHC_4H_4O_6$ occurs in colorless crystals or as a white powder permanent in air, soluble in 200 parts water; very sparingly soluble in alcohol, is crystallizable white salt, soluble in water.

Calcium sulphate, $CaSO_4$, a fine white, odorless and tasteless powder, nearly insoluble in water. Mixed with one-half its weight of water it forms a paste which hardens to a firm plaster.

Give the physical and chemical properties of hydrochloric acid. How is hydrochloric acid prepared?

Hydrochloric acid HCl, is a colorless gas, soluble in water. In this form, when pure, it occurs as a colorless liquid, fuming in air, with caustic and corrosive action upon organic tissues. Specific gravity is about 1.2.

It is a monobasic hydracid, and in union with bases forms salts called chlorides nearly all of which are soluble in water.

Hydrochloric acid may be prepared by heating sodium chloride with sulphuric acid.

Describe Fehling's test for sugar in urine.

Fehling's test: Dilute the Fehling's solution with three volumes of water, heat to boiling—the solution should remain clear—and then, to the hot solution, add the urine drop by drop. A yellowish red precipitate of cuprous hydroxide and oxide indicates the presence of glucose.

Complete the following reaction:

$PCl_3 + 3H_2O =$

$PCl_3 + 3H_2O = H_3PO_3 + 3HCl.$

How are the phosphates produced in the animal body?

The phosphates exist ready formed in plant foods, as in wheat. They are also found in the animal tissues that afford food for the human subject.

Give the symbol, atomic weight and the occurrence in nature of bismuth.

Symbol, Bi. Atomic weight, 207(206.9). Occurs native and as the sulphide, frequently associated with arsenic.

Give the formulas of the nitrogen acids. How is nitrogen prepared in the laboratory?

Hyponitrous acid, HNO. Nitrous acid, HNO_2. Nitric acid, HNO_3.

Nitrogen is prepared by burning phosphorus in a confined space until the oxygen is all removed, or, by heating ammonium nitrite. $NH_4NO_2 + \text{heat} = N_2 + 2H_2O$.

Give chemical name of (a) common table salt, (b) soot, (c) vinegar, (d) verdigris.

(a) Sodium chloride. (b) Carbon. (c) Dilute acetic acid. (d) Basic cupric acetate.

What reaction of urine favors the deposition of uric acid gravel or calculi? What is the reaction of the urine during the formation of a phosphatic calculus?

(a) A strongly acid reaction. (b) An alkaline reaction.

What is nitroglycerin? Give the medical properties of nitroglycerin.

Nitroglycerin is, chemically, glyceryl trinitrate $C_3H_5(NO_3)_3$. Made by the action of nitric acid on glycerin, in the presence of strong sulphuric acid—is glycerin in which three hydrogen atoms have been replaced by three NO_3 radicals.

It is used medicinally in a one per cent. alcoholic solution, as a vasodilator, to relieve heart tension by lowering the blood pressure.

What is (a) starch, (b) dextrin?

(a) Starch, $C_6H_{10}O_5$, is a white odorless, tasteless carbohydrate, insoluble in ether, alcohol, or cold water, forming a colloidal mucilaginous mass in hot water. Found in all plants, most abundantly in the root, soft parts, and seeds.

(b) Dextrin, $C_6H_{10}O_5$, isomeric with starch, may be produced from it by the action of dry heat, by the action of ferments, and by the action of dilute acids. An amorphous substance insoluble in ether or alcohol but soluble in cold water.

Describe and state the uses of the thermometer, the barometer and the hygrometer.

A thermometer is a capillary tube containing mercury hermetically sealed, with a bulb at the lower end and a graduated stem above. It is used to determine the degree of temperature by the expansion of the mercury in the tube.

A barometer is an instrument for measuring atmospheric pressure. Fill a long glass tube sealed at one end, with mercury and invert it in a cup of mercury. The mercury in the tube will fall until its weight is just balanced by the atmospheric pressure. Ordinarily the height of the mercury column will be about 30 inches. As the atmospheric pressure lessens, the mercury falls, as the atmospheric pressure becomes greater, the mercury rises.

A hygrometer is used to determine the degree of humidity of the atmosphere. The most usual form of instrument is that known as the "Dry and Wet Bulb"—two thermometers, side by side, the bulb of one exposed to the air, the bulb of the other kept constantly wet by threads of cotton dipping in a compartment containing water. The drier the air the greater the difference in temperature reading between the two instruments. Tables have been prepared by which the exact humidity of the atmosphere may be determined.

Explain the method of producing X or Roentgen rays.

The X or Roentgen rays are produced by passing a current of electricity of high potential through a glass tube that has been, as far as possible, exhausted of air.

(a) Express in cubic centimeters of distilled water the value of one ounce avoirdupois. (b) How many minims does a cubic centimeter contain?

(a) 28.3 Cc. (b) 16.2 minims.

What is hydrogen sulphide? Show by formulas and equation how it is obtained by the action of hydrochloric acid on calcium sulphide.

A compound of sulphur and hydrogen, H_2S, a colorless gas of offensive odor.

$$CaS + 2HCl = CaCl_2 + H_2S.$$

What salt forms the tartar deposited on the teeth? From what source is the tartar derived?

Chiefly calcium phosphate, with a little calcium carbonate, and salts of the alkalies. These salts are mixed with silica, organic matter and bacteria. The tartar is derived from food residues and from the saliva.

What are the properties of antimony? How is it found in nature?

Antimony: symbol, Sb, atomic weight 119 (119.3) valence, III., V., is a bluish-white, brittle, crystalline metal. Ignites at a red heat forming Sb_2O_3.

Used chiefly in alloys, it increases hardness, lowers fusion point, gives smoother surface, causes expansion of alloy when cooled after fusion, gives rigidity to soft metals. Antimony occurs in nature chiefly as the sulphide.

(a) What is an amorphous substance? (b) What are isomorphous substances?

(a) A substance, not crystalline having no regularity of internal structure. (b) Substances which crystallize in the same form.

Give uses of the urinometer. State its importance as an aid to diagnosis.

It is used to determine the specific gravity of the urine. Taken into consideration with the amount of urine passed, it indicates the amount of solid matter being excreted by the kidney. Certain diseases present a lessened excretion of solids, others an increased excretion; the determination of this factor, then, may be of importance in deciding upon the condition actually present. By it we learn of the condition of the kidney function and also of the body metabolism.

Describe potassium.

Potassium: symbol, K, atomic weight, 39(38.86), valence I., a soft silver-white metal, oxidizing in the air, and decomposing water in the cold with liberation of hydrogen gas and the formation of potassium hydroxide. It melts below the boiling point of water, is lighter than water, and is one of the most electro-positive of metals.

Write a chemical equation showing a double decomposition.

$$AgNO_3 + HCl = AgCl + HNO_3.$$

Give the physical and chemical properties of mercury. How is mercury obtained from the native ore?

Mercury: symbol, Hg; atomic weight, 198.5; valence, II; is a silver-white metal liquid at ordinary temperatures, 13½ times heavier than water; it is volatile at all temperatures, opaque, insoluble in water, soluble in nitric acid. Chemically, it is electro-positive, and capable of forming two distinct classes of compounds—the mercurous and the mercuric. It forms alloys (amalgams) with most metals. Mercury is obtained from cinnabar, HgS, by roasting the ore, thus burning out the sulphur and distilling over the mercury.

Define decay.

Decay refers, generally, to the slow oxidation, resulting in the decomposition of organic substances.

Describe distillation, filtration and precipitation as applied to processes for purifying drinking water.

There are two forms of distillation practiced, the continuous and the intermittent. In continuous distillation the water is fed constantly into the retort, and the distillate contains the gases and volatile products produced from the organic matter present. Such a water acquires a disagreeable odor and taste on standing, but is of course free from germ life. In intermittent distillation a given amount of water is introduced into the retort, the first part of the distillate is rejected, this containing the volatile organic products, then a middle portion is saved, and the final portion left in the retort is rejected. By this process we get a pure water which requires, however, to be aerated to be palatable.

Filtration on a large scale is through beds of sand and gravel. Suspended matter is removed and bacteria are largely destroyed. On a small scale filtration is generally through porcelain, suspended matter and bacteria are held back by the smallness of the interstices in the filtering medium. Such filters must be frequently and thoroughly cleansed.

Precipitation is effected by the addition to the water of one or more substances which shall produce a voluminous, more or less gelatinous, precipitate. In this will be carried down the suspended matter and the major part of the germ life. Iron salts, and alum, are among the chemicals generally used.

What is freezing? State the Fahrenheit freezing point of (a) water, (b) alcohol, (c) mercury.

Freezing is the change of a liquid to a solid upon the lowering of temperature.

(a) 32° F. (b) — 40° F. (c) 202.9° F.

Complete the following equation:

$C_2H_5OH + NaC_2H_3O_2 + H_2SO_4 =$

$C_2H_5OH + NaC_2H_3O_2 + H_2SO_4 = C_2H_5C_2H_3O_2 + NaHSO_4 + H_2O.$

Explain the difference between a sulphate and a sulphite.

A sulphate is a salt of sulphuric acid and contains the acidulous radical, SO_4.

A sulphite is a salt of sulphurous acid and contains the acidulous radical, SO_3.

Name the elements in the potassium group, and give their physical and chemical properties.

Lithium, sodium, potassium, and the rare metals, rubidium and caesium.

All are white metals, the softest being but little harder than wax. They melt below the boiling-point of water, oxidize in air, decompose water liberating hydrogen. All are strongly electro-positive, forming strong alkaline bases — oxides and hydroxides. Each communicates a distinctive color to flame when incandescent. All are monads, their carbonates all vaporize unchanged when heated. The carbonates and phosphates of all are freely soluble in water.

Describe the element silver, stating its compounds and their uses in medicine.

Silver: symbol, Ag, atomic weight 107 (107.12), valence I., a pure white metal, ductile and malleable, the best conductor of heat and electricity. Specific gravity 10.5.

Silver wire is used in surgery.

The compounds used in medicine are the oxide, nitrate, the cyanide and iodide. The nitrate is used in the solid state as a stimulant and caustic, and, internally, in solution, as an astringent and alterative especially in stomach and bowel disturbances.

Name five compounds of nitrogen and oxygen, and give their formulas.

Nitrous oxide or nitrogen monoxide, N_2O; nitric oxide or nitrogen dioxide, N_2O_2; nitrous anhydride or nitrogen trioxide, N_2O_3; nitric anhydride or nitrogen pentoxide, N_2O_5; nitric peroxide or nitrogen tetroxide, NO_2.

What is the presumption as to abnormal constituents in urine having a specific gravity of 1005 or less? What tests should be applied, and how, to verify the surmise?

It indicates a greatly decreased excretion of solids by the kidneys or an excessive polyuria; this may be due to lack of nervous control over excretory function of kidney, as in hysteria, chorea, etc., or it may be from large imbibition of fluids. It may be due to diseased conditions of kidney with destructive changes in structure. Such a low specific gravity always calls for a careful examination for albumin, which, if present and accompanied by urinary casts, would indicate a structural disease of the kidneys. Tests for albumin have been given.

What are the differences between common alcohol and absolute alcohol?

Absolute alcohol contains not more than 1 per cent. of water and this is in chemical combination with the alcohol. Sp. gr. not higher than 0.797 at 15.6° C.

Common alcohol contains about 7.7 per cent. of water, partially in mixture and partially in combination with the alcohol. Sp. gr. about 0.816 at 15.6° C.

Complete the following equations:

$C_2H_5Cl + AgHO =$

$CaCO_3 + 2HCl =$.

$C_2H_5Cl + AgHO = AgCl + C_2H_5OH$.

$CaCO_3 + 2HCl = CaCl_2 + H_2O + CO_2$.

What are the physical and chemical properties of SO_2?

It is a heavy colorless gas, dissolving in and chemically combining with water to form sulphurous acid. It has a suffocating, irrespirable odor, can be liquefied and solidified. It will not support combustion nor will it burn. It has a powerful affinity for moisture, forming, therewith, sulphurous acid. Sulphur dioxide is useful as a bleaching agent and as a disinfectant.

What is reduced iron (ferrum redactum) and how is it obtained?

It is a chemically pure form of iron occurring in fine powder. It is obtained by passing dry hydrogen gas over heated ferric oxide in a tube.

Describe ethyl oxide, giving derivation, ordinary name, chemical formula and mode of production.

Ethyl oxide, ordinary ether, $(C_2H_5)_2O$, is obtained by the replacement of two hydrogen atoms in a molecule of water by two ethyl radicals. It is manufactured by distilling a mixture of alcohol and sulphuric acid.

$$C_2H_5OH + H_2SO_4 = C_2H_5HSO_4 + H_2O;$$
$$C_2H_5HSO_4 + C_2H_5OH = (C_2H_5)_2O + H_2SO_4.$$

What is the presumption as to abnormal constituents in urine having a specific gravity of 1038?

Such urine will probably be found to contain glucose.

Give an equation showing the reaction when NH_3 comes in contact with an acid.

$$NH_3 + HCl = NH_4Cl.$$

Define emulsion, soap.

An emulsion is a liquid holding in suspension oil in so finely divided a condition, that the individual drops are invisible to the naked eye. There is generally required to be present a substance of mucilaginous nature.

A soap is a metallic salt of a fat acid. It is usually a potassium or sodium salt of oleic, stearic or palmitic acid.

Give the sources and explain the uses of benzene.

C_6H_6, benzene. It is found in the lighter oils produced in the distillation of coal tar.

It is used as a solvent for fats, oils, resins, and many other organic substances. Used in medicine as an anti-spasmodic and anticatarrhal remedy.

What is an alkaloid? Name three alkaloids used in medicine.

An organic nitrogenous substance, basic in character, capable of combining directly with acids to form salts. The volatile alkaloids contain carbon, hydrogen, and nitrogen; the non-volatile alkaloids contain carbon, hydrogen, nitrogen and oxygen. Examples: strychnine, quinine, and morphine.

State the chemical meaning of the term incompatible.

Chemically, substances are incompatible when on mixing their solutions there results an insoluble body, or a new substance having markedly different properties; or when two or more substances, in themselves harmless, form a poisonous, explosive, or inflammable substance when brought in contact; or if bringing them together impairs in any other way their individual characteristic properties.

State the use and the principle underlying the use of the blow-pipe.

The blow-pipe serves to provide, and to concentrate at a particular point, a jet of flame of extremely high temperature, this high temperature being attained by the perfect combustion resulting from the mixing of the air with gas before the latter burns.

Define electricity.

Electricity is that physical force generated by chemism, magnetism or friction, which manifests itself by producing attraction or repulsion between certain substances, and gives rise to heat, light, magnetism, and chemical action.

(a) In what compound is sodium most abundant? (b) In what calcium? (c) In what hydrogen?

(a) Sodium chloride. (b) Calcium carbonate. (c) Water.

What is glycerin and how is it obtained?

Glycerin, $C_3H_8O_3$, or $C_3H_5(OH)_3$. It is a tri-atomic alcohol derived from propane, C_3H_8. Made by decomposing

fat either by means of superheated steam, or by heating the fat with an alkali.

Explain the difference between a galvanic and a faradic current.

A galvanic current results from chemical action, and has but low potential with large quantity. Its direction of flow is always the same. A faradic current is an induced current obtained by use of an induction coil. Such a current possesses high potential, small quantity, and its direction of flow is to and fro, or alternating.

What products of phenol are of interest in medicine?

The phenates or carbolates, e. g. sodium phenate; the phenolsulphonates, and trinitrophenol or picric acid. Salicylic acid and its various products may be synthetically prepared from phenol.

Designate the following as chemical or physical changes: (a) The souring of milk. (b) Decomposition of sunlight by means of prisms. (c) Converting water into steam. (d) Dissolving salt in water. (e) Decay of wood.

(a) Chemical; (b) physical; (c) physical; (d) physical; (e) chemical.

Mention the chief properties of nitrogen.

Nitrogen: symbol N, atomic weight, 14, (13.93), valence III., V., is a colorless, odorless, tasteless gas, a little lighter than air, incombustible, a non-supporter of combustion, does not support life, is not poisonous.

What metal is liquid at ordinary temperature?

Mercury.

Mention a substance containing albumin, (a) as a liquid, (b) as a solid.

(a) Blood. (b) Albumin exists naturally only in solution, an example of a solid (coagulated) albumin would be the white of a hard-boiled egg.

What is the chemical cause of spontaneous combustion?

An active oxidation or other chemical change resulting in the development of sufficient heat to cause self-ignition.

Describe a test for the presence of organic matter in water.

Distill the water until free from ammonia, then add to the residue in the retort an alkaline solution of potassium permanganate, when if, on again distilling, ammonia appears in the distillate, the presence of organic matter would be indicated.

Give the names and formulas of five acids used in medicine.

Nitric acid, HNO_3; sulphurous acid, H_2SO_3; hydrochloric acid, HCl; phosphoric acid, H_3PO_4; acetic acid, $HC_2H_3O_2$.

Mention the elements existing uncombined in nature.

Hydrogen, oxygen, nitrogen, carbon, sulphur, gold, silver, platinum, copper, mercury, and a few other metals.

What is carbon dioxide? Give its formula, properties, uses, and mode of production.

Carbon dioxide, CO_2, a colorless gas, generally with a faint acid odor, soluble in water, a non-supporter of combustion and incombustible. It will not support life but is non-poisonous. Carbon dioxide is produced by respiration of animals, by the complete burning of carbonaceous matter, by heating many metallic carbonates, and by treating carbonates with acids. It is used in making "soda water" and other artificial effervescent drinks; liquified CO_2 is used for freezing purposes. It is essential to plant life.

When and why is a flame produced by combustion?

When the combustion is sufficiently rapid and active to raise the temperature to the ignition point.

Give the preparation of Fowler's solution, and describe the salts contained in it.

Boil one part arsenious oxide with two parts potassium bi-

carbonate in 94 parts water and add three parts compound tincture of lavender. The solution so made contains potassium metarsenite, an easily soluble compound of arsenic, not used in the solid state.

$$As_2O_3 + 2KHCO_3 = 2KAsO_2 + H_2O + 2CO_2.$$

What is chloroform and how is it made?

Chloroform, trichlormethane, $CHCl_3$. It is a heavy colorless liquid, specific gracity of 1.5, with a characteristic etherial odor and a sweet burning taste. Boils at 60-61° C. Prepared by the action of "bleaching powder" on alcohol, by the action of "bleaching powder" on acetone, and by the action of an alkali on chloral.

Describe and illustrate alcoholic fermentation.

Alcoholic fermentation is the decomposition of a sugar by a ferment, with the production of carbon dioxide and alcohol.

$$C_6H_{12}O_6 = 2CO_2 + 2C_2H_5OH.$$

What is ethyl hydrate? Give its formula and state how it is produced.

Ethyl hydrate, C_2H_5OH, is ordinary alcohol. It is produced by the fermentation of glucose.

Complete the following equations:

$$2NaCl + Ag_2SO_4 =$$
$$BaO_2 + CO_2 + H_2O =$$
$$2NaCl + Ag_2SO_4 = 2AgCl + Na_2SO_4$$
$$BaO_2 + CO_2 + H_2O = BaCO_3 + H_2O_2$$

Define matter.

Matter is that which has weight and occupies space.

Define and illustrate osmose.

Osmose is that property by which liquids and certain substances in solution pass through porous partitions. Thus, if copper sulphate in solution be placed in an unglazed earthenware vessel, and this be set in a larger vessel containing distilled water, the salt will pass through into the water (ex-

osmose), while the liquid in the inner vessel will increase in quantity (endosmose).

Give an illustration of decomposition by (a) heat, (b) electricity, (c) light.

(a) Mercuric oxide heated, yields oxygen and mercury.

(b) Pass a galvanic current through water and the latter will be decomposed, hydrogen and oxygen being set free.

(c) Expose silver chloride to the action of sunlight; it undergoes decomposition, producing a subchlorid of silver, and changing in color from white to grayish-violet.

What is a compound radical? Give three examples of compound radicals, indicating the valence of each.

A compound radical is a group of atoms capable of playing the part of an elementary substance and incapable of existing in the free state.

Examples: NO_3, valence I.; SO_4, valence II.; PO_4, valence III.

Describe the medicinal uses of oxygen, stating how it is brought to the bedside and how it is applied.

Oxygen gas subjected to pressure is liquefied and stored in steel cylinders. The gaseous oxygen from the cylinder is conducted into a rubber bag, and from this through a wash bottle containing a small quantity of water. In the use of the oxygen we secure a continuity of flow by allowing the bag to fill with the gas and then compressing it. Oxygen is indicated wherever respiration is embarrassed, in pneumonia, pleurisy, asthma, etc. It is also used for its general stimulant effect.

State the composition, mode of preparation and properties of sal ammoniac.

Sal ammoniac, ammonium chloride, NH_4Cl, prepared by saturating hydrochloric acid with ammonia. It is a white crystalline soluble substance with saline taste and neutral

properties. It yields ammonia gas when heated with strong bases. Used in medicine as an alterative and as a stimulating expectorant.

What are the distinguishing characteristics of urates and of uric acid as deposited in the urine?

Uric acid is deposited in reddish grains which settle rapidly to the bottom of the vessel and are not dissolved on warming.

Urates form generally a more bulky sediment, pink or white in appearance, settling more slowly, and easily dissolved on warming.

Both uric acid and urates respond to the murexid test. Under the microscope uric acid appears in yellowish lozenge-shaped crystals often in rosette-like groups, while urates are generally amorphous or semi-crystalline.

Mention two substances that are fusible, two substances that are volatilized by heat, two substances that are unaffected by heat.

Lead and iron are fusible. Iodine and sulphur volatilize. Carbon and silicon in absence of air, are unaffected by heat.

Describe iron and its preparations. Why is iron prescribed in anemic conditions?

Iron: symbol, Fe, atomic weight, 56 (55.5), valence II., IV., (Fe_2VI), specific gravity 7.84, a gray-white metal, with very high melting point, the most tenacious of metals, ductile and malleable.

It oxidizes in air in the presence of moisture and occurs in nature chiefly in the form of oxides.

Preparations frequently used: Ferric chloride, ferric sulphate, ferric acetate, ferric hydroxide, ferrous sulphate, ferrous carbonate, and the metal itself; organic salts of the metal, as the peptonate, albuminate, citrate, and tartrate.

Iron is prescribed in anemic conditions to afford the necessary element for the making of red blood corpuscles.

Give illustrations differentiating combustion, fermentation, putrefaction and decay.

Heat wood in air and it undergoes change into carbon dioxide, water, and a residue, called ash. This change, combustion, is accompanied by a rise in temperature and the production of a flame. Wood exposed to air and moisture for a lengthy period of time, slowly undergoes destructive change, a decay, yielding finally the same products as those produced in combustion.

Fermentation is the decomposition of complex substances by organized ferments or by enzymes. As an example we have the conversion of glucose into alcohol and carbon dioxide by the organized ferment, yeast.

Putrefaction is the decomposition of nitrogenous organic matter by the action of bacteria.

Explain the use of symbols and formulas. Give and translate five examples of each.

A symbol is used as a representation of one atom of an elementary substance. A formula, an aggregation of symbols, represents one molecule of a substance.

Oxygen, O; chlorine, Cl; bromine, Br; nitrogen, N; hydrogen, H.

HNO_3, nitric acid; H_2SO_4, sulphuric acid; PbO, litharge; NH_3, ammonia; NaCl, sodium chloride.

What is the source of tartaric acid? What is its use in medicine?

It is obtained from argol, the impure cream of tartar deposited during the fermentation of grape juice. It is used pure in the seidlitz powder, occasionally as an antiscorbutic, etc. Used chiefly in the form of its salts, cream of tartar, Rochelle salt, and tartar emetic.

Explain the principle of the action of yeast.

Under favoring conditions of proper temperature, presence of moisture, and of air, the yeast plant causes, by its growth,

such a rearrangement of the atoms of C, H and O in glucose as to produce from one molecule of glucose two molecules of alcohol and two molecules of carbon dioxide gas.

How is an excess of urates determined in a sample of urine?

To 200 Cc. of urine add 20 Cc. of strong hydrocloric acid and let the mixture stand 48 hours. The urates will be decomposed and uric acid deposited. Collect the sediment on a previously weighed filter paper, wash, dry, and weigh again.

What antidote should be employed in a case of strychnine poisoning?

At once administer an emetic and tannic acid, then give potassium bromide in drachm doses; if convulsions occur use inhalation of ether or chloroform. Use rectal injections of chloral, etc.

Define hydride, specific heat, haloid salt.

A hydride is a binary compound containing hydrogen and one other element.

By specific heat we mean the amount of heat given off or absorbed by a definite weight of a substance in undergoing a measured change of temperature, as compared with the amount of heat given off or absorbed by an equal weight of water in undergoing the same change in temperature.

A haloid salt is one containing a metal or basic radical in combination with a member of the halogen or chlorine group.

In what respect does sterilized milk differ from raw milk?

The sterilizing of milk coagulates the lactalbumin and the globulin, and modifies the casein. On acidifying the sterilized milk all the proteids are precipitated at once in a firm curd not easily digested. In sterilizing milk, germs that may be present are killed.

Complete the following equations and write the name of each resulting compound under its formula:

$As_2O_3 + 3H_2S =$

$H_2SO_4 + NaNO_3 =$

$As_2O_3 + 3H_2S = As_2S_3 + 3H_2O$

Arsenic trisulphide. Water.

$H_2SO_4 + NaNO_3 = NaHSO_4 + HNO_3$

Sodium hydrogen sulphate. Nitric acid.

Explain the chemistry of a candle flame.

Candle flame shows three distinct zones: Inner one consisting of vaporized hydrocarbons gives no illumination and scarcely any heat. Middle flame, the illuminating flame, consists of solid carbon in fine subdivision rendered incandescent by the heat due to the combination of oxygen with hydrocarbon vapors, gives a large amount of heat. Third or surrounding zone, darker in color, contains solid particles of carbon, as soot, also carbon dioxide and vapor of water, as a result of the burning of the hydrocarbon vapors, supplies but little heat or light.

Write the chemical name and formula for laughing gas.

Nitrous oxide, or nitrogen monoxide, N_2O.

What is the chemical change which occurs in the making of malt?

Starch under the action of a ferment is changed to maltose, through chemical union with water.

$$2C_6H_{10}O_5 + H_2O = C_{12}H_{22}O_{11}.$$

Explain how water containing organic impurities may become purified by running in a shallow stream or over a precipice.

All parts of the water and its contained impurities are brought in contact with atmospheric oxygen; the organic matter is oxidized and decomposed.

What is ammonium?

Ammonium, NH_4, is a basic radical forming compounds

similar to those of the alkali metals. Its relation to ammonia, NH_3, is shown in the manner of formation of its compounds, e. g. ammonium chloride, $NH_3 + HCl = NH_4Cl$.

Mention a test of CO_2, and also its chief properties.

When passed into clear lime-water it produces a white precipitate of calcium carbonate. Carbon dioxide is a gas about 1½ times the weight of air, a non-supporter of combustion and incombustible, produced by the complete oxidation of carbon. It is colorless, has a faint acid odor, and is soluble in water.

What elements enter into the composition of all alkaloids?

Carbon, hydrogen, nitrogen, in volatile alkaloids. Carbon, hydrogen, nitrogen and oxygen, in fixed alkaloids.

Explain an experiment to prove that chemical action may be induced by light.

The sun's rays or diffused daylight will bring about chemical union between hydrogen and chlorine to form hydrochloric acid, this union being accomplished with explosive violence. Mix equal volumes of hydrogen and chlorine in a glass jar and place in the sunlight.

What is the technical name of (a) aqua regia, (b) aqua fortis, (c) oil of vitriol?

(a) Nitro-hydrochloric acid; (b) nitric acid; (c) sulphuric acid.

Describe the properties of hydrogen, and mention a test to prove that it will not support combustion.

It is a colorless, tasteless, odorless gas, lightest of the well-known elementary gases; burns in air or oxygen; will not support combustion nor animal respiration. It is strongly electro-positive. A proof that it does not support combustion is afforded by plunging a lighted taper into a jar of hydrogen, held mouth downward; the flame of the taper is extin-

guished, although the hydrogen may burn at the mouth of the jar.

Give the composition of aqua ammoniae.

Ammonium hydroxide NH_4OH, is theoretically composed of one molecule of ammonia gas, NH_3, dissolved in and chemically combined with one molecule of water. The aqua ammoniæ of the U. S. P. is an aqueous solution of ammonia containing 10 per cent. by weight of the gas.

What is peroxide of hydrogen?

Peroxide of hydrogen or hydrogen dioxide, H_2O_2, in its purest form, is a syrupy liquid. The usual strength in commerce is a 3 per cent. by weight solution giving off 10 volumes of available oxygen.

Account for the poisonous property of illuminating gas.

The poisonous action is due to the presence of carbon monoxide and in less degree to carbon dioxide, various hydrocarbons and sulphur compounds.

What is the normal reaction of (a) saliva, (b) bile? What causes the reaction?

(a) Alkaline, from the presence of bicarbonates and phosphates of the alkalies and alkaline earths; (b) alkaline, from the presence of alkaline carbonates, and the sodium salts of organic acids.

Give formula for (a) mercuric chloride, (b) sodic sulphate, (c) potassium chlorate, (d) cupric nitrate, (e) calcium carbonate.

(a) $HgCl_2$; (b) Na_2SO_4; (c) $KClO_3$; (d) $Cu(NO_3)_2$; (e) $CaCO_3$.

Define saturation.

The term saturation, applied to a liquid, means that the liquid holds dissolved all of a solid or gaseous body that it is capable of dissolving.

Discuss the value of sulphur as a germicide.

Sulphur will act as a germicide only when combined with oxygen to form sulphur dioxide.

In its germicidal action, the sulphur dioxide extracts moisture to form sulphurous acid and this acts as a deoxidizing or reducing agent.

Practically it must be remembered, that sulphur dioxide is a bleaching agent, so that care must be taken to remove from the room colored fabrics of value.

By what forces can (a) a solid be changed into a liquid or a gas, (b) a gas be changed into a liquid or a solid?

(a) By heat or by lessened pressure; (b) by cold or by increasing pressure.

What is the composition of baking powders? How are they adulterated? What is their mode of action?

They all contain sodium bicarbonate mixed with an acid salt as potassium bi-tartrate, or a weak acid.

In the presence of heat and moisture their contained chemicals react with the evolution of carbon dioxide.

$KHC_4H_4O_6 + NaHCO_3 = KNaC_4H_4O_6 + H_2O + CO_2$.

Among adulterants are alum, flour, chalk and gypsum.

What is turpentine?

Turpentine, $C_{10}H_{16}$, an essential oil, is a hydrocarbon obtained from the exudate of pine trees.

State the properties and uses of H_2SO_4.

Sulphuric acid, H_2SO_4, a heavy corrosive liquid, colorless when pure but often brown from presence of carbon. It has a strong affinity for water, the union of the two being accompanied by the evolution of heat. It is one of the most important of all known manufactured substances, being used directly or indirectly in a great variety of industries. It is an important chemical reagent and forms many salts of importance medicinally.

How does diet affect the elimination of urea?

A nitrogenous diet tends to increase the elimination of urea.

A restricted diet, starvation, or a non-nitrogenous diet diminishes the elimination of urea.

Disease accompanied by rapid or long-continued tissue changes, as during high fevers, may be accompanied by increased elimination of urea even in the absence of a nitrogenous diet.

What are bromides, iodides, chlorides?

Bromides are salts of hydrobromic acid; iodides are salts of hydriodic acid; and chlorides are salts of hydrochloric acid.

Write the formula of (a) sulphurous acid, (b) acetic acid, (c) hydrochloric acid, (d) water, (e) cupric sulphate.

(a) H_2SO_3; (b) $HC_2H_3O_2$; (c) HCl; (d) H_2O; (e) $CuSO_4$.

What are mineral waters?

Mineral waters are such waters as contain too great a quantity of dissolved mineral salts to warrant their use for ordinary drinking purposes.

They possess various medicinal virtues in accordance with the particular kind of mineral salts contained.

Give the composition of water by volume and by weight.

Water is composed of two volumes of hydrogen and one volume of oxygen.

Water is composed of two parts by weight of hydrogen with 16 parts by weight of oxygen.

Give test for the presence of sulphuric acid in vinegar.

To vinegar add a few drops of a solution of barium nitrate, when, should sulphuric acid be present, there will form a white precipitate insoluble in acids.

How may the presence of arsenic in wall-paper be detected?

Use the Reinsch test: The paper, torn into fragments,

is placed in a beaker along with hydrochloric acid and water. bring to a boil and introduce a strip of clean copper foil. If a gray coating form on the copper dry it carefully and heat in an ignition tube. If the coating be due to arsenic it will be volatilized and will deposit on the cooler portion of the tube in crystals of arsenious oxide.

What chemical changes take place in decaying bodies?

All the body tissues including the complex albuminoid substances are split up, by decomposition, into simple substances. Among these products of decomposition, are peptones, ptomaines, leucin, tyrosin, amines, acids, ammonia, ammonium sulphide, hydrogen sulphide, etc. Finally we have produced, simply, water, carbon dioxide, ammonia, hydrogen sulphide, and mineral residues.

What is the antidote for poisoning from hydrocyanic acid?

Hydrogen dioxide. There is also used a solution of mixed ferrous and ferric sulphates with sodium or potassium hydroxide or carbonate added. Use ammonia by inhalation, artificial respiration, faradism to the heart.

What antidotes should be used in phosphorus poisoning? Why?

Copper sulphate in solution acts antidotally to phosphorus through producing an insoluble copper phosphide.

Old French ozonized oil of turpentine acts as an antidote to phosphorus, by oxidizing it to a comparatively harmless form.

What double salts of tartaric acid are used in medicine?

Double tartrate of potassium and sodium, or Rochelle salt.

Double tartrate of potassium and antimony (SbO), or tartar emetic.

Double tartrate of potassium and hydrogen, or cream of tartar.

Mention five common vegetable poisons, and state the antidote for one of them.

Opium, belladonna, aconite, digitalis, nux vomica.

Antidotes to opium are permanganate of potassium, atropine, caffeine.

Describe the preparation of hydrogen dioxide, writing the reaction. Give uses of hydrogen dioxide.

Mix barium dioxide with water, pass CO_2 gas through the mixture, filter, concentrate the filtrate by evaporation in vacuum over strong sulphuric acid. $BaO_2 + H_2O + CO_2 = BaCO_3 + H_2O_2$. Made also by the action of an acid on barium dioxide $BaO_2 + H_2SO_4 = BaSO_4 + H_2O_2$. Uses: For bleaching, disinfection and for destroying pus; it is a strong oxidizing agent.

Complete the following equations:

$CuSO_4 + 2KOH =$

$NaHCO_3 + HCl =$

$CuSO_4 + 2KOH = Cu(OH)_2 + K_2SO_4$.

$NaHCO_3 + HCl = NaCl + H_2O + CO_2$.

Describe an electric battery, and explain the operation of the chemicals used.

An electric battery is composed of several cells. An electric cell may be made as follows: Two plates of dissimilar substances are immersed in an acid or other fluid which acts upon one of the substances more than upon the other. If these two plates are joined outside of the cell by a wire a current of electricity will flow, from one plate to the other through the liquid, returning by the connecting wire. If the plates are made of carbon and zinc, and the solution used is dilute sulphuric acid, the zinc plate will gradually dissolve, zinc sulphate will accumulate in the solution, and hydrogen gas will be given off at the carbon plate. The current is said to flow from the zinc to the carbon through the liquid, and from the carbon to the zinc through the connecting wire.

Give the sources and uses of ammonia in medicine and in the arts.

Ammonia is obtained from the ammoniacal liquor produced in the manufacture of illuminating gas from coal. The gas may be obtained in a pure state by heating a salt of ammonium with a strong base.

Ammonia is used in medicine as a cardiac and a general, quickly-acting, stimulant. In the arts it is used as a volatile base, as a cleansing, detergent substance, as an ant-acid.

Show by equation how nitric acid is formed by the action of sulphuric acid on potassium nitrate. How is nitric acid distinguished from the other mineral acids?

$$2KNO_3 + H_2SO_4 = 2HNO_3 + K_2SO_4.$$

Nitric acid in contact with metallic copper yields a greenish-blue liquid, and gives rise to orange-red fumes of N_2O_4, this action not being brought about by any other of the mineral acids.

Indicate by chemical sign and symbols the reactions that occur when (a) a phosphorus match is lighted in the air, (b) sodium is placed on the surface of the water, (c) hydrochloric acid is poured on marble, (d) two portions of seidlitz powder are mixed in water.

(a) $P_4 + \text{air}\,(5O_2) = 2P_2O_5$.

(b) $Na_2 + H_2O = Na_2O + H_2$; then $Na_2O + H_2O = 2NaOH$.

(c) $2HCl + CaCO_3 = CaCl_2 + H_2O + CO_2$.

(d) $KNaC_4H_4O_6 + NaHCO_3 + H_2C_4H_4O_6 =$
$KNaC_4H_4O_6 + NaHC_4H_4O_6 + H_2O + CO_2$.

Describe the chemistry of alcohols and ethers.

An alcohol is a compound of a hydrocarbon radical with hydroxyl.

An ether is an oxide of a hydrocarbon radical.

What treatment is indicated in a case of poisoning by mercuric chloride?

Administer albumin, of eggs, milk, flour, etc., and then

use stomach pump, or emetic, to at once remove the newly formed albuminate of mercury. Repeat this process several times.

Explain the constitution of the fats and the process of saponification.

A fat is a chemical union of glycerin with a fat acid.

If a base, such as caustic potash, be boiled with a fat, the glycerin is separated from the acid, and the latter combines with the base to form a salt known as a soap.

Complete the following equations:

$AgNO_3 + NaCl =$

$SiO_2 + HF =$

$AgNO_3 + NaCl = AgCl + NaNO_3.$

$SiO_2 + 4HF = SiF_4 + 2H_2O.$

Find the weight and the volume of hydrogen contained in 17 grams of NH_3.

The atomic weight of nitrogen is 14, of hydrogen 1, the molecular weight of NH_3 is, therefore, 17, and in 17 grams of NH_3 there must be 3 grams of hydrogen. One litre of hydrogen weighs 0.0899 gram; three grams of hydrogen, then, must measure 33.48 litres $(3 \div 0.0899)$.

What is sulphuretted hydrogen? Give its formula, property and uses.

Sulphuretted hydrogen or hydrogen sulphide, H_2S is a colorless gas, slightly heavier than air, of offensive odor and poisonous action. It is soluble in water, and burns in air with a blue flame, forming sulphur dioxide and water. It is used as a group reagent, precipitating a number of metals in the form of insoluble sulphides.

Name and give the formulas of three important salts of potassium used in medicine.

Potassium acetate, $KC_2H_3O_2$.

Potassium nitrate, KNO_3.

Potassium chlorate, $KClO_3$.

What is methylic alcohol? What are its properties and uses?

Methylic or wood alcohol, CH_3OH, is obtained as a product of the destructive distillation of wood. It is a light, colorless liquid, miscible with water, inflammable, burning with a non-luminous flame.

It has a large use in the arts as a solvent for resinous and gum-like substances, as in the making of varnishes; and is used as a fuel.

Defend the statement, "Matter is indestructible."

That matter is indestructible may be illustrated by the burning of a candle, where although the candle loses in weight from the consumption of its wax, yet if care be taken to save and weigh the results of the combustion it will be found that nothing has been lost, that the burned substance has merely assumed a different form.

Explain and illustrate the law of chemical combination by volume.

Law of Gay-Lussac: When two or more gases combine chemically to form a gaseous compound the volumes of the individual constituents bear a simple relation to the volume of the product. Thus one volume of hydrogen combines with one volume of chlorine to form two volumes of hydrochloric acid vapor. Again, three volumes of hydrogen combine with one volume of nitrogen to form two volumes of ammonia.

Give the history, occurrence in nature and preparation of oxygen.

Attention was first called to the existence of oxygen by Dr. John Mayow, of England, in 1664. Oxygen was discovered by Dr. Joseph Priestley, of Birmingham, England, on August 1st, 1774. It was given the name oxygen, "acid-producer," by Lavoisier, the French chemist, because it was believed to be an essential constituent of all acids.

It is found free in air and dissolved in water. It is found

in combination in water and in most animal, vegetable, and mineral compounds. It may be prepared by heating a mixture of manganese dioxide and potassium chlorate.

Give reasons from a chemical standpoint for the use of gold and silver for coin.

They do not oxidize in air or water; when properly alloyed they are durable; their degree of purity may be readily determined by reagents; they do not communicate an odor or a poisonous effect when handled and their intrinsic value is fairly constant.

Name three metals of the alkaline earths, giving a compound of each with its formula.

Barium; barium chloride, $BaCl_2$.

Strontium; strontium nitrate, $Sr(NO_3)_2$.

Calcium; calcium carbonate, $CaCO_3$.

What are the general characteristics of the metals of the iron group?

When at a red heat they decompose water; their oxides, hydroxides, phosphates and carbonates are insoluble in water. They have relatively high fusing points, and considerable tenacity, malleability and ductility. They are all precipitated when in alkaline solution, by hydrogen sulphide.

What is coal-oil, and what are some of its principal products used in the practice of medicine?

Coal oil, or petroleum, is a brown-colored oil found in nature and probably produced from decomposition of organic matter. It is a mixture of liquid paraffin hydrocarbons, containing the gaseous and solid hydrocarbons in solution. Some of the principal products used in medicine are benzin or benzinum, petrolatum liquidum or liquid vaseline, petrolatum or vaseline, and paraffinum or paraffin wax.

Complete the following equation and write the name of the resulting compounds:

$$C_2HCl_3O + KOH = \text{'}$$

$$C_2HCl_3O + KOH = \underset{\text{Potassium formate.}}{KCOOH} + \underset{\text{Chloroform.}}{CHCl_3}$$

Give the general properties of alkaloids.

The alkaloids may be described as organic nitrogenous substances, basic in character, capable of combining directly with acids to form salts. They are commonly divided into two groups: (1) Liquid or Volatile alkaloids, containing carbon, hydrogen and nitrogen. (2) Fixed or non-volatile alkaloids containing, carbon, hydrogen, nitrogen and oxygen. They may also be classified according to origin as vegetable, animal, or synthetic. The volatile alkaloids are volatile liquids colorless when pure and freshly prepared, but turning brown on exposure to the air. Examples, nicotine, coniine, sparteine. The non-volatile alkaloids are crystalline solids. Examples, morphine, aconitine, quinine. Most alkaloids are soluble or very slightly soluble in water, more soluble in alcohol and in chloroform while the salts of the alkaloids are generally soluble in water and alcohol and less soluble in chloroform.

What is the percentage composition of $NaNO_3$?

Atomic weight of Na is 23; of N, 14; of O, 16; of O_3, 48. The molecular weight then, of $NaNO_3$ is 85.

85 :100 : :23 :X = sodium, 27. per cent.
85 :100 : :14 :X = nitrogen, 16.4 "
85 :100 : :48 :X = oxygen, 56.6 "

100.0

Why is capillary attraction so called? Mention some familiar examples.

Because this force is best observed in liquids enclosed in minute tubes, hair-like in size; (*Capillus*, hair.)

The rise of oil in a lamp wick. The flow of sap through vegetable fibre. The absorption of a liquid by blotting-paper.

Define sterilization.

Sterilization is the process of removing that upon which germs depend for food and existence.

How does permanganate of potassium act as a disinfectant?

In contact with organic matter it undergoes decomposition, liberating its oxygen in a nascent form.

Upon what theory are eggs given in cases of poisoning by corrosive mercury?

That the albumin of the egg will form an insoluble albuminate of mercury.

Give the boiling-point (Fahrenheit) of water, alcohol, of ether, of mercury.

Water boils at 212°; alcohol at 173°; ether at 96°; mercury at 675°.

Give the names and formulas of four iodides commonly used in medicine.

Mercuric iodide, or the red iodide of mercury, HgI_2; potassium iodide, KI; sodium iodide, NaI; strontium iodide, SrI_2.

Give the formula for carbolic acid. How is it obtained, and what are its properties and uses?

Carbolic acid, phenol, C_6H_5OH, produced in the destructive distillation of coal, is obtained from coal tar. When pure is a crystalline solid with a characteristic odor, pungent and caustic taste, forming a white eschar on the skin. The crystals require an addition of but five per cent. of water to liquefy them; if more water be added a turbid mixture results, which again becomes clear when 20 parts of water have been added. Carbolic acid is soluble in 20 parts of water; easily soluble in alcohol, glycerin and oils. It is used as an antiseptic, a disinfectant and a caustic. It has slight local anesthetic properties.

Give the comparative constituent of cows' milk and human milk as relating to water, fat, sugar, albuminoids.

Cow's milk, according to Frankland, will show on the average, water 87.5 p. c., fat, 3.8 p. c., sugar, 3.8 p. c. and albuminoids (proteids), 4.2 p. c.

Woman's milk will show water, 88.6 p. c., fat, 3.5 p. c., sugar, 5.0 p. c. and albuminoid (proteids) 2.7 p. c.

Human milk contains, then, rather less proteid, more sugar, about the same amount of fat, and rather less water, than cow's milk.

How are the compounds containing two, three, or four elements distinguished by name? Define hydroxide.

Compounds composed of two elements are called binary compounds, and their names, if they are salts, end in "ide."

Compounds containing three elements are ternary compounds and, if acids, their names terminate in "ic," or in "ous;" while if salts their names end in "ate," or "ite."

Compounds made up of four elements are called quaternary compounds.

A hydroxide is a compound of the radical, hydroxyl OH, with a metal or basic radical.

Define anhydrous, deliquescent, electrolysis, decantation.

An anhydrous substance is one from which water has been removed, as anhydrous sulphate of copper.

A deliquescent substance is one which will absorb moisture on exposure to air.

Electrolysis is decomposition of a fluid into its constituents by the action of an electric current.

Decantation refers to the act of pouring off a supernatant liquid from a precipitate or sediment.

Give the reaction of tannin with (a) preparations of iron, (b) gelatin.

(a) A purplish-black precipitate of a tannate of iron is formed. (b) Forms immediately a brownish precipitate.

What relation does the amount of solid matter in urine bear to the specific gravity of urine?

The total solids in 1000 Cc. of urine are approximately equal to 2.33 (Häsers coefficient) times the last two figures of the specific gravity.

Give source and characteristics of citric acid.

Citric acid, $H_3C_6H_5O_7$, H_2O, is obtained from lemons and limes. Occurs as colorless, rhombic crystals, odorless, acid taste, effloresceing in warm dry air and deliquescing in moist air. Soluble in water and alcohol, antiseptic, antiscorbutic, and refrigerant.

Give the formula, synonyms and properties of (a) mercurous iodide, (b) mercuric iodide.

Mercurous iodide, Hg_2I_2 or 2HgI, known also as proto-iodide of mercury, and yellow mercurous iodide, is a yellow, odorless, tasteless powder, almost insoluble in water, insoluble in alcohol, easily undergoing decomposition into mercuric iodide and mercury.

Mercuric iodide, bin-iodide of mercury, or red mercuric iodide, HgI_2, is a scarlet-red, odorless, tasteless powder, almost insoluble in water, slightly soluble in alcohol, becomes yellow on heating, regaining red color when cooled. It is poisonous and resembles mercuric chloride in therapeutic activity.

Give the formula, preparation and properties of nitrate of silver. Mention a test for nitrate of silver.

$AgNO_3$; formed by dissolving silver in nitric acid, evaporating the excess of acid, dissolving the residue in water and evaporating to crystallization. It occurs in colorless rhombic crystals, odorless but with caustic, metallic taste. Easily soluble in water, less soluble in alcohol. It is a self-limiting caustic, and is employed internally, as an astringent and alterative. Test: A soluble chloride added to silver nitrate solution precipitates curdy white silver chloride, soluble in ammonium hydroxide, insoluble in nitric acid. Evaporated with phenolsulphuric acid a pink coloration, characteristic of nitrates, is obtained.

Mention the properties of (a) hydriodic acid, (b) hydrobromic acid.

(a) Hydriodic acid, HI, is a fuming, colorless gas, strongly

acid, freely soluble in water to form a colorless solution turning brown from decomposition and separation of free iodine. Hydriodic acid possesses, in less marked degree the general properties of hydrochloric acid: its binary salts are used medicinally.

(b) Hydrobromic acid, HBr, is a colorless gas of acid nature, soluble in water forming a clear colorless liquid having properties closely resembling those of hydrochloric acid—its binary salts are used in medicine.

Give a test for the detection of alum in baking-powder.

Dissolve in 25 Cc. water and add 5 Cc. of a 5% solution of ammonium carbonate. If alum is present, a violet or lavender color is produced.

Give the chemical changes occurring when potassium is placed on water.

Two atoms of potassium displace two atoms of hydrogen from a water molecule to form K_2O and this combines with a second water molecule to form two molecules of potassium hydroxide. The liberated hydrogen takes fire from the heat of the chemical action.

$$H_2O + K_2 = K_2O + H_2.$$
$$K_2O + H_2O = 2KOH.$$

Define photography.

It is the art of obtaining in permanent form the images of the camera obscura, by causing light to produce chemical changes on sensitive substances.

Write the graphic formula of (a) sulphuric acid, (b) nitric acid, (c) calcium hydrate.

(a) $\begin{matrix} HO \\ HO \end{matrix}\!\!>\!S\!\!<\!\!\begin{matrix} O \\ O \end{matrix}$

(b) $HO - N\!\!<\!\!\begin{matrix} O \\ O \end{matrix}$

(c) $HO - Ca - OH$

Describe the relations of oxygen to combustion and to life.

Oxygen is the great, universal supporter of combustion, entering into chemical union with all well-known elements (except fluorine) often with sufficient energy to produce heat and light (active combustion).

Since life is maintained only through a constant oxidation of existing tissues, (a form of slow combustion) and the replacement of these oxidized and decomposed structures by new materials, oxygen is essential to life.

What mineral acids are incompatible with mercurous chloride? Give synonyms of mercurous chloride.

Mercurous chloride, Hg_2Cl_2 or 2HgCl, known also as calomel, mild mercurous chloride, and proto-chloride of mercury.

This substance is incompatible with sulphurous acid, hydrochloric acid, and, in general, with all strong mineral acids.

Describe the appearance of urine containing bile.

Such urine varies in color from greenish-brown to a brownish-black (porter-colored), and produces on shaking, a persistent froth, yellow in color.

Define decomposition, putrefaction.

Decomposition refers to the breaking up of a complex or compound substance into simpler substances.

Putrefaction is the decomposition of a nitrogenous organic substance into simpler bodies by bacterial action.

Give the general definition of an ether.

An ether is an oxide of a hydrocarbon radical.

Give a test for the detection of hydrocyanic acid in solution.

Silver nitrate produces a curdy white precipitate of silver cyanide, soluble in ammonium hydroxide, and in strong boiling nitric acid.

Complete the following equations:

$CH_3Cl + HCl + Zn =$
$2FeCl_3 + H_2S =$
$CH_3Cl + HCl + Zn = CH_4 + ZnCl_2.$
$2FeCl_3 + H_2S = 2FeCl_2 + 2HCl + S.$

Give the symbol, valence and a principal compound of each of ten elements.

Hydrogen, symbol H, valence I, water, H_2O.

Oxygen, symbol O, valence II, nitrous oxide, N_2O.

Nitrogen, symbol N, valence I, III, V, ammonia, NH_3.

Iodine, symbol I, valence I, potassium iodide, KI.

Sulphur, symbol S, valence II, IV, VI, hydrogen sulphide, H_2S.

Bromine, symbol Br, valence I, sodium bromide, NaBr.

Iron, symbol Fe, valence II, IV (Fe_2 VI) ferrous sulphate, $FeSO_4$.

Calcium, symbol Ca, valence II, calcium hydroxide, $Ca(OH)_2$.

Magnesium, symbol Mg, valence II, magnesium carbonate, $MgCO_3$.

Silicon, symbol Si, valence IV, silicon oxide, SiO_2.

State the normal reaction of synovial fluid.

Alkaline.

Describe the microscopic appearance of (a) uric acid, (b) triple phosphates.

(a) Yellow to orange-red in color, losenge-shaped, rhombic prisms or modified forms, often grouped in star-shaped, or fan-shaped clusters, sharply pointed at angles.

(b) White, triangular prisms, coffin-shaped; or in star-shaped, feathery crystals.

Give a typical example and state the principal ingredients of each of the following mineral waters: Saline cathartic, alkaline, sulphurous.

Saline cathartic water may be represented by Carlsbad

mineral water containing sulphates of sodium and potassium, and carbonates of sodium, calcium and iron.

An alkaline mineral water as Buffalo lithia water contains carbonates of lithium, calcium, sodium and potassium, and usually an excess of CO_2 although not in sufficient amount to produce effervescence.

A sulphurous water, as that of red sulphur spring of Virginia, usually contains hydrogen sulphide, or an alkaline poly-sulphide.

Give the characteristics of (a) nephritic urine, (b) cystitic urine.

In acute nephritic conditions the urine may be diminished in amount with normal or increased specific gravity and considerable albumin. In chronic nephritis the urine may be normal or increased in amount, the specific gravity low and the albumin variable. Nephritic urine always shows casts of the uriniferous tubules.

In acute cystitis the urine shows pus, mucus, and epithelium and the reaction may be neutral or acid. In chronic cystitis the urine contains pus, mucus, epithelium and separated "triple phosphates" and the reaction is ammoniacal.

Express the following in apothecaries' weight and measure:

Ammonii carb.	5 grams
Syr. aurantii	60 c. c.
Aquæ destil. ad	120 c. c.

Ammonia carb.	grs. lxxvii
Syr. aurantii	℥ ij
Aquæ destil. ad	℥ iv

Complete the following equations:

$C_2H_5NO_3 + KOH =$

$CaCO_3 + 2HCl =$

$C_2H_5NO_3 + KOH = C_2H_5OH + KNO_3.$

$CaCO_3 + 2HCl = CaCl_2 + H_2O + CO_2.$

Give the general characteristics of bismuth.

Bismuth, Bi, atomic weight, 207 (206.9), valence III, specific gravity 9.9, melts 512° F., is a brittle, white metalloid with reddish tint, crystalline, occurs native and as the sulphide, frequently associated with arsenic.

Define and illustrate monatomic element, neutral salt.

A monatomic element, like mercury, is one whose molecule contains but one atom, and whose molecular weight corresponds with the atomic weight.

A neutral or normal salt is one formed from an acid by substituting a metal or basic radical for all of the replaceable hydrogen. Example: Sodium sulphate, Na_2SO_4, formed from sulphuric acid, H_2SO_4.

Indicate the sources of the following acids: Lactic, butyric.

Lactic acid is developed from lactose in souring milk. It is produced on the large scale by the lactic fermentation of cane sugar or glucose.

Butyric acid occurs in rancid butter, and cheese. It is prepared by fermenting a mixture of sugar and old cheese.

Mention a diatomic element and give its chemical properties.

Oxygen, symbol O, atomic weight 16, valence II., electronegative, supporter of combustion, combines with all well-known elements except fluorine.

Give an explanation of the formation of ammonia in the urine.

Under the influence of the micrococcus ureae taken up from the atmosphere, the urea is changed into ammonium carbonate.

$$CO(NH_2)_2 + 2H_2O = (NH_4)_2CO_3.$$

Complete the following equations:

$2FeCl_2 + 2HCl + O =$

$2Na_2HPO_4 + 3CaCl_2 =$

$2FeCl_2 + 2HCl + O = Fe_2Cl_6 + H_2O.$

$2Na_2HPO_4 + 3CaCl_2 = Ca_3(PO_4)_2 + 4NaCl + 2HCl.$

Give the formula and properties of (a) chlorate of potassium, (b) ammonia gas, (c) tartaric acid.

(a) Chlorate of potassium, $KClO_3$, white crystalline solid, permanent in air, soluble in 16.7 parts of cold water and 1.7 parts boiling water. A strong oxidizing agent, decomposible by heat into oxygen and potassium chloride, forms explosive mixtures when in contact with strong acids or organic matter. It is a mild astringent and antiseptic.

(b) Ammonia gas, NH_3, is a strongly basic, diffusible, irrespirable gas, extremely light, and very soluble in water; it is colorless, alkaline and caustic in taste and effect.

(c) Tartaric acid, $H_2C_4H_4O_6$, found in vegetables and fruits: in its pure form occurs as colorless, transparent prisms, strongly acid and readily soluble in water and in alcohol; crystals melt at 135° C. It forms salts, of which Rochelle salt, $KNaC_4H_4O_6$, cream of tartar, $KHC_4H_4O_6$, and tartar emetic, $KSbOC_4H_4O_6$ are medicinally useful.

How is anilin obtained? State how anilin dyes are manufactured from anilin.

Anilin, $C_6H_5NH_2$ is obtained by the action of nascent hydrogen on nitrobenzene.

Anilin dyes are made by oxidizing mixtures of anilin and toluidin with nitric or chromic acids or other oxidizing agents.

Mention two reactions by which hydrocyanic acid is formed. Give the properties of hydrocyanic acid.

Add hydrochloric acid to potassium cyanide and obtain potassium chloride and hydrocyanic acid. Add hydrochloric acid to silver cyanide and obtain silver chloride and hydrocyanic acid.

Hydrocyanic acid is a volatile colorless liquid, with odor of bitter almonds. It is extremely poisonous and is employed in medicine in a 2% water solution.

Give the symptoms and diagnostic features of oxalic acid poisoning. With what commonly used salt is oxalic acid likely to be confused?

Symptoms: a hot, burning, sour taste, burning sensation extending to stomach, great burning pain in stomach and abdomen, prostration, slight stupor, convulsions, pulse small and irregular, numbness of extremities, irregular, spasmodic breathing, death. It acts as an irritant and as a heart depressant.

Oxalic acid has been frequently confused with magnesium sulphate.

What are aldehydes? Mention the properties and principal derivatives of aldehydes.

Aldehydes are substances formed by oxidizing (taking two hydrogen atoms from) primary alcohols.

Aldehydes combine directly with ammonia, hydrocyanic acid, alkaline sulphites, etc. They are strong reducing agents, their oxidation produces fatty acids, their reduction gives rise to alcohols.

Formaldehyde and paraldehyde and, a derivative, trichloraldehyde or chloral, are all used in medicine. Derived from chloral are many addition and decomposition products.

How are soaps made? What constitutes (a) hard soap, (b) soft soap, (c) castile soap?

By heating a fat, with a strong alkali. (a) Hard soap is the sodium salt of a fat acid. (b) Soft soap is the potassium salt of a fat acid. (c) Castile soap is a mixture of oleate, palmitate and stearate of sodium obtained by saponifying olive oil.

Complete the following equation:

$K_2Cr_2O_7 + 4H_2SO_4 =$

$K_2Cr_2O_7 + 4H_2SO_4 = Cr_2(SO_4)_3 + K_2SO_4 + 4H_2O + O_3.$

What is an ion? Give an example of ionization.

When acids, bases and salts are dissolved in water they dis-

sociate, the molecules break apart. Each particle carries a charge of electricity, and is called an ion. Hydrochloric acid dissolved in water dissociates into positive ions of hydrogen (cations), and negative ions of chlorine (anions).

What simple tests should be employed to determine whether or not a suspected water contains albuminoid matters sufficient to make its use unhealthful?

Add to the water a drop or two of dilute sulphuric acid and enough potassium permanganate to give a faint pink color, cover the vessel with a glass plate and if the pink color still persists after the lapse of fifteen minutes the water is not greatly impure from organic matter.

Shake a stoppered flask half full of the suspected water; if no odor is discernible, warm flask and contents for fifteen minutes at a temperature not higher than 110° F. and after again shaking vigorously should there still be no odor the water is probably free of any material quantity of dissolved organic matter.

Mention the principal uses of the following elements and their compounds: (a) Fluorine, (b) chromium, (c) silicon, (d) selenium.

(a) Hydrofluoric acid is used as a solvent for glass; calcium fluoride and the double fluoride of sodium and aluminum are employed as fluxes.

(b) Chromium is used in steel-making; lead chromate and barium chromate are used as pigments; potassium and sodium dichromate are important reagents; the oxides are oxidizing agents and glass pigments. The oxide CrO_3 is a powerful caustic.

(c) Silicon in the form of its oxide SiO_2 is used in making glass and glass-like substances; hydrofluosilicic acid is a chemical reagent; SiO_2 is also used for polishing, filtration, etc.

(d) Selenium is used, from its non-conducting property, in certain electrical appliances; selenic acid, H_2SeO_4 is used as a solvent for gold.

State the atomic weight, valence and uses of sulphur.

Sulphur, atomic weight 32 (31.83), valence II, IV, VI.

Is used in making gun powder, matches, as a medicine, is incorporated into rubber, is burned to form SO_2 and in this combination used for disinfection, bleaching and in making sulphuric acid.

Complete the following equations:

$BaCl_2 + Na_2SO_4 =$

$3P + 5HNO_3 + 2H_2O =$

$BaCl_2 + Na_2SO_4 = BaSO_4 + 2NaCl.$

$3P + 5HNO_3 + 2H_2O = 3H_3PO_4 + 5NO.$

Differentiate arsenic from antimony.

In Marsh's test on burning the evolved gas both arsenic and antimony produce brown-black stains on a piece of cold porcelain held in the flame, but the stain due to arsenic is freely soluble in chlorinated lime solution while the antimonial stain is almost insoluble in this reagent. If ansenical and antimonial substances be strongly heated in air, arsenic forms octahedral crystals of As_2O_3 which dissolving in water produce green and yellow precipitates respectively with cupric ammonium sulphate and silver ammonium nitrate; while antimony, oxidizing, gives needle-like crystals or an amorphous deposit, soluble in water but not precipitated by the reagents named.

Give two chemical tests for blood.

Add a drop of suspected liquid to a freshly-made tincture of guaiacum, in a test-tube, then on the surface of this liquid float an etherial solution of hydrogen dioxide. If the suspected liquid contains blood, a blue color band forms at the junction of the two liquids.

To a drop of blood on a glass slide add a drop or so of glacial acetic acid and a small crystal of sodium chloride. Heat slowly to boiling, then cool and examine under the microscope for crystals of hematin hydrochloride.

Describe the tests for acetone, and for diacetic acid in the urine.

For acetone add to the urine sufficient sodium hydroxide to give a decided alkaline reaction and then add a few drops of an aqueous solution of sodium nitroprusside. The mixture assumes a ruby-red color. Acidify with glacial acetic acid—a purple-red color indicates the presence of acetone.

Test for diacetic acid: To a freshly-passed specimen of urine add a few drops of a ferric chloride solution; if a precipitate forms, filter, and to the filtrate add a few more drops of the reagent. If diacetic acid be present there is produced a dark red color which fades on boiling.

Describe a test for excess of hydrochloric acid in the gastric contents.

To 100 c.c. of filtered gastric contents add a few drops of tropaeolin indicator solution, and then titrate with $\frac{N}{10}$ alkali solution until the magenta color of the solution is destroyed. If more than 55 c.c. of the alkali solution are required to neutralize then the acid is in excess.

Define albumose; give a test for detection.

Albumoses are transition compounds formed in the conversion of albumin into peptone. Albumose is precipitated by nitric acid in the cold, dissolves on heating, and is again precipitated on cooling.

Define bilirubin; describe its properties; give test for its presence.

Bilirubin, the principal bile pigment, $C_{16}H_{18}N_2O_3$, is a reddish-yellow substance, derived from hematin, slightly soluble in water, more soluble in hot chloroform.

A drop of the fluid is spread in a thin film on a porcelain plate and a drop of yellow nitric acid added. In the presence of bile pigment the drop of acid is surrounded by colored rings—green, blue, and reddish-yellow.

What substances in the urine, other than glucose, may produce the reaction of the Fehling's test.

Glycuronic acid gives the same reaction as does glucose. Uric acid, creatinine, pyrocatechin, lactose, pentose, chloroform, etc., may produce partial reactions.

Describe a chemical test that would suggest the presence or absence of gastric carcinoma.

A marked diminution in or absence of free hydrochloric acid in the gastric contents as shown by titration with a $\frac{N}{10}$ alkali solution. Normally about 55 Cc. of $\frac{N}{10}$ alkali are required to neutralize 100 Cc. of gastric juice.

Give chemical tests for the various forms of urinary calculi.

A calculus which on heating to redness burns entirely away may be of uric acid, urate of ammonium, xanthine, cystin, or fibrin. Test a portion of the powder with boiling water; urates dissolve, uric acid remains undissolved. Apply the murexid test—evaporate with nitric acid and touch the residue with a drop of ammonia water. A purple-red color indicates uric acid or urates.

If the calculus fuses when heated, giving off water vapor and ammonia, it is a "fusible calculus" and consists of a mixture of calcium, magnesium, and ammonium phosphates.

If the calculus leaves a residue when heated and gives a murexid test it consists of sodium urate. If it dissolves in acetic acid and a precipitate is formed on adding ammonia water it is a phosphate of calcium or magnesium. If it is insoluble in acetic acid but soluble in hydrochloric acid, it is calcium oxalate. If on adding an acid an effervescence is produced a carbonate is present.

Detail a test for the detection of indoxyl-potassium sulphate (indican).

To 5 Cc. concentrated fuming hydrochloric acid add 20 drops of urine, and warm, but do not boil, the mixture. With

normal urine the resulting color will be yellow or a very pale violet, while with increased indican a darker violet or blue will be obtained. If the hydrochloric acid is not sufficiently concentrated add 1 drop of nitric acid before adding the urine.

PATHOLOGY AND BACTERIOLOGY.

Describe the protective agencies by which the body guards itself against the entrance and harmful effects of pathogenic bacteria.

Phagocytosis, the ingestion and possible destruction of bacteria by certain leukocytes. Antitoxins, substances formed in the body that are antidotal to bacterial toxins. Bacteriolysins, substances resulting from the union of two bodies known as complement and addiment that produce the solution of bacteria. Antiseptic substances present in the blood serum and tissues that restrain bacterial growth.

What is immunity? How is immunity produced?

Immunity expresses the degree of resistance of the living organism against disease. It is produced by attacks of disease, by the introduction into the body of living or dead bacteria or their products, or of antitoxins or by heredity.

Give the pathologic changes occurring in acute phlebitis.

Congestion of vessels of vasa vasorum and effusion in the walls of vein of serum and leukocytes, with formation of thrombus within vessel. This may terminate in absorption and resolution, the permanent occlusion of the vein, or in suppuration.

What conditions (non-traumatic) favor cerebral hemorrhage? Mention the vessel from which cerebral hemorrhage occurs most frequently.

a. Arterio-sclerosis or aneurysm of cerebral vessels and their causes, cerebral tumor, infarction, whooping cough or convulsions, leukemia, pernicious anemia.

b. The left lenticulo-striate artery.

Give the histologic characteristics of amyloid degeneration.

The amyloid substance appears in the form of irregular homogeneous, translucent, faintly granular areas of fused cells and intercellular substance affecting chiefly the connective tissues about the capillaries, as in the glomerules of kidney or spleen. The adjacent epithelial cells may show atrophic changes or fatty degeneration. The urinary tubules may contain amyloid casts.

What are the blood changes in progressive pernicious anemia?

A marked and disproportionate oligocythemia, slight leucopenia, poikilocytosis, and the presence of nucleated red corpuscles.

Give the gross and the microscopic appearance of an epithelioma of the lip.

A crushed papule or warty growth, with infiltrated base, that tends to undergo crater-like ulceration. Microscopically, an invasion of the subcutaneous and deeper tissues by irregular columns composed of squamous epithelial cells that often contain pearly bodies is seen.

Give the functions and the products of bacteria.

Functions are reproduction, motion, absorption, excretion, growth; also fermentation, decomposition, disease-production. They may produce as products ferments, toxins, phosphorescence, pigments, acids or alkalies.

Give the causes of edema.

Passive hyperemia, anemia, change in vessel walls or in vascular innervation, reduction in extra-vascular pressure, lymphatic obstruction.

What are cysts? How are cysts formed? Give the varieties of cysts.

Abnormal, persistent, encapsulated collections of liquid

formed by obstruction to outlet of glands by secretion in a cavity without outlet, extravasation of blood or other liquid, softening of tissues, tumor formation, or by the presence of a parasite or foreign body. Varieties are simple, compound, and proliferous, congenital, retention, extravasation, softening, neoplastic and parasitic cysts.

What is the special cause of the croupous inflammation found in diphtheria?

The toxin of the diphtheria bacillus.

Describe the comma bacillus and give the manner of its introduction into the system.

A spirillum, a short, curved rod .8 to 2 microns in length, motile, flagellate, readily staining but decolorized by Gram's method, usually enters through the alimentary canal with contaminated water, milk or solid food.

What conditions give to the system immunity from the harmful action of bacteria?

The bacteriolysins, the antitoxins, the phagocytes, the antiseptic action of tissue cells and juices, the protecting layers of epithelium.

(a) Give the microscopic appearance of a melano-sarcoma and (b) state its usual sites of development.

(a) Consists usually of vascularized tissue consisting of spindle cells, or at times of round cells, that have vesicular nuclei, and many of which contain dark pigment granules. (b) Skin and choroid.

Describe the pathologic conditions in meningitis.

An inflammation of the membranes of brain or cord characterized by congestion of meningeal vessels, edema of arachnoid, effusion of serum, fibrin, or pus into the cavity of arachnoid, at times petechial or larger hemorrhages within or without arachnoid. Adjacent degeneration of nervous substance may occur.

Give the pathology of cirrhosis of the liver.

A marked hyperplasia of the interlobular connective tissue, and often of interlobular bile ducts. The new-formed connective tissue tends to contract, compressing the lobules and perhaps causing degeneration of the hepatic cells. The liver may become much smaller and show a rough ("hob nail") surface.

(a) How is fibrous tissue formed? (b) What tumors are composed largely of fibrous tissue, and in what part of the body do they usually occur?

(a) By a proliferation of cells of the pre-existing, adjacent fibrous tissue. The young cells or fibroblasts being nourished by new capillary blood-vessels that sprout from neighboring pre-existing vessels and invade the formative area.

(b) Fibromas and fibromyomas chiefly occur in the uterus.

What is the significance of tube-casts in the urine?

Tube-casts result from irritative and degenerative changes in the epithelium of kidney, permitting an exudation of coagulable substance into the tubules, and signify renal irritation or disease. They are minute cylindric bodies having a homogenic matrix, in which there may be imbedded cellular or granular particles.

Describe yellow or crude tubercle.

A yellowish, rounded, firm, adherent body, one to several millimeters in diameter, showing under microscope a central caseous area, an intermediate zone of epithelioid cells and often giant cells, and a peripheral zone of lymphocytes.

Give the structural differences between sarcoma and carcinoma.

Sarcoma consists of connective tissue of embryonic type containing imperfectly formed blood-vessels. Tissue may consist of round, oval, spindle or, in part, of giant cells.

Carcinoma is less circumscribed, consists of alveoli filled by cuboidal, columnar or squamous epithelial cells in a stroma,

usually of fibro-connective tissue, that contains well-informed blood-vessels and lymphatics.

Define anemia, hyperemia, leukemia.

Anemia is deficiency in the quantity or quality of circulating blood.

Hyperemia is an excessive quantity of circulating blood in a part.

Leukemia is a grave primary anemia characterized by enormous leucocytosis and pathologic changes in the spleen, red marrow or lymphatics.

State the difference between degeneration and infiltration. Illustrate.

Cell degeneration is a condition in which the cell contents become abnormal. If abnormal from the deposit of substance from without it is termed cell infiltration, as in fatty infiltration. If abnormal from transformation of cell contents it is termed a cell metamorphosis, as in fatty metamorphosis. Fatty infiltration and fatty metamorphosis are both examples of cell degeneration.

Give the morbid anatomy of chronic bronchitis.

Mucous membrane may be red and thickened and covered by thick mucus; or pale, thinned, and showing adherent, inspissated mucous masses. The thickening is due to leucocytic infiltration and overgrowth of fibrous tissue; the thinning to atrophy of the mucous membrane. The ciliated cells may be replaced by columnar or polygonal epithelium.

What is thrombosis? Describe the manner of its formation.

Thrombosis is the intravascular coagulation of blood during life resulting from the arrest of circulation and the formation of fibrin by the action of fibrin ferment upon the fibrinogen.

(a) What is mucoid degeneration? (b) What is colloid degeneration?

(a) A conversion of cells and intercellular substance into mucin.

(b) A conversion of cells into colloid material, a substance resembling mucin but not giving its reaction.

State the results of stenosis of the tricuspid valves of the heart.

Dilatation of right auricle, cyanosis of face, passive hyperemia of pulmonary and abdominal organs, anasarca.

(a) Define fatty metamorphosis. (b) Give its terminations.

(a) Conversion of cells into fat.

(b) Destruction of cells, colliquation or caseous necrosis.

What are the possible lesions in the third stage of syphilis?

Gummata, syphilitic rupia, sclerotic changes in organs, especially the arteries, liver, kidneys and spinal cord.

Describe the local appearances in a case of embolism of the middle meningeal artery.

The affected vessel contains thrombus extending from the seat of embolism back as far as the first collateral branch. The distal branches may be shrunken, anemic, and associated with cerebral softening or distended, and in the midst of a hemorrhagic effusion (hemorrhagic infarction).

What is productive inflammation?

Inflammation characterized by the formation of new tissue, usually of the fibro-connective tissue type.

What changes take place in hypertrophy of the heart?

An increase in thickness of the muscular walls of the heart, chiefly affecting the ventricle, blunting the apex. The cavities may or may not be increased in size.

Give the origin and appearance of papillomata.

Originate from overgrowth of the papillary body, and are wart-like, villous, dendritic or polypoid outgrowths from skin or mucous membrane covered by epithelium.

Briefly describe the types of gangrene, and give the conditions determining each.

Dry gangrene or putrefactive death of a part with mummification is characterized by a dry, shriveled, blackish, leathery, friable area, and is caused by arterial obstruction, such as occurs in old age (senile gangrene), from arterio-sclerosis, in Raynaud's disease, from ergot poisoning and frostbite.

Moist gangrene is characterized by swollen, greenish or blackish, cool, moist, soft, fetid area, with bleb-covered surface, loosened epidermis and crepitation on palpation, and is due to severe infection (pulmonary gangrene, malignant phagedena, hospital gangrene), trauma, venous obstruction, diabetes (diabetic gangrene), and deficient trophic innervation (decubitus).

Describe the histological elements of carcinoma.

Acini containing epithelial cells. The amount of protoplasm, as in other epithelial cells, is large in proportion to the size of the nucleus. Cells may be squamous cylindric, cuboidal or polyhedral. The nuclei are usually vesicular and atypical karyokinetic, and other cell figures may be present. The stroma usually consist of well-formed fibro-connective tissue containing lymphatics and well-formed blood-vessels.

Describe tuberculosis of the skin in any of its forms.

Lupus vulgaris is characterized by brown nodules originating in corium, and consisting of a rather vascular granulation tissue composed of epithelioid cells, lymphoid cells, and frequently of giant cells. The nodules may lead to extensive ulceration and cicatrization.

Describe the changes in the heart due to fatty metamorphosis.

Diffuse or circumscribed, yellowish, opaque, soft, friable areas of heart muscle, in the circumscribed form chiefly occurring under endocardium of papillary muscles. Microscopically, the muscle fibres lose their striation and show fatty

granules, usually first about the nuclei; finally fibres may break down into fatty particles and detritus.

What histological changes occur in acute simple inflammation?

Dilatation of blood-vessels, retardation and stasis of blood current, exudation into tissues of modified plasma, transmigration of leukocytes, and often diapedesis of erythrocytes, distension of lymphatics by exudate of cells and fluid, regenerative or degenerative changes in the tissue cells.

Give the pathology of carcinoma.

Carcinoma is a malignant, uncircumscribed tumor consisting of acini, containing invaded epithelial cells in a vascularized stroma that usually consists of fibro-connective tissue. The epithelial cells tend to a progressive invasion through the lymphatic channels.

What is fibrinous degeneration?

A retrogressive process in which, by the action of fibrin ferment upon fibrinogen, fibrin is formed.

What do you understand by the term cirrhosis of the liver?

Overgrowth in the liver of connective tissue that contracts, rendering the organ smaller and firmer.

Is cerebro-spinal fever more generally sporadic or endemic?

Cerebro-spinal fever generally occurs in the form of small sporadic epidemics.

Give some of the lesions in chronic diffused or interstitial nephritis.

Macroscopic. Small, granular-surfaced kidney with adherent capsule and thinned cortex.

Microscopic. Thickening of Bowman's capsules, hyaline degeneration of glomerules, increase of intertubular tissue, dilatation of certain tubules.

What anatomic changes take place in the skin in chronic eczema?

Enlargement of papillæ, dilatation of blood and lymph vessels, perivascular cellular infiltration, hyperplasia of connective tissue and epithelium, atrophy of sebaceous and sweat glands.

What are the characteristic features of diphtheritic exudation or infiltration of mucous membrane?

The layers of mucous membrane undergo coagulation necrosis, and are infiltrated by a granular or fibrillar exudation of fibrin, and by leukocytes.

What abnormal organic ingredients are found in the urine in chronic morbus Brightii?

Tube casts — hyaline, granular or cellular; cylindroids, epithelial cells from urinary tubules, albumin, and at times leukocytes and erythrocytes.

In what general respects do "anemia and progressive pernicious anemia" differ?

Anemia refers to any blood impoverishment. Pernicious anemia is a very serious type of an essential anemia in which there is a disproportionate oligocythemia. In most anemias this is proportionate to the oligochromemia.

What is cretinism, and with what is it associated?

A disease developing in early life characterized by distension (at times myxomatous) of subcutaneous tissues and by general mental and physical ill development, that is always associated with abnormality or absence of the thyroid gland.

How should sputum be examined for tubercle bacilli?

A selected portion of morning expectoration is thinly spread on a cover-glass, dried, fixed by heating, stained for three minutes in hot carbol-fuchsin, washed, decolorized and counter-stained for one-half minute in Gabbet's solution, washed, dried, mounted in balsam, and examined under a one-twelfth

oil immersion objective for minute red rods—the tubercle bacilli.

What is infective inflammation? How does it differ from simple inflammation?

Infective inflammation is that form due to the action of bacteria, while simple inflammation is not due to micro-organisms. Infective inflammation tends to spread, is more severe, and is often associated with marked constitutional reaction, the reverse being the case in simple inflammation.

Give the morbid anatomy of acute lobar pneumonia.

In *engorgement* (first stage) the affected lobe is deep red, boggy, slightly crepitant, and on section exudes bloody serum; this passes into *red hepatization* (second stage), in which the affected lobe is dark red, solid, airless, friable, with dry, granular surface of section, while in *gray hepatization* (third stage) the lobe is grayish-white, solid, friable, with moister surface of section. Microscopically, in the first stage, there is intense hyperemia, with presence of serous liquid and red and white corpuscles in alveoli. In the second stage the air cells are filled by red and white corpuscles entangled in coagulated fibrin, while in the third stage the fibrin, erythrocytes and hyperemia disappear and the alveoli are distended by leukocytes and granular detritus. *Resolution* (fourth stage) is characterized by liquefaction necrosis, absorption and expulsion of exudate.

Give the causes and process of cerebral softening.

The chief causes are the obstruction of cerebral arteries by an embolus, thrombus or arterio-sclerosis. The area thus rendered anemic degenerates and undergoes colliquation necrosis, and if pyogenic bacteria are present an abscess may form.

Describe the rash and give the morbid anatomy of scarlatina.

Scattered red points on a deep reddish base appear over neck and chest by the second day, spread over the body, and

after three or four days gradually fade, to be followed by desquamation. There are no specific lesions, but usually acute catarrhal or pseudo-membranous pharyngitis, acute diffuse nephritis, and often follicular tonsillitis, lymphadenitis (at times suppurative), catarrhal gastro-enteritis, interstitial hepatitis, splenic enlargement, and as complications, purulent otitis media, endocarditis, pericarditis, bronchopneumonia.

What is a giant cell? Give characteristics.

A very large cell with many nuclei, found in the tubercle, in gumma, in bone marrow, and in myeloid sarcoma. It is irregular, and often indefinitely outlined, with hyaline protoplasm and from four to one or two hundred nuclei, that may be (as in tubercle) arranged peripherally, equatorially, at the poles or (as in sarcoma) near the center of the cell.

Describe the formation of adipose tissue.

In protoplasm of connective tissue cells, fat droplets that tend to coalesce and displace the nucleus are deposited. Finally the nucleus is displaced to extreme periphery of cell and may disappear, while the cell is transformed into a distended sac filled by fat. If this take place, in many adjacent connective tissue cells adipose tissue results.

What pathological changes occur in caries?

In caries (rarefying ostitis) there is a solution of bone with or without the formation of pus. A round-celled infiltration, often with the formation of granulation tissue, occurs in medulla and in Haversian canals with solution of soft and hard structure of bone, the ended pits being Howship's lacunæ.

How is dental caries produced?

Acids (especially lactic) formed by bacteria present in the saliva acting upon starchy particles, progressively dissolve the mineral structure of the tooth, whereupon saprophytic micro-organisms present cause solution of the organic substance of the tooth.

Describe catarrhal inflammation.

An inflammation of a mucous surface, with the fluid exudation consisting of mucus, serum, leukocytes and desquamated epithelial cells in varying proportions. The area affected is red, swollen and bathed by exuded secretion.

What is the line of demarcation in gangrene?

The zone of inflammatory reaction observed in the living tisue adjacent to the gangrenous area.

What is the line of separation in gangrene?

The narrow zone of progressive ulceration and molecular disintegration distal to the line of demarcation that tends to sever the connection between the living and dead tissues.

What post-mortem changes occur in the tissues?

Rigor mortis, algor mortis, livores mortis, muscular relaxation, formation of adipocere, decomposition.

Define atrophy. Give the varieties of atrophy.

The diminution in size and functional capacity of a part. It may be simple or degenerative, passive, active, senile, pressure or neuropathic atrophy.

Differentiate fatty infiltration and fatty degeneration.

In fatty infiltration the fat is from without affected cells, and appears as fat droplets that coalesce, displace and obscure the nucleus, and distend, but do not entirely destroy, the cells. In metamorphosis the cell protoplasm is converted into fat that appears in the form of granules or minute droplets that tend to cause the breaking down and destruction of protoplasm and nucleus.

Define fibromata. Give the histology of fibromata.

A tumor of the type of fibro-connective tissue, showing under the microscope whorls or curving bundles of long, narrow fibers having occasional narrow spindle-shaped nuclei. As a rule, fibromas are encapsulated and not very vascular.

Give the varieties, the histology, and the physical characteristics of lipomata.

a. Diffuse and circumscribed, sessile or pediculated.

b. Resembles normal adipose tissue, consisting of fat-distended cells supported in a light fibro-connective tissue framework.

c. Greasy, lobulated, yellowish, encapsulated, soft growths. The overlying skin "dimples" when elevated.

What part of the cord is involved in locomotor ataxia? Give the pathology of locomotor ataxia.

a. Posterior columns.

b. In columns of Goll and Burdach areas of degeneration showing destroyed myelin sheaths and axis cylinders and a proliferation of neuroglia occur.

What are the intestinal changes in chronic enteritis?

The mucous membrane and muscular wall may show hyperplastic thickenings or atrophy. Enlargement of lymph follicles is frequent, and polypoid masses may project from mucous membrane. Ulcers may be present.

Define myomata, neuromata, angiomata.

a. Myomata are tumors of the type of muscle.

b. Neuromata are tumors of the type of nerve tissue.

c. Angiomata are tumors of blood or lymph vessels.

Explain the development of pus corpuscles.

Migrating leukocytes pass through the walls of the adjacent capillaries, and in large numbers invade the area of suppuration, and whether living or dead as soon as they are surrounded by liquor puris are termed pus corpuscles.

Give the pathology of spina bifida.

The spinal lamina being congenitally imperfect, the contents of the spinal canal tend to protrude in the form of a tumor. The mass usually contains fluid, and is covered by the attenuated cord, nerves, or by the membranes alone.

Spina bifida occulta is a form in which the vertebral cleft is unassociated with the formation of a tumor.

What are the pathologic conditions in gonorrheal ophthalmia?

A purulent conjunctivitis with marked chemosis, edema of eyelids, profuse purulent discharge, and as complications, ulcerative or suppurative keratitis, with or without resulting perforation, anterior synechia, leucoma, staphyloma, iritis, hypopyon.

What are the pathologic appearances of anemia of the brain?

The blood-vessels are empty or imperfectly distended by blood, and if the process has been long continued the brain may show atrophy or degenerative changes in the involved areas.

What is embolism?

Intravascular obstruction from the lodgment of a foreign body.

What is an infarct?

The area of degenerative and inflammatory changes produced by the lodgment of an embolus in an end artery.

Describe the pathologic conditions present in atheroma.

A diffuse or circumscribed mesarteritis occurs with involvement of vasa-vasorum and the production of new sclerotic tissue that undergoes coagulation necrosis and fatty degeneration. This softened degenerative material is termed atheromatous. It may become calcified, be discharged with the formation of an atheromatous ulcer or cause a weakening of the wall, favoring rupture or aneurysm formation.

What structural changes take place in chronic gout?

Polyarthritis, with deposits of urate of sodium in articular cartilages, and about joints with formation of concretions (tophi). Arterio-sclerosis, hypertrophy of left ventricle and

sclerotic changes in liver and kidneys are common, and there is a tendency to inflammation of the larger serous sacs.

What are the four cardinal indications in inflammation?

Heat, swelling, redness and pain, to which may be added altered function.

Define ascites.

An abnormal collection of serous fluid in the peritoneal cavity.

What condition of the blood is generally prominent in all forms of gout?

Excess of sodium urate.

Give some of the causes (pathologic) of paresis.

A chronic, progressive meningo-encephalitis characterized by a productive arteritis involving especially the adventitia, with degenerative atrophy and sclerosis of cortex and subcortical portions of brain. Degenerative changes in spinal cord are associated.

What is the pathology of aneurysm?

A localized enlargement of an artery containing blood or clot, due to a circumscribed stretching of one or all the coats of a vessel. It occurs in vessels weakened by trauma, arteriosclerosis, mycotic inflammation, or by ulceration, or proximal to areas of thrombosis or embolism. The vessel walls forming the aneurysm are thinned, often calcified, with impaired elasticity, and usually having thicker or thinner lining of adherent, laminated fibrin.

Describe the pathological conditions in icterus.

The skin, conjuctivæ, urine, blood and the various organs are tinged a yellow color by the biliary pigment. The feces are usually clay-colored. The pulse is slow; there is a tendency to hemorrhage.

Define the term malignant as applied to new formations.

New growth having an inherent tendency to a fatal issue.

Give the pathology of peritonitis.

The peritoneum is red from vascular injection, the surface is dull, and may be covered by adherent fibrinous or puriform exudate. The cavity of the peritoneum contains serum, in which there may be fibrin or pus. There is a tendency for adjacent peritoneal surfaces to adhere, localizing the process.

What is understood by the phrase "new formation"?

A multiplication of certain cells of the body producing a mass of tissue that has no place in the normal organism, such, for example, as a tumor.

By examining the fluid removed by lumbar puncture, how may we distinguish between tubercular and other forms of meningitis?

In tuberculous meningitis the fluid contains chiefly lymphocytes, and by staining, or inoculation into animals, the presence of the tubercle bacillus may be demonstrated. In other forms of meningitis the cerebro-spinal fluid, as a rule, is more turbid, contains chiefly polymorpho-nuclear leukocytes, and the causal organisms, as the pneumococcus, the diplococcus intracellularis meningitidis or other bacterium, but not the tubercle bacillus.

Differentiate a tuberculous joint from one enlarged by chronic rheumatism.

Tuberculous joint-disease occurs chiefly in children, affects usually but a single joint, has insidious onset, with slight and often characteristically reflected pain, and muscular rigidity; is persistent, and tends to cause flexion and pale, doughy thickening of joint, with later the formation of cold abscess and sinuses. Rheumatism usually involves several joints, has acute onset, is transient, with marked localized tenderness, and if severe, redness and swelling.

What part of the spinal cord is involved in progressive muscular atrophy?

The anterior horns of the gray matter.

What are the degenerative changes of arteries?

Calcareous infiltration, hyaline, fatty and amyloid degeneration.

What pathologic changes may cicatrices undergo?

Cicatricial contraction or distension, cicatricial keloid, cicatricial carcinoma, abscess and ulceration.

What is ischemic paralysis?

The loss of voluntary motion in a living part, the result of local anemia.

Differentiate between a tubercular and typhoidal ulcer of the small intestine.

The tubercular ulcer results from the action of the tubercle bacillus, is chronic, tends to have a long axis transverse (annular ulcer) to bowel, to show outlying tubercles and irregularly thickened edges and base. The typhoid ulcer results from the action of the bacillus of Eberth, tends to have its long axis parallel to gut, to have undermined edges and thin floor, and often causes hemorrhage or perforation.

Distinguish between burns inflicted on a body before death and those inflicted after death.

Vesicles containing albuminous serum and an adjacent red zone of inflammatory reaction indicate infliction of burn during life, and are absent in case of burns produced after death.

Give the causes of hemorrhage.

Increased blood pressure, atheroma, aneurysm, fatty, calcareous, inflammatory change or malignant infiltration of vessel wall, embolism, traumatism, hemophilia, scurvy, typhus fever, venoms, phosphorus poisoning, and anomalous innervation, as in hysteria.

What are the causes of lymphorrhagia?

Lymphatic obstruction or injury, as may result from trauma, pressure of neoplasms, aneurysms or inflammatory tissue, or obstruction by filaria or other parasites.

How does calcareous degeneration of the arteries influence the circulation?

Increases arterial pressure and the work of heart, causes imperfect blood supply, at times leading to gangrene, and favors thrombosis and hemorrhage (hemiplegia).

What are pyogenic bacteria?

Schizomycetes capable of inaugurating suppuration.

What changes take place in simple atrophy of the liver?

A reduction in size, with preservation of general outlines, and without noteworthy increase of stroma, or degenerative change in the liver cells.

Describe syphilitic gummata.

Rounded, soft or firm, grayish or yellowish, circumscribed masses, from five mm. to several cm. in diameter, surrounded by an area of fibro-connective tissue, and consisting of a typical granulation tissue showing mucoid degeneration or central caseous necrosis.

What changes characterize inflammation of bone?

An absorption of bone, with the ingrowth of new granulation tissue (*rarefying ostitis*) or possibly abscess formation, or a progressive ossification with resulting thickening and condensation (*condensing ostitis*).

Where and what are the pathologic changes in bulbar paralysis?

Degenerative atrophy and sclerosis, with shrinking of motor cells and degeneration of processes, affecting the glosso-labio-laryngeal nucleus in the medulla.

Give the pathologic changes in sclerosis of nerves.

An overgrowth of the supporting connective tissue and neuroglia, with thickening of blood-vessel walls and atrophic, fatty or other degenerative changes in myelin sheaths and axis cylinders.

(a) What features render a tumor malignant? (b) Mention some of the growths considered malignant.

(a) Invasion of adjacent tissue, recidivity, metastasis, the production of cachexia.

(b) Carcinoma, sarcoma, endothelioma.

What is lardaceous (amyloid, waxy, bacony) degeneration?

The transformation of tissue into a homogeneous, wax-like albuminous material, giving a mahogany-brown color with dilute Lugol's solution.

What is the pathology of plastic inflammation?

A modified serum, leukocytes and at times erythrocytes escape from the vessels. The fibrin factors in this exudate unite, producing fibrin that may cause adhesion between contiguous viscera. Later this plastic exudate may break down, or, if it be replaced by new fibro-connective tissue, more or less permanent adhesions may result.

What are some of the results of lymphorrhagia?

Chylous extravasation, lymph fistulæ, chyluria, chylothorax, chylous ascites, malnutrition, death.

What conditions may result from enlargement of lymph spaces or lymph vessels?

Capillary, cavernous or cystic lymphangioma, cystic hygroma ("hydrocele of the neck"), macroglossia (of tongue), macrocheilia (of lip), elephantiasis, lymph scrotum.

What inflammatory conditions may result in enlargement of the lymphatic glands?

Infection by pyogenic bacteria, plague, syphilis, tuberculosis.

What non-inflammatory condition may produce enlargement of lymph glands?

Hodgkin's disease (pseudoleukemia), leukemia (especially lymphatic types), lymphadenoma, secondary tumors (carcinoma, sarcoma) in lymph glands.

Give the pathologic features of mechanical hyperemia of the liver (nutmeg liver).

A chronic, passive hyperemic condition resulting from valvular heart disease, emphysema, pleuritic exudations, aneurysm, or other obstructions to venous return. The liver is more or less enlarged and is deeply mottled, this being due to the distension of the capillaries near the center of the lobules by blood, often with atrophy of the adjacent hepatic cells, while the liver cells at the periphery of the lobules may show fatty or other degenerative changes.

Describe the formation of an acute abscess.

By stages: 1. Local tissue irritation, usually from the presence of pyogenic bacteria. 2. Exudation of modified serum and many leucocytes. 3. Colliquation necrosis in affected area, resulting in the formation of cavity (abscess) filled with a liquid (pus), consisting of fluid part (liquor puris) and many dead and living leucocytes (pus cells).

Describe symbiosis with special reference to pathogenesis and cite an example.

Symbiosis refers to the modifications in the activities of different species of bacteria resulting from their association as compared with their activities when in pure culture. Thus, the injurious affects of the tubercle bacilli upon the tissues are greatly increased when the bacilli are in association with streptococci or staphylococci. Upon the other hand, anthrax bacilli become less virulent when mixed with cultures of Bacillus prodigiosus.

Give a general description of the action of agglutinins.

Agglutinins are substances observed chiefly in the blood serum of infected animals, which when brought in contact with living or dead bacteria of the same species as those having produced the infection, cause the bacteria to become immotile, and to agglutinate or collect in clumps. The action is usually specific; that is, it occurs only against bacteria of the same

species as that causing the infection. It is not necessarily associated with the death of the bacteria, and as agglutinins may be produced by the action of bacteria upon culture media, the animal body is not essential to their formation.

Describe the process of ulceration.

Ulceration or the production of an ulcer is an inflammatory process in which a definite loss of substance from a surface of the body is produced. The area may be destroyed by the injurious action of physical or animate agents, by interferences with the circulation, or as a result of the progress of tumors. The tissue of the involved area is first removed by processes of necrosis, or mechanically. The area left has borders of more or less healthy tissue which become the seat of extension or of healing of the ulcer; and a floor or base, which usually becomes occupied by granulations, or, if the ulcer be progressive, by necrotic and sloughing tissues. Ulceration may be a chronic, indolent process, may be progressive, leading to extension of the ulcer, or as usually occurs, it becomes arrested and cicatrization, or healing of the area, occurs.

Describe the changes that occur in cartilage in arthritis deformans.

The cartilage becomes softened, fissured, and develops surface excavations which may extend deeply into the bone. Simultaneously, other cartilage cells may proliferate and produce nodular, cartilaginous projections. Medullary spaces invade the degenerating and proliferating cartilage, and it is transformed in part into osteoid tissue. Villous or nodular, fatty, calcareous or bony outgrowths may spring from the synovial membrane, and if they become detached, form free joint bodies. The bones making up the joint become more flattened, more porous, excavated, or the seat of new bony processes; and fibrous ankylosis, subluxation or luxation frequently follow.

Enumerate the most ordinary senile changes that occur in the various tissues of the body.

In organs, atrophy and increase of fibro-connective tissue elements. In bones, absorption of oseous tissue, and certain changes in form, especially noted in the edentulous mandible, and in the neck of the femur. In walls of arteries and veins, arteriosclerotic changes, with tendency to calcification. In joints, degenerative changes, resembling rheumatoid arthritis of a mild type. In skin and adipose tissue, wasting and atrophy.

Describe how mitral stenosis and aortic regurgitation respectively affect the cavities and musculature of the heart.

In mitral stenosis, as the left ventricle receives insufficient blood, it may atrophy. As the left auricle insufficiently empties, it hypertrophies and dilates. Secondarily, the back pressure through the lungs increases the work of the right ventricle, which hypertrophies. The cavities of the right ventricle and left auricle are increased and their walls are thickened. The cavity of the left ventricle decreases in size, and has unaltered or thinned walls. In aortic regurgitation, much of the blood which has left the left ventricle is permitted to return, so that the ventricle receives not only the normal blood from the left auricle, but also the return leak from the aorta. This results in distension of the cavity and compensatory hypertrophy. This may cause an enormous increase in the thickness and size of the ventricle. Eventually the ventricle becomes incompetent, or in its distension produces mitral insufficiency, and there ensues an auricular hypertrophy, and dilatation, pulmonary congestion, and finally distension and hypertrophy of the right heart. An enormous heart (cor-bovinum) may thus be produced.

Describe the bacillus tuberculosis, its habitat, mode of growth and method of detection.

The tubercle bacillus has the form of a minute, slightly

curved rod, with rounded ends, and an average measurement of 2 x .35 microns. It occurs singly and in small groups. Its habitat is the tissues of vertebrates. Precise knowledge of its natural growth outside of the body is wanting. Its growth under artificial cultivation is slow, requiring several weeks for colonies to develop, and necessitates special media, such as glycerine agar, or special blood serum. Pale gray or yellowish, dry, wrinkled, rather firm, crustlike, surface masses are formed by the growth of the bacteria. Growth usually occurs only at a temperature about that of the body, in the absence of strong light, and in the presence of free oxygen.

It is detected—(a) by inoculating guinea-pigs with some of the suspected material, and six weeks later killing them and searching for the characteristic lesions of tuberculosis. Or—(b) by staining spread smears of suspected material three minutes with hot carbol-fuchsin and decolorizing for five minutes with a three per cent, solution of HCl, in absolute alcohol. Tubercle bacilli retain the red fuchsin color after this treatment, while nearly all other bacteria are decolorized.

Describe the microscopic appearances of acute parenchymatous nephritis and explain the origin of blood in the hemorrhagic form.

The microscopic changes may be chiefly of the glomerules —glomerulo-nephritis, or in convoluted tubules—tubulo-nephritis, or may affect all the parenchyma. In the capsular spaces are glomerular or desquamated epithelial cells, leukocytes, erythrocytes and plastic or granular exudate. The epithelial cells may show cloudy swelling, fatty metamorphosis, or karyokinetic changes indicating regenerative efforts. Where the walls of the vascular tuft in the glomerulus give way, a hemorrhage occurs, distends the capsules, flows down the renal tubules, coagulates there, and forms blood casts. The cells lining the tubules (especially the convoluted) show cloudy swelling, fatty metamorphosis, or even necrosis,

and hyaline, granular, cellular, or hemorrhagic casts fill the tubules.

Describe the pathologic histology of amyloid liver and state where the deposit occurs.

The amyloid substance is formed in the connective tissue framework of the liver, appears in or about the walls of the capillaries, as anuclear, homogeneous cylinders, and as irregular wax-like masses in the tissues which displace the cells of the parenchyma, and perhaps favor the atrophic, fatty, degenerative changes that they show. The amyloid substance does not take the usual nuclear stain, but is given a reddish color by gentian violet.

Describe the lesions characteristic of chronic alcoholism.

The lesions produced by chronic alcoholism also occur from other toxic causes, and it is difficult to state that any are absolutely characteristic of alcoholism alone. In the nervous system a form of multiple, peripheral neuritis (alcoholic neuritis) characterized by swelling, redness, infiltration, and degeneration that may be perineural or interstitial, occurs. The myelin may be degenerated, and the axis cylinders show varicosities or granular degeneration, and finally may be destroyed and replaced by connective tissue that is sometimes infiltrated with fat. In the central nervous system opaque thickening of the meninges with wasting of the cerebral convolutions, are common. Hemorrhagic pachymeningitis may also result. The liver may be reduced in size with irregular surface, increase of connective tissue framework, and degeneration of parenchyma (gin-drinkers' liver). The typical beer drinkers' liver is a much enlarged organ showing fatty degeneration. The stomach and intestines may be dilated, the atrophied mucosa being the seat of a chronic catarrh with fibrous interstitial changes. The artèries usually show arterio-sclerotic changes, frequently associated with cardiac dilatation. The superficial capillaries and venules, especially of the cheeks and nose, are dilated and

have thickened walls (acne rosacea). The kidneys are less affected than the organs of the digestive tract, but are often enlarged or contracted and show arterio-sclerotic changes. The resistance to tuberculosis and other infections is decreased in topers.

Describe why and how obstructive disease of the coronary arteries causes myocardial degeneration.

The coronary arteries are end arteries with only capillary anastomoses between their terminal branches, and supply the myocardium with nutriment. Therefore unless abnormal anastomoses exist or a vicarious compensating flow through the vessels of Thebesius and the coronary veins occurs, obstruction to the circulation in the coronary arteries results in ischemia and degeneration or death of the heart muscle supplied by the obstructed vessel. A coronary thrombus or embolus causes a myocardial infarct. A more gradual obstruction may lead to a fibrous myocarditis.

Explain the pathological characteristics respectively of exudative and productive renal degeneration.

In the exudative renal degeneration there is an escape of blood serum, leukocytes, at times erythrocytes, and the products of epithelial cells into the capsules of Bowman, the renal tubules, and at times into the intertubular connective tissue. In the productive renal degeneration there is a new growth of fibro-connective tissue about the capsules of Bowman, about the blood vessels, and in the capsule proper of the kidney. Often there is an association of productive and exudative changes in the same organ.

What varieties of degeneration may occur in lymph glands?

Fatty degeneration, pigmentary infiltration, calcification, hyaline degeneration, amyloid degeneration.

Mention the malignant neoplasms.

The varieties of carcinoma, including epithelioma; sarcoma, endothelioma.

What tissues are most frequently the seat of tubercular formation?

In order of frequency—lungs, lymph glands, ileum and larynx, joints, pleura, meninges, peritoneum, bones, spleen, kidneys and genito-urinary organs.

(a) On what principle are tumors classified? (b) Mention the important classes of tumors, giving an example under each class.

The varieties of normal tissue that they typify.

1. Adult connective tissue type, as fibroma.
2. Embryonic connective tissue type, as sarcoma.
3. More highly specialized tissue type, as myoma, neuroma, lymphangioma.
4. Endothelial type, as endothelioma.
5. Epithelial type, squamous, columnar or glandular, as squamous papilloma, columnar epithelioma, adeno-carcinoma.
6. Tumors of mixed type, as teratoma.

What pathologic changes may result from cerebral hemorrhage?

Cerebral hematoma, softening, cyst, cicatrix, porencephalus, atrophy or sclerosis. Atrophy of voluntary muscles and cutaneous tissues, secondary descending sclerosis of motor paths.

Give the process of tubercle development.

(1) Lodgment of tubercle bacilli, (2) Proliferation of epithelioid cells and an invasion of lymphoid cells in the affected area, (3) Fusion of epithelioid cells with formation of giant cells, (4) Central coagulation necrosis, (5) Fusion of adjacent tubercles with caseation, producing yellow tubercle.

What is (a) productive inflammation? (b) Suppurative inflammation?

(a) One characterized by the formation of new fibro-connective tissue.

(b) One characterized by the formation of pus.

What structures are principally involved in bubonic plague? How are these structures affected?

Lymphatic glands — suppurative lymphadenitis; lungs — a form of bronchopneumonia; intestinal tract—hemorrhagic gastro-enteritis; kidneys—an acute interstitial and parenchymatous nephritis; spleen—hyperplastic splenitis.

Mention the varieties of eczema.

Squamous, papular, vesicular, pustular, impetiginous, eczema parasiticum, rubrum, fissum, impetiginodes, marginatum, populosum, vesiculosum, pustulosum, squamosum, sclerosum, seborrheicum, ulcerosum.

What pathologic conditions increase the elimination of urea?

Acute fevers, inflammations, bacterial infections, in diabetes, rheumatism, gout, in lithemia.

Give the lesions of typhoid fever.

Catarrhal entero-colitis, infiltration and hyperplasia of Peyer's patches, terminating in necrosis and ulceration, hemorrhages, perforation or cicatrization. Mesenteric lymphadenitis. Splenic hyperplasia, parenchymatous hepatitis and nephritis. At times degeneration of cardiac or voluntary muscles, hypostatic congestion of lungs and ulceration of larynx occur.

What pathologic changes take place in the blood plasma?

Hypertonicity (excess of salt) hyperinosis (excess of fibrin factors); hypinosis—deficiency in fibrin factors; hydremia (excess of water); anhydremia—deficiency in water. Lipemia — contains fat droplets; melanemia — contains melanin; hemoglobinemia—contains dissolved hemoglobin. Abnormalities in alkalinity.

What conditions may cause dropsical effusion in the abdomen and in the lower extremities?

Cirhosis, or tumor of the liver, syphilitic hepatitis, valvu-

lar heart disease, pulmonary disease, neoplasms, parasites or inflammatory exudates interfering with the portal circulation, tuberculous peritonitis.

Give the causes and pathologic anatomy of lymphadenitis.

Inflammation of lymphatic glands results from irritants, especially the pyogenic bacteria, the tubercle bacillus and the bacillus of plague. The glands are enlarged, hyperemic, soft, pulpy, and infiltratd by serum and red and white corpuscles, and may suppurate.

What is calcific metamorphosis?

The transformation of cells into a calcareous or mineral substance.

Name some of the causes of active hyperemia and give illustrations.

Paralysis of vaso-constrictor or stimulation of vaso-dilator nerves, mechanic, thermic or chemic irritation, as shown in blushing, after friction of skin, application of heat or cold, or action of bacterial or drug irritants.

Illustrate and define hypostatic inflammation.

When the circulation is insufficient the blood tends to settle or stagnate in dependent parts of the body (hypostatic congestion), and a form of inflammation may ensue (hypostatic inflammation), such as the hypostatic pneumonia occurring in low forms of typhoid fever.

What are some of the phenomena attending pus formation?

Heat, redness, swelling, tenderness, throbbing pain, softening of tissue, fluctuation, pointing.

Describe the pathologic conditions in hectic fever.

Hectic fever is a persistent form characterized by high exacerbations at night, and resulting from microbic action, and, as a rule, the formation of pus within the body.

What are pathologic conditions causing favus?

The proliferation in the hair follicles of a mold, *achorion schoenleinii.*

How are secretions affected in anemia?

Usually decreased, although the urine may be increased either in bulk or relative solid contents, while the free hydrochloric acid, which may be absent from the gastric secretion in progressive anemia, may be present in increased amount in chlorosis.

What organs are most subject to tuberculosis?

Lungs, lymph glands, serous membranes, bones, spleen, kidneys, adrenals, genital organs, bladder, skin.

Name some of the changes which occur in extravasated blood.

Coagulation, solution, replacement by granulation tissue, decomposition and suppuration, desiccation and scabbing.

What glands are most frequently affected by amyloid degeneration?

Liver, spleen, kidneys, lymph glands.

To what diseases does calcareous degeneration of the arteries predispose?

Aneurysm, hemiplegia, cerebral softening, dry gangrene.

Give the varieties of tubercle.

Reticulated tubercle, lymphoid tubercle, epithelioid tubercle, miliary tubercle, submiliary tubercle, gray tubercle, yellow or crude tubercle of Laennec.

(a) What are bacteria? (b) What conditions are favorable to their increase, and (c) what is meant by their toxic products?

(a) Fission fungi or schizomycetes. (b) Warmth, moisture, albuminous media, usually best if of neutral or slightly alkaline reaction, absence of strong actinic rays. (c) Poison-

ous substances, toxins, ptomaines or bacterial proteids formed by or in bacteria.

Name some of the principal bacteria of the staphylococci and the streptococci groups.

Staphylococcus aureus, staphylococcus albus, staphylococcus citreus, streptococcus pyogenes, streptococcus erysipelatis.

Name the important pathogenic diplococci.

Diplococcus gonorrhœæ, diplococcus pneumoniæ, diplococcus meningitidis capsulatus of Weichselbaum.

What changes take place in cyanotic atrophy of the liver? Give the microscopic appearance of this diseased condition.

A persistent passive congestion, with secondary hyperplasia of the connective tissue and pigmentation of hepatic cells; microscope shows wide dilatation of capillaries and veins, with atrophy and pigmentation of hepatic cells and overgrowth of perilobular connective tissue.

Define and illustrate bacilli, micrococci, spirilla.

(a) Bacilli are rod-shaped; micrococci, spherical shaped; spirilla, spiral-shaped bacteria. (b) Bacillus tuberculosis, streptococcus pyogenes, spirillum choleræ.

Give the pathologic features of angioleucitis (lymphangitis).

The lymph vessels are inflamed, red, swollen and distended by a cell-laden liquid. Their walls are edematous, infiltrated by leukocytes, and may be broken down if the process be suppurative. The cause is almost invariably microorganismal, and there is usually an associated lymphadenitis.

Mention the structural changes that occur in tubercular joints.

Tubercles in the synovial membrane, subsynovial tissue or cancellous bone. Diffuse (tumor albus) or nodular (synovitis tuberosa) thickening of synovial membrane, or distension of

joint with inflammatory serum (hydrops) or puriform liquid (empyema); erosion of cartilage and bone; tuberculous abscess and sinus formation.

Give the possible causes of occlusion of the bile-duct.

Catarrhal swelling of mucous lining, lodgment of calculus or parasitic worm (as ascaris lumbricoides or distoma hepatinum), invasion by coccidia, cicatricial contraction of walls of duct, pressure from without by an adjacent tumor or floating kidney, involvement in a neighboring carcinoma, sarcoma, endothelioma or an inflammatory process, duodenal disease involving the terminal papilla.

(a) What causes contribute to obesity? (b) What tissues are most frequently invaded in obesity?

(a) Anemia, hemorrhages, use of malt liquors, lack of exercise, hereditary tendency, over-eating, certain dyspesias.

(b) The subcutaneous tissues and subserous tissues of abdomen, especially about kidneys, in great omentum and appendices epiploicæ.

In what order are the organs of the thorax and abdomen best examined at a post-mortem section?

Authorities differ. The following is useful: Inspection of abdominal cavity, inspection of pleura, pericardium, heart and vessels, examination of heart, lungs, organs of neck, spleen, gastro-intestinal tract, liver, pancreas, genito-urinary organs, abdominal aorta and sympathetic ganglia.

SURGERY.

Define peritonitis. State three ways in which the peritoneum may be invaded by bacteria.

By peritonitis is meant an inflammation of the peritoneum. Bacteria may invade the peritoneum through the wall of the intestine, through a wound in the abdominal wall, or through a perforating ulcer of the stomach.

What is the treatment for stenosis of the lachrymal duct?

Dilatation by means of lachrymal probes. The passage of the larger probes is preceded by division of the lower canaliculus. If the stenosis is simply due to tumefaction of the mucous membrane (as in the new-born) it may yield to medicinal agents.

What are the causes of ischio-rectal abscess?

Infection of the ischio-rectal areolar tissue with pyogenic organisms from the perineum or rectum, injuries to the perineum or rectum, and exposure to cold or wet. Suppuration in the ischio-rectal fossa may also be due to disease of adjacent or distant structures (sacro-iliac or hip joints, pelvic bones, spine, prostate).

Give an operation for excision of the tongue for carcinoma.

Kocher's operation. After all aseptic precautions have been carried out, tracheotomy is performed, a well-fitting canula is introduced, and the pharynx packed with a carbolized sponge which has a cord attached to it. The incision commences near the lobule of the ear, passes down the ante-

rior border of the sterno-mastoid muscle to its middle, along the hyoid bone to near the median line, and then upwards to the symphysis. This flap of skin and subcutaneous tissue is dissected up and held out of the way by a retractor. All the lymphatic glands in the submaxillary triangle are removed, as well as the submaxillary (and if necessary the sublingual) salivary gland, and the facial and lingual arteries are ligated close to the carotid. If any portion of the mandible is diseased it may be removed by enlarging the wound. The opposite lingual artery is now tied through a separate incision. The mylo-hyoid muscle and the reflection of the oral mucous membrane are then divided close to the alveolus, the tongue is drawn out through the wound and removed close to the epiglottis behind and close to the hyoid bone below. The entire raw surface is now painted with Whitehead's varnish, the external incision is closed by sutures, excepting the lowermost portion, in which a drainage tube is inserted, an aseptic dressing is applied, and the sponge in the pharynx is replaced by gauze packing.

How should ankylosis of the jaw be treated?

By division of the neck of condyle, by excision of condyle, removal of the vertical ramus as far as the alveolar border, or by the excision of a wedge of bone (apex toward alveolar border) from the neighborhood of the angle, and the establishment of an artificial joint in this situation (Esmarch's operation). Excision of the condyle and Esmarch's operation are the measures usually employed.

How should hemorrhage from the liver, occurring in the course of an operation, be controlled?

By tamponing with iodoform gauze, by the thermo-cautery, by ligature, and by suture.

Describe Pŏtt's fracture of the lower extremity.

By Pott's fracture is meant a fracture of the fibula about three inches above the tip of the malleolus. Dependent upon

the amount of violence, there may co-exist one or more of the following lesions: 1. Rupture of the internal lateral ligament; 2. Tearing off of the internal malleolus; 3. Fracture of the external portion of the articular surface of the tibia. The foot is practically always everted, and shows a tendency to slip backward. There are points of tenderness over the lines of fracture, the foot may be moved from side to side in the widened tibio-fibular mortise, and crepitus may be obtained.

Give the symptoms and treatment of section of the median nerve.

If divided just above the wrist there will be anesthesia over the radical side of the palm, over the palmar aspect of the thumb, index, middle, and half of the ring fingers, and over the dorsal aspect of the terminal phalanges of the same fingers. There will be paralysis of the outer group of the short muscles of the thumb (abductor, opponens, and outer half of flexor brevis pollicis), as a result of which "opposition" is impaired, the thumb remaining extended by the side of the fingers. The outer lumbricals are also paralyzed, causing loss of power of flexion of the index and middle fingers at the metacarpo-phalangeal articulation. If divided at the bend of the elbow or in the arm, in addition to the previously mentioned symptoms, there will be loss of pronation (paralysis of flexor carpi radialis), loss of power in the hand-grasp, particularly on the radial side, with probable hyperextension of the wrist (paralysis of flexor longus pollicis, of the flexor sublimis, and of the outer half of the flexor profundus digitorum), and paralysis of the palmaris longus.

Treatment: After all aseptic precautions have been carried out, the ends of the nerve are to be sought in the wound and approximated by sutures of the finest chromicized cat-gut. One or more sutures should pass through the nerve and the remainder merely through the sheath. A fine Hagedorn needle or a domestic sewing-needle without cutting edges should be employed. If difficulty is encountered in bringing the ends together, the wrist and elbow joints are flexed to a

right angle, and subsequently maintained in this position by a fixed dressing.

State the constitutional effects and give the treatment of burns.

Stage of shock or collapse: The surface of the body is covered with a cold and clammy sweat, the temperature is subnormal, the pulse is rapid and feeble, and the respirations are quick and shallow. The tongue is dry, the patient experiences great thrist, vomiting often occurs, and the urine and feces may be passed involuntarily. There is congestion of the internal viscera, particularly those in relation with the portal system.

Stage of reaction: Symptoms of septic traumatic fever, with special symptoms dependent upon inflammatory affections of the internal organs (meningitis, peritonitis, enteritis, duodenal ulcer).

Stage of exhaustion or recovery: Symptoms of septicemia or pyemia may make their appearance. Death may occur from inflammation of the lungs or pleura or from amyloid degeneration of the viscera. If repair is healthy, no abnormal constitutional condition follows the second stage excepting a certain amount of asthenia.

Local treatment: Superficial burns without vesication simply require a dusting powder such as flour or boric acid. If vesication is present, the blisters should be opened aseptically, and the part enveloped in lint soaked in carron oil (equal parts of linseed oil and lime water, with one part of oil of eucalyptus in ten of the mixture), or in aqueous solutions of picric acid (1-200). In deep burns the part should be cleansed as thoroughly as possible, and covered by a moist antiseptic dressing until the sloughs separate, when the resulting granulating surface may be treated on general principles. During the process of cicatrization, great care must be exercised lest deformity result from contraction. Such deformity may be prevented by the use of splints or weights, and particularly by the employment of Thiersch's method of

skin-grafting. When a limb has been hopelessly charred it is best to amputate in healthy tissue at the earliest favorable opportunity.

Constitutional treatment: Promote reaction by external heat, hypodermatic injection of strychnine, and some warm, stimulating fluid given by the mouth or rectum. Intravenous injection of warm saline solution is advisable in some cases. If the pain is severe, opium may be administered. During the second stage the secretions should be kept active, and the patient placed on a liquid nutritious diet. In the third stage, tonics, stimulants, and nutritious easily-digested food are indicated.

Name five of the principal complications of gonorrheal urethritis in the male.

Lymphangitis, bubo, prostatitis, cystitis, and epididymitis.

What are the indications for exsection of the knee-joint?

Tubercular disease, disorganization of joint after pyemia or osteo-arthritis, old, neglected cases of infantile paralysis where there is a flail-like limb (Wright), certain cases of compound fracture (particularly after gunshot wounds), and deformity due to fibrous or bony ankylosis in a bad position.

What is the treatment of depressed fracture of the skull?

All such cases should be trephined under aseptic precautions, and the exact amount of intracranial mischief determined. The depressed fragment may then be elevated, and any pressure upon the brain immediately relieved.

Give the indications for the removal of the mammary gland.

Carcinoma, sarcoma, diffuse hypertrophy, diffuse septic or tubercular disease, and certain cases of interstitial mastitis.

What is Paget's disease of the nipple? State the special significance of its occurrence.

Paget's disease of the nipple is said by some to be a form

of eczema, but according to high authority, it is a destructive dermatitis of the papillary layer of the skin. It may be due to psorosperms, but this is not definitely settled. The nipple affected has an excoriated, bright red surface, which discharges a yellowish viscid fluid. The excoriation spreads until the entire areola is involved and the patient complains of burning pain.

The special significance of the occurrence of the disease is that it is almost always a precursor of cancer, but this is not invariably the case.

What are the indications for incising the membrana tympani?

The evacuation of serum, mucus or pus from the tympanum, the relief of anomalies, of tension of the drum membrane, and to gain access to the tympanum for the purpose of removing intratympanic polypi or dividing synechiæ.

Describe the steps in the treatment of a scalp wound.

Hemorrhage is to be controlled by pressure or ligation. The scalp should be shaved for a distance of several inches from the margins of the wound. If the wound is very extensive the entire scalp should be shaved. All foreign substances are removed from the wound, and it is disinfected with antiseptic solutions (bichloride 1-1000). The wound should now be sutured with silkworm gut and a moist bichloride dressing (1-4000) applied. If the wound subsequently shows signs of infection, one or more of the sutures should be immediately removed, the wound again disinfected, packed with iodoform gauze, and allowed to granulate. After granulation has occurred it may be closed by secondary sutures. Primary suture should be the routine treatment in almost every case.

How can the danger of ankylosis be averted after injury to a joint?

By surgical cleanliness, rest, and the early employment of massage and passive motion.

What are the symptoms of morbus coxae in its different stages?

First stage: Pain in affected joint and corresponding knee, limping or shuffling gait, more or less fixation of the joint from muscular rigidity, the knee is slightly flexed and the limb is usually abducted. Swelling is most marked in the arthritic variety of the disease. Heat and redness are usually absent on account of the distance of the articulation from the surface.

Second stage: Pain is more acute, the child limps decidedly, atrophy of the thigh is apparent, and rigidity of the abductors is marked. The limb is somewhat flexed, abducted, everted, and apparently lengthened. Flattening of the buttocks is present, and the sulcus between the nates is no longer vertical, but inclined toward the affected side. Full extension and abduction are restricted, "starting" pains are present.

Third stage: Flexion is marked, adduction is present, and shortening is observed which is apparent at first, but subsequently actual. The whole extremity, including the gluteal region, is greatly atrophied. If the diseased leg is extended so that the knee touches the table, the lumbar curve becomes so pronounced that there is frequently room for the arm of the surgeon between it and the table. The rima natium is inclined away from the affected side and there is a compensatory double lateral curvature of the spine. Abscesses may form and point at the outer side of the thigh below the trochanter (disease of head of femur), in the pubic region (disease of acetabulum), or in the gluteal region (either form). If the abscess points above Poupart's ligament, it is intrapelvic, if below, extrapelvic.

What is hydrophobia and how is it treated?

Hydrophobia is an acute infectious disease resulting from the inoculation of a specific virus from an animal suffering from rabies.

Prophylactic treatment: Most important, as no curative

treatment exists. The wound, if made by a supposedly rabid animal, should be freely excised or thoroughly cauterized (actual cautery is best, caustic potash, fuming nitric acid). If this canont be done at once, constriction should be applied upon the proximal side of the wound. The wound resulting from excision should be thoroughly disinfected and sutured or treated openly, according to the exigencies of the case. Prophylactic inoculations with emulsions of the dried spinal cords of rabbits infected with hydrophobia (Pasteur treatment) should be made in all cases where the animal inflicting the bite was rabid, and in those cases in which it can not be proven that the animal did not have rabies. The prophylactic treatment also includes the muzzling of dogs and the rigid maintenance of a dog quarantine.

Palliative treatment: The free use of morphine, chloral and chlorofom. The patient is kept in a darkened room, and all external sources of iritation are removed. Nutritive enemata may be given.

How would you perform tracheotomy?

The patient is placed in the dorsal position, with the head extended, and a cylindric cushion placed beneath the neck. An asistant holds the head so that the median line of the face will correspond to the median line of the neck. After all aseptic precautions have been observed and the various landmarks (pomum Adami, cricoid cartilage) located, an incision, two and a half inches in length, is made in the median line, terminating at the lower border of the thyroid cartilage. This incision is made from below upward, and divides the skin and superficial fascia. The anterior jugular veins lying to either side of the median line should be avoided by cutting between them and drawing them aside. The deep cervical fascia is now divided, the interval between the pretracheal muscles recognized, and the wound deepened by blunt dissection. The pretracheal fascia is now divided, and the isthmus of the thyroid gland drawn downward. After hemorrhage has been checked and the tracheal rings clearly exposed, the

trachea is steadied by a tenaculum, and two or three rings are divided from below upward with a narrow-bladed knife. The edges of the tracheal wound are then held apart and the tracheal tube inserted.

What are the symptoms of septic surgical fever?

There is a sharp rise of temperature 24 or 36 hours after the operation or injury. The skin is hot and dry, the pulse is rapid, and the tongue is coated. Constipation, anorexia, local heat, thirst, restlessness and delirium are present. The urine is scanty and highly colored. The lips of the wound are red, swollen and tender. The temperature falls with the advent of suppuration.

What are the indications for trephining in fractures of the skull?

All punctured fractures, all compound depressed fractures, all simple depressed fractures, and all cases in which there are symptoms of intracranial mischief.

Mention the different kinds of displacement in fracture. In what directions does the line of fracture extend in the case of the long bones?

Varieties of displacement: Angular, transverse, longitudinal and rotary.

Directions of line of fracture: Transverse, oblique, spiral, longitudinal, toothed, V-shaped, and T-shaped.

What general principles govern the diagnosis of a tumor?

The age and sex of the patient, hereditary influence, the history of previous trauma, the location, shape, size, consistency, and rapidity of growth of the tumor, whether the tumor is freely movable or fixed to the surrounding tissues, whether it is painful, whether it is encapsulated, whether it has given rise to metastases, and whether these have occurred through the lymphatics or through the blood-vessels, whether the neighboring lymphatic glands are involved, and the presence or absence of cachexia.

What is the most common seat of rupture of the quadriceps extensor femoris? Give the symptoms and treatment.

At its insertion into the patella.

Symptoms: Sudden pain in the part, inability to extend the leg, and the appearance of ecchymosis several days after the injury. A swelling may be felt just above the patella (extravasation) or a gap may be observed (retraction of muscle).

Treatment: The treatment usually advised is to place the part at rest, the leg being extended on the thigh, and the thigh being flexed at the hip. This position tends to bring the torn ends together. A certain amount of compression is made at the site of the injury, and the extremity is kept in the position described until union has occurred. If perfect asepsis can be obtained, however, primary suture of the muscle (if healthy) will give better results.

What are the steps in the ligation of arteries?

The preparation of the region in which the vessel is situated for an aseptic operation, the incision dividing the skin and superfical fascia (at an angle of about five degrees to the course of the artery), the division of the deep fascia, the recognition of muscular or bony landmarks, and the location of the vessel by its pulsations, the opening of the sheath, the passage of the aneurysm needle, the tying of the ligature, and the closure of the wound.

Give the treatment for talipes calcaneus.

Division of the extensor tendons. If the tendo Achillis is attenuated, a portion of it may be excised and the ends united by suture. In other cases the tendon of a healthy peroneus longus may be grafted into the tendo Achillis, or the tubercle of the os calcis, into which the tendo Achillis is inserted, may be sawn off and reattached by a peg to the bone at a lower level (Walsham). In the paralytic variety some form of apparatus must always be worn.

What are the causes and treatment of paraphimosis?

Causes: Gonorrheal balano-posthitis, ulceration from chancre or chancroid, violent coitus, and edema following upon the retraction of a tight prepuce.

Treatment: The glans should be rendered bloodless by digital pressure or by the compression of a finger bandage and well anointed with sweet oil. The index and middle fingers of each hand are now crossed behind the glans and an attempt made to force the glans through the constricted preputial orifice by pressing upon it with the thumbs. If the edema of the prepuce is very marked, it may be punctured in several places to relieve tension. Should this measure fail, the preputial orifice (at the bottom of the *second* groove) is to be divided with a sharp-pointed, curved bistoury. Lead water and laudanum may then be applied to reduce the inflammatory swelling.

In what portion of the base of the skull may fractures lead to the escape of cerebro-spinal fluid?

Cerebro-spinal fluid may escape through the nose in a fracture of the anterior fossa involving the cribriform plate of the ethmoid (if there is a laceration of the mucous membrane below the fracture and of the dura and arachnoid above it); it may escape through the ear in a fracture of the middle fossa (if the fracture passes across the internal auditory meatus, if the tubular prolongations of the membranes in this meatus are torn, if there is a communication between the internal ear and the tympanum, and if the membrana tympani is lacerated).

Give the symptoms of sacro-iliac disease and mention the affections from which it must be differentiated.

Pain and a sensation of weakness in the lower part of the back, which is increased by standing, sneezing, or any movement which suddenly calls the abdominal muscles into play and drags on the ilium. The unfortunate individual feels as though his pelvis were coming to pieces. The pain is fre-

quently referred to the gluteal region or leg (lumbo-sacral cord). If the pelvis is not supported, movements of the lower extremity are painful. There is apparent lengthening upon the affected side, owing to the tilting downwards and forwards of the innominate bone. Lateral compression of the pelvis causes pain. The region over the joint is often swollen and tender. Abscesses may form, and these may point over the articulation, upwards into the lumbar region, forwards into the groin, or downwards into the pelvis. Sacro-iliac disease must be differentiated from sciatica, hip-joint disease, and lumbar spondylitis.

Give the differential diagnosis between fracture of the neck of the humerus and dislocation of the shoulder joint.

Fracture.	*Dislocation.*
Elbow readily approximated to side.	Elbow cannot be approximated to side without causing great pain.
Elbow can be made to touch chest with hand of affected extremity upon the sound shoulder.	Elbow cannot be made to touch chest with hand of affected extremity upon the sound shoulder.
Crepitus.	No crepitus.
Preternatural mobility.	More or less fixation.
Shape of shoulder-joint unchanged.	Flattening of shoulder-joint, the head of the bone being felt in an abnormal position.
Deformity recurs after reduction.	Deformity does not recur after reduction.
Shortening of the arm.	Elongation may be present (subglenoid), or the arm may be of same length as that of opposite side.

What are the indications for thyroidectomy?

Fibro-adenomatous and cystic goitres, parenchymatous goitres which increase in size in spite of palliative treatment, and carcinoma and sarcoma of the thyroid gland.

Describe active congestion, passive congestion. State their points of difference.

Active congestion is an increase in the amount of blood in

the more or less dilated arteries of a part, with an increase in the velocity of the blood stream.

Passive congestion is an increase in the amount of blood in the more or less dilated veins and capillaries of a part, with a diminished velocity of the blood stream.

In active congestion the part is reddened, not perceptibly enlarged, and the velocity of the blood current, the temperature and the functional activity of the part are increased.

In passive congestion the part is bluish, greatly swollen, and the velocity of the blood current, the temperature and the functional activity of the part are diminished.

What is the usual site of a vulvovaginal abscess? Give the symptoms and treatment.

In the glands of Bartholin at either side of the entrance of the vagina.

Symptoms: Heat, redness, and tenderness, together with a peculiar pyriform swelling. In the early stages this swelling is best detected by introducing the finger in the vagina and pressing outward against the pubic ramus.

Treatment: Incision and drainage. The wound should be irrigated, packed with iodoform gauze, and made to heal up from the bottom. The principles of antisepsis obtain here as elsewhere.

How would you operate for the radical cure of complete fistula in ano?

The bowels should be completely evacuated by a suitable purgative, and also by an enema, about an hour before the operation. The patient is etherized, placed in the lithotomy position, and the perineal and anal regions shaved and properly cleansed. The external sphincter is forcibly stretched by the thumbs in the rectum, and a grooved director is then passed into the external orifice of the fistula, through the fistulous tract, and brought out through the internal orifice. A curved bistoury is now introduced along the grooved director, and all the overlying tissues are divided. All

pockets and tributary branches of the fistula must be opened up and curetted. All undermined tissue and unhealthy tags of skin should be removed. Hemorrhage should be checked, the cavity carefully packed with iodoform gauze, and compression made over the anal region by a thick pad of sterile gauze and a T-binder.

What affections occur on the female external genitalia?

Vulvitis, vulvovaginal abscess, vulvovaginal cyst, hematoma of vulva, pruritus vulvæ, hypertrophy of the clitoris or of the nymphæ, urethral caruncle, noma pudendi, chancre, chancroid, syphilitic ulcerations, venereal warts, papilloma, myxoma, and epithelioma. A labial hernia or a hydrocele of the round ligament may make its appearance in this situation.

What is the cause of the impulse felt in a scrotal hernia on coughing? When is this impulse absent in such a hernia, and in what other condition resembling hernia may it be present?

In a scrotal hernia a portion of the abdominal cavity is, so to speak, within the scrotum, and any increase in the intra-abdominal pressure will, of course, be transmitted to the hernial sac.

This impulse is absent when strangulation is present.

An impulse on coughing may be present in a congenital hydrocele.

Differentiate between true and false sacculated aneurysm.

The sac of a true sacculated aneurysm contains all of the coats of the blood-vessels. In a false sacculated aneurysm some of the coats of the blood-vessel are absent.

Describe the signs of each variety of fistula in ano.

Complete fistula: There is an external opening in the skin and an internal opening in the bowel.

In complete external fistula: There is an external opening, but no internal opening.

In complete internal fistula: There is an internal opening, but no external opening. The internal opening may be discovered by direct inspection through a speculum and sometimes by palpation. This fistula is often associated with undermining of the mucous membrane or with stenosis of the bowel. Signs of inflammation may be present and pus may be discharged from the rectum.

Describe the anatomic varieties of abdominal hernia.

Oblique, or external inguinal: The hernia in all cases enters the inguinal canal through the internal abdominal ring, *external* to the deep epigastric artery. This variety is called complete if it escapes through the external abdominal ring (scrotal hernia in the male, labial in the female); it is called incomplete (bubonocele) if it remains in the inguinal canal.

Direct, or internal inguinal: The hernia gains entrance to the inguinal canal by passing through Hesselbach's triangle (bounded by edge of rectus, deep epigastric artery, and Poupart's ligament). It does not pass through the internal abdominal ring, and the neck of the hernia is *internal* to the deep epigastric artery.

Femoral: The hernia passes out of the abdominal cavity through the femoral canal and makes its appearance upon the thigh.

Umbilical: The hernia passes through the umbilical ring.

Obturator: The hernia passes through the obturator canal and may make its appearance upon the thigh.

Sciatic: The hernia passes out of the pelvis through one of the sacro-sciatic foramina (usually through the greater) and makes its appearance at the lower border of the gluteus maximus. The neck of the hernia is above the great sacro-sciatic ligament.

Perineal: All hernias which protrude through the muscular floor of the pelvis toward the perineum are designated as perineal hernias. The neck of the hernia is below the great sacro-sciatic ligament. They receive special names according

as to whether the skin, the vagina, or the rectum is pushed in advance of the hernial protrusion.

Inguino-perineal (Coley): A hernia associated with maldescent of the testis. In these cases the testicle is in the perineum and the hernia follows the testicle.

Diaphragmatic: The hernia protrudes through the diaphragm. Many of these cases are not true hernias, as they have no sac of peritoneum.

Ventral: The hernia appears at any portion of the anterior abdominal wall except the umbilicus. They are subdivided into epigastric hernia (in the median line above the navel), hernia of the linea alba (below the navel), and lateral ventral hernia.

Lumbar: A hernia making its appearance in the lumbar region. It is commonly taught that it passes through Petit's triangle, but no such instance has ever been proved by dissection (Sultan). In some instances it passes through Braun's space.

Internal hernias: 1. Hernia through the foramen of Winslow. 2. Hernia through the duodeno-jejunal recess (retro-peritoneal). 3. Hernia through the retro-cecal and ileo-cecal recesses (retro-peritoneal). 4. Hernia through the inter-sigmoid recess (retro-peritoneal). 5. Retro-vesical hernia. The lateral vesico-umbilical fold is so markedly developed that a peritoneal pocket is produced at one side.

Describe the symptoms and give the treatment of hemorrhage from the middle meningeal artery.

Symptoms: The first symptoms are those of concussion. These are followed by a temporary return of consciousness (very important) and the gradual onset of coma within 24 hours, usually without any rise in the temperature. Since the blood clot presses upon the motor area, localized twitchings or paralyses may be present. The paralysis is apt to be progressive, commencing in the face and then extending to the arm and leg. If the clot gravitates toward the base the pupil of the same side will be dilated and immobile; if on the

left side aphasia will be present, the pulse will be frequent, the respiration slow and stertorous, and the temperature will rise to 101° to 103° (or even higher) upon the side opposite the clot.

Treatment: The anterior branch of the middle meningeal is the one commonly involved, but the posterior may also be the source of the bleeding. After all aseptic precautions have been carried out, a semicircular flap is turned down and the skull trephined. The pin of the trephine is placed upon a point one and one-fourth inches behind the external angular process at the level of the upper border of the orbit (anterior branch). If the clot is not found the trephine should be immediately reapplied just below the parietal eminence at the same level as the first opening (posterior branch). The clot should now be removed, the trephine opening being enlarged with rongeur forceps if necessary, and the cavity thoroughly irrigated with sterile water. If the artery is still bleeding it should be tied by passing a cat-gut ligature through the dura and about the artery by means of a Hagedorn needle. Drainage should be provided for and the wound closed in the ordinary manner. If there is evidence that the clot is gravitating toward the base, the first trephine opening should be made at a point one-half inch lower than that above given.

Give symptoms and treatment of fracture of the nasal bones.

Symptoms: Crepitus, deformity (depression or lateral displacement), preternatural mobility, swelling, and ecchymosis. Severe epistaxis, surgical emphysema, and cerebral symptoms are occasionaly encountered.

Treatment: Reduction at the earliest possible moment in order to avoid the persistence of the deformity. It is best to give an anesthetic, as these parts are exceedingly sensitive, and the reduction should be accurate and deliberate. The fragment is best returned to its proper position by a padded dressing forceps carried well up into the nose and assisted by external manipulation. Should there be any

tendency toward a recurrence of the displacement the nasal chamber should be carefully packed with sterile gauze and the packing renewed every 24 hours.

Describe the steps in the operation of stretching the facial nerve.

After the aseptic precautions have been observed, an incision is made commencing behind the pinna opposite the external auditory meatus and extending downward and forward behind the lobule of the ear to the angle of the jaw. This incision divides the skin, superficial fascia, superficial layer of the deep fascia, and branches of the auricularis magnus nerve. The flaps are now dissected from the parotid gland, sterno-mastoid muscle, and mastoid process, care being taken to avoid the posterior auricular nerve, vein, and artery. The internal jugular vein is close to the posterior margin of the wound. After the parotid gland has been separated from the mastoid process the trunk of the nerve is found lying on the styloid process just above the posterior belly of the digastric muscle. The nerve is stretched by lifting it up with a blunt hook. The external incision is sutured and an antiseptic dressing applied.

How would you expose the brachial artery for ligation in the middle of the arm?

After all asèptic precautions have been observed, an incision is made along the inner edge of the biceps muscle. The line of the artery is from a point just to the inner side of the center of the clavicle to midway between the two condyles. The incision divides the skin, superficial fascia, twigs of the internal cutaneous nerves, and small branches of the superior profunda and anterior circumflex arteries. The deep fascia is now divided and the inner edge of the biceps recognized. The arm should be *held* at right angles to the body and not allowed to rest upon any support, since the triceps muscle would displace the biceps and our muscular guide would be lost. The biceps is now displaced outwards and the pulsa-

tions of the artery sought for. The median nerve generally lies over the artery in this position of the arm. It should be drawn inward and the sheath of the vessel opened.

Give the treatment of foreign bodies in the trachea.

The performance of a low tracheotomy, a sufficiently extensive opening being made in the trachea. If the foreign body cannot be removed at the time of the operation, by means of delicate forceps, coin-catcher, wire loop, or hooked probe, the edges of the tracheal wound should be sutured to the cutaneous incision, and the foreign body, if movable, will usually be spontaneously expelled. If the foreign body is not expelled within a day or two, the trachea and bronchi should be examined with a long probe. This excites violent coughing, which may dislodge the foreign body. The patient may be also inverted and simultaneously struck upon the back at the level of the tracheal bifurcation (fourth dorsal vertebra).

Describe a method of differentiating between (a) the urethra, (b) the bladder, and (c) the kidneys as the sources of pus in the urine.

Urethra: It is usually stated that if the urine is passed into two beakers, the first quantity will be turbid and the second one clear. If the pus originates in the posterior urethra, however, it regurgitates into the bladder and both specimens will be turbid. (Finger). The urine will usually be acid, the pus will be in small quantities, and there will be signs of the local inflammation.

Bladder: The freshly drawn urine will be alkaline, and may contain crystals of triple phosphate. The urine is increased in amount, and the last portions passed contain ropy, thick mucus. It may be possible to identify bladder cells in the sediment, and the pus corpuscles are said to be better formed than when they originate in the kidney.

Kidney: In pyonephrosis the discharge of pus may be intermittent, clear specimens being obtained for days or even

weeks. In calculous and tubercular pyelitis the pyuria is usually continuous. The pus is more intimately mixed with the urine than when it originates in the bladder or urethra, and the urine is acid in reaction.

In all three instances the history of the case will be of value.

Describe in detail the condition known as talipes equino-varus.

In the affection known as talipes equino-varus the heel is drawn up and the anterior half of the foot is adducted and drawn inwards. The inner border of the sole is concave, and traversed by a sulcus corresponding to the position of the mid-tarsal joint; the outer border is convex, and this convexity is usually covered by a bursa. The sole of the foot is arched from secondary contraction of the plantar fascia and some of the plantar muscles (particularly the abductor hallucis), and its center may be marked by a longitudinal crease due to a folding over of the outer metatarsal bones. The individual walks upon the outer border of the foot, and, in neglected cases, even upon the dorsal aspect of the cuboid bone.

In acquired cases the extensor and peroneal muscles are paralyzed, and the tibialis anticus, tibialis posticus, flexor longus digitorum, and the tendo-Achillis are secondarly shortened.

The astragalus is displaced forwards and outwards, and is the most deformed of all the tarsal bones. The neck of the bone is elongated, and the angle between the neck and the body, instead of being 35 degrees (child) or 10 degrees (adult), is increased to 50 degrees or even more. The scaphoid is pushed to the inner side of the astragalus, the tuberosity approaching or even touching the internal malleolus. The ligaments on the inner side of the foot are contracted (anterior portion of deltoid), inferior calcaneo-scaphoid, long and short plantar ligaments).

What means has the surgeon at his command for the separation of tissues?

Knife (scalpel, bistoury, tenotome), scissors, thermo-cautery, ecraseur, snare, elastic constriction, saw, trephine, chisel, osteotome, and the osteoclast.

Describe talipes equinus and give its treatment.

In the affection known as talipes equinus the heel is drawn up so that the patient walks upon the metatarso-phalangeal joints and the toes. The degree of deformity ranges from those cases in which there is simply a slight elevation of the heel to those in which the foot is almost vertical, and the plantar muscles and fascia so contracted that the patient walks upon the heads of the metatarsal bones, the toes being in a position of hyperextension (or even of hyperflexion).

Treatment: The milder cases may be treated by means of Sayre's apparatus, but subcutaneous division of the tendo-Achillis is usually required. The foot is subsequently placed in its normal position and put in plaster of Paris. The foot is kept in plaster for three months, and a mechanical support (rendering extension beyond a right angle impossible) should be worn for a year. In severe cases it may be necessary to divide the plantar fascia and elongate the tendo-Achillis by splicing. In the most obstinates cases some surgeons excise the astragalus.

What are the symptoms of a foreign body in the stomach? Give the treatment.

The symptoms of a foreign body in the stomach are frequently most obscure. There may be a sensation of weight and distress, and if the object is rough and irritating there may be local tenderness and vomiting of blood-tinged fluid. The X-ray will usually furnish valuable aid.

Treatment: If the foreign body is small, non-irritating, and capable of being passed per rectum, the patient should be made to eat large quantities of foods leaving a considerable

residue. If the foreign body will not pass the pylorus it should be removed by gastrotomy.

What are the causes of acute prostatitis? Describe a typical case of acute prostatitis and give the treatment.

Causes: Urethritis (usually gonorrheal), traumatism, stricture, retention of decomposing urine, prostatic calculi, and cystitis.

Symptoms: Deep-seated pain, accompanied by a sensation of heat and weight in the perineum. The desire to pass water is frequent and micturition is painful, particularly at the conclusion of the act. Defecation is painful, and digital examination per rectum reveals a hot and exquisitely tender swelling of the prostate gland. The perineum is also hot and tender. The patient cannot sit comfortably, but will support his weight upon one buttock to avoid any pressure upon his perineum. If suppuration occurs, as is usually the case, the pain becomes more marked and of a throbbing character, the perineum becomes red and edematous, retention of urine may occur, and the passage of a catheter causes excruciating pain. Fever is present, and there may be a marked chill. The abscess may discharge through the urethra, rectum, perineum, or above Poupart's ligament.

Treatment: Absolute rest in bed, and a bland, non-irritating diet. The bowels should be kept loose to avoid the pressure of hardened feces upon the inflamed organ. Hot hip baths sometimes cause a marked diminution of the pain. If the case is seen early, leeches followed by hot fomentations should be applied to the perineum. If the pain is intense, suppositories of morphine and belladonna should be given. If retention is present the urine should be drawn off with a small rubber catheter. If suppuration has occurred the passage of the catheter will ocasionally rupture the abscess, which may then evacuate itself through the urethra. If this does not occur, and there are evidences of deep-seated suppuration, or if the pus does not discharge freely, the patient should be etherized and placed in the lithotomy position. The finger

is now introduced into the rectum and an incision made in the median line of the perineum down to the seat of pus formation. The abscess cavity is then evacuated, irrigated, and a drainage tube introduced.

Give the course, symptoms, and treatment of varicocele.

Course: The affection appears in early adult life (rarely after 35), and is practically always upon the left side, varicocele of the right side *alone* being almost unheard of. In many cases it persists throughout life without any injury to the individual, while in some cases it may lead to atrophy of the testicle.

Symptoms: A swelling situated along the spermatic cord and feeling like a bunch of earth-worms. The swelling is compressible, gives an impulse upon coughing, disappears when the patient lies down, and reappears when he stands up, even though firm pressure is made over the site of the external ring. In most cases the scrotum is relaxed and flabby, and there may be a sensation of dragging weight, or even of actual pain. The testicle upon the affected side may be smaller or flabby, but it is nearly always perfectly healthy. Many individuals with this affection worry themselves into a condition of mental disquietude out of all proportion to the local disease.

Treatment. Palliative: A well-fitting suspensory bandage.

Operative: Operative treatment is to be adopted if the patient desires to enter the army or navy, if the affection causes physical discomfort despite the wearing of a suspensory, and if the mental condition of the patient cannot be relieved until the varicocele is removed. The operation for the cure of varicocele consists of the excision of a section of the dilated veins. The incision is to be made in the groin, and not in the scrotum, as was formerly practiced. About two inches of the cord is drawn up through the incision, the vas deferens (feels like a "whip-cord") and its accompanying vessels are carefully isolated and not included in the

double ligature (chromicized cat-gut). The ligatures are placed at a distance of from one to two inches from each other and the intervening bundle of veins is removed. One end of each ligature is cut short, and the other ends are tied so that the cord is shortened and the testicle elevated. To insure accurate apposition of the two stumps it is well to insert one or two sutures of fine cat-gut. All hemorrhage must be thoroughly arrested to insure the best results. The testicle is now drawn down into the scrotum and the cutaneous incision sutured in the customary manner.

Describe McBurney's "grid-iron" incision for appendicitis. What is the advantage of this incision and what is the disadvantage?

After the skin has been carefully disinfected, an oblique incision about three inches in length is made, commencing one inch above McBurney's line and crossing this line about an inch and a half internal to the anterior-superior spine. The position of the incision will naturally vary somewhat according to the location of the swelling, but it should always be made in the direction of the fibres of the external oblique muscle. The aponeurosis of the external oblique and a small portion of the muscle itself are now divided in the direction of the external incision. The fibres of the external oblique muscle should be *separated* (not incised), great care being taken that none of the fibres are divided transversely. Retractors are now placed in the wound and the internal oblique and the transversalis muscles are similarly split in the direction of their fibres. The transversalis fascia and peritoneum are then divided in the usual manner.

The advantage of the incision is that the abdominal wall is not weakened as much as if the muscular fibres were cut across, and therefore there is consequently less tendency to subsequent ventral hernia.

The disadvantage of the incision is that the amount of room to work in is somewhat lessened, and the performance of the operation consequently rendered more difficult.

What is the difference between congestion and inflammation?

Arterial congestion is an excess of blood in the more or less dilated arteries of a part, the velocity of the blood-current being increased. The part is reddened, the temperature is increased, swelling is scarcely appreciable, pain is not present, except that the patient may complain of a throbbing sensation, and the function and nutrition of the part are increased. If the congestion continues the part becomes either hypertrophied or inflamed.

"Inflammation is the succession of changes which occur in a living tissue when it is injured, provided that the injury is not of such a degree as to at once destroy its structure and vitality." (Burdon Sanderson). The part is reddened, the temperature is increased, swelling may be considerable, and pain is present dependent upon the character of the tissue involved and the severity of the inflammation. The function of the part is diminished and fever is usually present.

How would you diagnose and treat a case of fracture of both bones of the forearm occurring at the middle third?

The diagnosis is usually apparent at a glance. There will be angular deformity, as a rule, crepitus, a new point of motion (preternatural mobility), pain, and subsequently swelling and ecchymosis. The power of supination and pronation is entirely lost. In those cases in which the diagnosis might be doubtful the X-rays will reveal the nature of the lesion.

Treatment: Reduction by extension and counter-extension combined with manipulation at the site of the fracture. After the deformity has been reduced the forearm should be kept flexed at a right angle to the arm and in a position midway between pronation and supination (*thumb up!*) Two splints should be applied, a palmar extending from the bend of the elbow to below the wrist. The splints should be firmly and evenly padded, and must be broad enough to prevent circular constriction of the forearm. A primary roller

should never be applied, and an interosseous pad is not to be employed. Union is usually complete in four or five weeks.

Define amputation in the continuity and amputation in the contiguity of a limb.

By amputation in the continuity of a limb is meant an amputation through the bone or bones of the extremity.

By an amputation in the contiguity of a limb is meant an amputation through any of the joints of the extremity.

Define the following terms: (a) Bursitis; (b) bunion; (c) paronychia. Give the treatment for each disease.

By bursitis is meant the inflammation of a bursa.

By a bunion is meant an inflammation of one of the bursæ about the foot, usually over the metatarso-phalangeal joint of the great toe.

By paronychia or felon is meant an inflammation of a finger. It may be subcuticular, subcutaneous, thecal (suppurative teno-synovitis), or subperiosteal (bone felon).

Simple acute bursitis is treated by keeping the part at rest and the application of fomentations. If the effusion persists it may be aspirated or the entire cavity may be excised. Suppurative bursitis should be treated by early and free incision and the subsequent maintenance of effective drainage. Chronic bursitis may be met by rest and counter-irritation; if these measures fail the bursa should be dissected out. Special care must be exercised in dealing with bursæ which communicate with a joint. In tuberculous bursitis the part should be freely incised, the tubercular tissue scraped away, and the cavity packed with iodoform gauze.

The treatment of bunion is that of acute or of suppurative bursitis. If the bone is diseased it must be removed, and any malposition of the toe corrected during the period of convalescence. In some cases the underlying joint must be resected.

All varieties of paronychia are best treated by a free and early incision extending well into the inflamed area. In the

subcuticular and subcutaneous varieties care must be taken not to incise the sheaths of the tendons and thus give rise to additional infection. In the subperiosteal whitlow, the incision should go *down to the bone*, and cannot be made too early.

Describe the various steps in the operation of inguinal colostomy.

After all aseptic precautions have been observed, an incision about two inches in length is to be made, one and one-half inches above and parallel with the outer portion of Poupart's ligament. This incision should be carried down to the peritoneum. All hemorrhage having been checked, the parietal peritoneum is to be incised for about two-thirds the length of the external wound and accurately stitched to the skin. While this step of the operation is being performed the intestines should be held out of the way by a sterile gauze pad. After the colon has been found it should be drawn out of the wound, pulling from above downward, and returning the protruding bowel through the lower angle as it is drawn out from the upper one. As soon as the colon is almost taut, an opening is made in the meso-sigmoid (or descending meso-colon, as the case may be) and a glass rod passed through it so as to bring a coil of intestine out of the wound, the ends of the rod resting upon the skin. The two limbs of the intestinal coil are fixed by suturing them together beneath the glass rod. An aseptic dressing is now applied. Adhesions will be sufficiently firm by the third or fifth day, when the intestine may be opened by a transverse incision. This latter step may be performed without an anesthetic. A few days later all of the bowel projecting above the skin may be cut away and the bleeding carefully checked. Should it be necessary to open the bowel immediately, the intestine should be accurately sutured to the lips of the cutaneous incision and a Paul's tube tied in place.

Describe an operation for wry-neck.

Open myotomy of the sterno-cleido-mastoid muscle. All

aseptic details having been observed, the skin is freely incised about a half inch above the clavicle, and the sterno-cleido-mastoid muscle is freely divided at the level of the cutaneous incision, the external wound is closed, and an aseptic dressing is applied. The faulty position of the head is then over-corrected and fixed in its new position by a plaster of Paris bandage or other suitable contrivance.

What are the causes of dysphagia?

1. Pharyngeal: Acute or chronic inflammation, tuberculosis, syphilis, malignant growths, stricture, paralysis, naso-pharyngeal polypi, impaction of foreign bodies, and retro-pharyngeal abscess or tumor.

2. Laryngeal: Acute or chronic inflammation, tuberculosis, syphilis, or malignant growths.

3. Esophageal: Acute or chronic inflammation, impaction of foreign bodies, the presence of diverticula, esophagospasm, and simple or malignant stricture.

4. Extrinsic causes: Aneurysm, goitre, enlarged glands, mediastinal growths, pericardial effusion, tumors growing from the bodies of the vertebra, and backward dislocation of the sternal end of the clavicle (modified from Rose and Carless).

What are the varieties of arterio-venous aneurysm and state their points of difference.

An arterio-venous aneurysm is either an aneurysmal varix or a varicose aneurysm.

An aneurysmal varix is a direct communication between an artery and a vein without the interposition of a sac.

A varicose aneurysm is an indirect communication between an artery and a vein with the interposition of a sac.

Give the main points of difference between acromegaly, ostitis deformans, and leontiasis ossea.

Acromegaly occurs in young adults (20-30). It affects the bones of the hands and feet and those of the face (particu-

larly the lower jaw and the nasal bones). The cranial bones are not affected, with the exception of the lower portion of the frontal bones and the margins of the orbits. The bones of the hands and feet are broader, but there is no increase in their length. Microscopically the osseous structure does not differ from that of normal bone.

Ostitis deformans begins more commonly in men past middle life. It affects the long bones of the extremities and the bones of the cranium. The facial skeleton shows little change. Kyphosis is present. Pain is present in the early stages of the disease, but, unlike other bone pains, it is not worse at night. The affected long bones are increased in length. The microscope reveals changes similar to those of rarefying ostitis.

Leontiasis ossea begins in early life, and the extremities are not affected. Both the facial and the cranial bones are involved, the bones of the jaws first becoming enlarged.

Give the treatment for mammary carcinoma.

The treatment of mammary carcinoma consists of the earliest possible removal of the entire breast, together with the axillary and supraclavicular glands. All these structures should be removed in one continuous piece, so that no infected lmyphatic vessel is divided. Advanced cases may require the removal of the sternal portion of the pectoralis major and of the pectoralis minor, and in such cases the entire mass removed should also be in one piece. The sharpest knife obtainable should be used. The first thought in the mind of the surgeon should be to remove all of the cancerous tissue, the closure of the wound being a consideration of secondary importance. Adequate drainage should be provided, and skin grafting should be resorted to if sufficient cutaneous covering cannot be safely left to close the wound. Those cases are to be regarded as inoperable in which the disease is no longer local. Palliative operations may be performed for the relief of pain in certain well-selected cases.

Describe the various steps in amputation at the wrist by a long palmar flap.

After all aseptic precautions have been observed, the hand is supinated, the thumb is abducted, and an incision is made commencing at the styliod process of the radius and extending over the thenar eminence to the distal transverse palmar crease. This incision is continued transversely across the palm and then up over the hypothenar eminence to the styloid process of the ulna. This flap is now dissected away from the bones, and contains all of the structures of the palm; the flexor tendons and large nerves should be divided at the level of the wrist joint and removed. The hand is then placed in the pronated position and a slightly curved incision is made connecting the two styloid processes, the convexity of the incision being directed downward. The extensor tendons and the lateral and posterior ligaments of the wrist are divided and the hand removed. After all hemorrhage has been checked the palmar flap is brought over the ends of the bones and held in position by interrupted sutures of silkworm-gut. An aseptic dressing is then applied.

How does ulceration differ from mortification?

By ulceration is meant the molecular death of a part; by mortification (or gangrene) is meant molar death or the death of the part en masse.

Differentially diagnose phimosis and gonorrhea from phimosis and subpreputial chancroid.

In phimosis and gonorrhea there is no history of a sore on the glans or prepuce, the preputial swelling is at first simply edematous, the discharge is usually purulent, there is no localized area of hardness or tenderness, chordee is frequently present, the ardor urinæ is felt along the entire urethra, vesical symptoms are not uncommon, and bubo is very rare.

In phimosis and subpreputial chancroid there is a history of a sore, the preputial swelling is due to plastic exudate about the ulcer, the discharge is frequently bloody, a localized area of hardness or tenderness is usually present, true chordee

never occurs, the ardor urinæ is experienced only when the urine comes in contact with the ulcerated foreskin, vesical symptoms are absent in uncomplicated cases, and bubo is common.

Describe Bassini's operation for the radical cure of oblique inguinal hernia.

After all aseptic details have been observed, an incision is made parallel to and one-half inch above Poupart's ligament. This incision extends from above the center of Poupart's ligament to the base of the scrotum, and exposes the aponeurosis of the external oblique and the external abdominal ring. All hemorrhage having been checked, a grooved director is carried into the inguinal canal, and the aponeurosis of the external oblique is divided to a point well above the internal abdominal ring. The upper flap of aponeurosis is freed until the arching fibres of the conjoined tendon come into view; the lower flap is drawn down until the shelving edge of Poupart's ligament is exposed. The sac is now separated from the cord (the cord usually being behind the sac), and this separation is carried up to the internal ring. The sac is opened, adhesions properly dealt with, omentum ligated in sections, and the intestine returned to the abdominal cavity. The sac is then ligated at a point high up, just above the internal ring, and the redundant portion cut off about a centimeter below the ligature. The cord is now held up out of the wound by a strip of sterile gauze, and the conjoined tendon sutured to the deep shelving of Poupart's ligament by four or five sutures. It has been advised to place one suture *above* the cord, as this is the point at which the recurrence is most likely to occur. None of these sutures should be tied too tightly, as strangulation of the tissues greatly favors infection and interferes with primary union, which is absolutely essential to the success of the operation. The cord is now laid upon its newly-formed bed (after resection of some of the veins if necessary), and the cut edges of the aponeurosis of the external oblique are united by a continuous suture. Great care should be taken to pre-

vent any suture interfering with the circulation in the cord. The cutaneous wound is then closed with a subcuticular stitch and an aseptic dressing applied. The deep sutures should consist of kangaroo tendon, the superficial ones of chromicized cat-gut. If the operator is not sure of the asepticity of the tendon or cat-gun, silk sutures should be employed.

Give the differential diagnosis of abscess.

If an abscess is present there will a history of a preceding inflammation, fluctuation, a tendency to point, an absence of thrill, an absence of bruit, a febrile temperature (as a rule), and an examination of the blood usually reveals a polymorphonuclear leukocytosis. If the abscess lies over a blood-vessel it may have an up-and-down pulsation, but if the abscess is pushed to one side this pulsation ceases. In such a case the abscess will not change in size if pressure is made upon the vessel above or below the abscess. The exploring syringe reveals pus.

Aneurysm: If an aneurysm is present there will be no history of a preceding inflammation, fluctuation is rare, the swelling preserves its fusiform or rounded shape, showing no tendency to point, thrill and bruit are present, the pulsation is expansile, the swelling cannot be moved from the line of the blood-vessel, pressure above the aneurysm decreases its size and expansile force, pressure below the aneurysm increases its size and expansile force, there may be a difference in the pulse to the distal side of the aneurysm as compared with the corresponding vessel upon the opposite side, and leukocytosis and fever are absent (unless the sac is inflamed). The exploring syringe reveals blood.

Cysts: The overlying tissues are not edematous, nor is there a history of a preceding inflammation. The exploring syringe is of value in doubtful cases.

Tumors: The only tumor apt to be confused with an abscess is a rapidly growing sarcoma (small round cell). Although these tumors may fluctuate, inflammatory symptoms are absent, and the exploring syringe reveals a bloody fluid.

Describe intermediate and secondary hemorrhage, giving both preventive and curative treatment of each.

By intermediate hemorrhage is meant a hemorrhage recurring within twenty-four hours of an accident or operation.

Preventive treatment: The proper method of tying the ligatures (surgeon's knot), which should include the artery alone, and not the surrounding tissues. All bleeding points should be carefully and completely controlled at the time of the accident or injury, and stimulants should not be injudiciously employed.

Curative treatment: Elevation and pressure. If these measures are not successful, the wound should be opened up, irrigated with hot sterile saline solution, and all bleeding points tied. If ligatures cannot be applied, the actual cautery may be employed, or the wound may be packed with antiseptic gauze.

By secondary hemorrhage is meant any hemorrhage occurring in a wound after the lapse of twenty-four hours from the time of the injury or operation.

Preventive treatment: Thorough asepsis, the proper application of ligatures to all bleeding points, and the avoidance of the injudicious use of stimulants.

Curative treatment: This will depend upon whether the hemorrhage comes from the end of a divided artery (as in a stump) or whether it comes from an artery which has been ligated in its continuity.

If the hemorrhage comes from the end of a completely divided artery (as in a stump), elevation, exposure to the air, irrigation with hot sterile saline solution, and firm bandaging may suffice in the milder cases. If the hemorrhage recurs, the wound must be opened again, and the bleeding points ligated. If ligatures cannot be employed on account of the septic condition of the tissues, the actual cautery will be of service. All septic sloughs should be removed by the Volkmann spoon, and the wound swabbed out with carbolic solution (1-20) or with a solution of chloride of zinc (1-12). The wound should then be dusted with iodoform crystals,

firmly packed with iodoform gauze, and a firm bandage applied. If the secondary hemorrhage occurs later in the case, the wound must be opened up, the bleeding vessel isolated from the surrounding structures, and ligated higher up. If this is impossible, the artery must be ligated still higher up, or a re-amputation performed. If the secondary hemorrhage occurs after a shoulder or hip amputation, proximal ligation is the only measure to rely upon should the local treatment fail.

If the hemorrhage comes from an artery which had been ligated in its continuity, the same local treatment should be adopted as in the former instance. If this is unsuccessful, the treatment will depend upon the situation of the vessel. If the vessel is in the *trunk* (iliac) or *neck* (carotid) the wound must be opened up, the artery again ligated above and below, and the septic condition of the tissues combated by packing with antiseptic gauze. If this fails, and proximal ligation is impossible, pressure will be the last resort. In the *arm*, if cold, pressure and elevation are without effect, the original wound must be enlarged, and the vessel tied above and below. If the hemorrhage still continues, the artery must be exposed and ligated higher up through an independent incision, or amputation will have to be performed. In the *leg*, a second ligature at a higher point is of questionable value on account of the poorer collateral circulation. Should it control the hemorrhage, gangrene will result, and consquently amputation should at once be performed if the local measures are unsuccessful.

State the differences between sthenic and asthenic inflammatory fever.

Sthenic inflammatory fever occurs in the young and in the robust. It rarely commences with a chill, the temperature rises to 102 degrees or 103 degrees F., delirium if present is maniacal, the pulse is full and strong, the skin is hot and dry, and constipation is present.

Asthenic inflammatory fever occurs in the aged and in the debilitated. It usually commences with a chill, the temper-

atures rises to 104° or 105° F., the delirium is low and muttering, the pulse is rapid and weak, the skin is cold and clammy, and diarrhea is present.

Differentiate dislocation of the head of the femur from fracture of its neck, and give main essentials of treatment of each.

Dorsal Dislocation.	*Intracapsular Fracture.*
Inversion of foot.	Eversion of foot.
Immobility.	Preternatural mobility.
Head of femur not felt in its natural position.	Head of femur felt in its natural position.
The buttocks of the affected side are unduly prominent, due to the presence of the head of the dislocated bone.	Flattening of hip, the great trochanter moving in an arc of smaller radius, and relaxation of the ilio-tibial band.
Crepitus is absent.	Crepitus may be elicited (unless impaction is present).
Immediate shortening of two or three inches.	Immediate shortening of a half-inch, consecutive shortening of two or three inches.
Rarely occurs after forty-five, and more commonly in the male.	Much more common in advanced life and in the female.
Violence usually considerable.	Violence usually trivial.
Treatment.	
Reduction by flexion of leg upon thigh (for leverage), flexion of thigh upon abdomen (to relax Y-ligament), external circumduction, and extension. When reduction has been effected, the knees should be bandaged together, and the patient kept in bed for two weeks.	Reduction by extension and counter-extension. Buck's extension should be permanently employed. A sand-bag extending from the axilla to the external malleolus should then be placed upon the outer side of the extremity, and one extending from the groin to the internal malleolus upon the inner side of the extremity.
	In some cases it may be advisable to apply a plaster cast over the abdomen and over the injured extremity to below the knee, and to allow the patient to change her position. In other cases the general condition of the patient makes it imperative to absolutely disregard the fracture.

Describe a method of amputation of the thigh.

The method giving the best results will generally be a flap amputation through the skin and a circular amputation through the muscles (*mixed method*). After all aseptic precautions have been observed, and a tourniquet properly applied, the surgeon takes his position upon the right side of the extremity to be amputated and makes a straight incision upon either side of the thigh. These incisions commence at the level at which the bone is to be divided; they are as long as the diameter of the limb at their point of origin, and they divide the skin and subcutaneous connective tissue. The lower ends of these incisions should be connected by a transverse cut of similar depth, and the corners of the flap rounded off. The centers of the two incisions should now be joined by a posterior transverse incision, the corners being rounded off as before. The anterior flap is now raised, and consists of nothing but skin and subcutaneous fat, excepting at its base, where a certain amount of muscular tissue should be included. The posterior flap is then dissected up, and should consist of nothing but skin and subcutaneous fat throughout. The muscles are now to be divided by a circular sweep of the knife. An assistant retracts the muscular tissue, a cuff of periosteum is raised, and the bone is sawn through as high up in the wound as possible(about one and one-half inches above the angles of junction of the flaps). After the main vessels have been secured the tourniquet should be loosened and all bleeding points caught and ligated. Large nerves are drawn out and divided with scissors at the highest possible level, any projecting tendons are retrenched, and capillary hemorrhage is checked by hot sterile saline solution. The muscular tissue may then be sutured over the end of the bone if desired, and the edges of the flap united by interrupted sutures. The opration is concluded by the application of an aseptic dressing.

Give the symptoms and treatment of luxation of the

elbow-joint with special reference to the prevention of ankylosis.

The most frequent dislocation, that of both bones backward will be selected.

Symptoms: The elbow is flexed, the forearm is midway between pronation and supination, and slight motion causes great pain. The olecranon and the head of the radius may be felt posteriorly while the lower extremity of the humerus is prominent anteriorly. The forearm is shortened and the olecranon projects above a line connecting the two condyles.

Treatment: The patient is seated in a chair. The surgeon places his knee in the bend of the elbow and makes pressure against the lower end of the humerus, simultaneously fixing the forearm by grasping it just above the wrist. After maintaining this pressure for a short time the forearm is slowly but forcibly flexed upon the arm, the knee of the surgeon acting as a fulcrum and disengaging the coronoid process of the ulna from the trochlear surface of the humerus. The elbow is then put upon an angular splint or encased in a plaster of Paris bandage for two weeks after which passive motion and massage should be employed daily to prevent ankylosis. A lighter splint should be worn between the periods of massage for at least one week longer.

Outline the treatment for irreducible umbilical hernia.

If any contra-indication to operation exists and there is no risk of strangulation some retentive apparatus may be worn.

Practically all of these cases, however, should be operated. The entire hernial site is excised, the contents are reduced, and the abdominal wound is closed layer by layer. The patient should be kept upon her back until the union is firm and an abdominal belt may be worn for several months.

Describe the operation of perineal prostatectomy.

After all aseptic precautions have been carried out the patient is placed in the lithotomy position and an inverted V-shaped incision is made through the skin and superficial

fascia, the apex of the V being over the posterior part of the bulb and the branches extending to a point midway between the anus and the tuberosity of the ischium. The central tendon of the perineum and the recto-urethralis muscle are divided so that the rectum may easily be retracted backward giving free access to the membranous urethra and the apex of the prostate gland. The membranous urethra is incised longitudinally upon a grooved staff, the edges are caught with forceps and Young's prostatic tractor is introduced and opened out. By pulling upon the tractor the prostate is brought well down into the wound and may be readily enucleated. By making two divergent incisions into the prostate as advised by Young, the ejaculatory ducts, and the floor of the urethra may be spared. If a median bar or lobe be present it may be made to project into one of the lateral cavities and also enucleated. In some cases the finger may be substituted for the prostatic tractor with advantage.

Describe any one of the dislocations of the shoulder-joint.

Subcoracoid dislocation. There is a flattening of the shoulder-joint, the head of the humerus being felt beneath the coracoid process. The vertical circumference around the axilla is increased (Callaway's sign). A ruler or straight-edge may be brought in contact with the tip of the acromion and the external condyle of the humerus simultaneously (Hamilton's sign). If the hand of the dislocated extremity be placed upon the sound shoulder the elbow cannot be approximated to the chest-wall (Dugas' sign). The elbow is away from the side and slightly posterior. The axis of the arm is altered. The patient is unable to touch the top of his head with the hand of the dislocated extremity.

Give the diagnostic symptoms and the surgical treatment of congenital inguinal hernia.

Symptoms: The sudden appearance of an inguinal swelling which soon extends into the scrotum. This swelling gives

an impulse on coughing and when reduced flops back with a gurgle. It is not translucent. The hernia is always of the indirect variety. The hernial contents can not be differentiated from the testicle as readily as in a hernia of the acquired type. In a congenital inguinal hernia, the testicle is at the bottom of the scrotum while in the acquired variety the testicle is on the posterior wall of the scrotum at the junction of the middle with the lower third. As in the acquired variety, the symptoms will also depend upon the nature of the hernial contents. A "congenital hernia" may develop at any period of life, it is only the sac which is present at birth.

Surgical treatment: Bassini's operation (described elsewhere). Instead of removing the entire sac as in a typical Bassini, a tunica vaginalis is fashioned from its lower portion. The upper portion of the sac is ligated or sutured as in the ordinary operation for the radical cure of the acquired variety of inguinal hernia.

Give the symptoms and treatment of acute ischiorectal abscess.

Symptoms: Severe stabbing pain at one side of the rectum which is increased by defecation and digital examination. The patient is unable to sit squarely upon the buttocks but rests upon the healthy side allowing the inflamed area to project beyond the edge of the chair. Inspection reveals a hard brawny swelling at the side of the anus, which is exquistely tender; the overlying skin is reddened and edematous. The swelling soon softens and exhibits fluctuation upon palpation. A considerable amount of fever is usually present.

Treatment: Free incision and the maintenance of gauze drainage so that the cavity will heal up from the bottom.

Give symptoms and treatment of gun-shot and stab-wounds of the abdominal wall involving the intestines.

Symptoms: The presence of a wound of entrance and possibly also one of exit. The most characteristic symptoms of a wound of the intestine are localized pain and rigidity of the

overlying muscles. The other symptoms are so variable that small dependence may be placed upon them. Shock may or may not be present.

Treatment: While a masterly inactivity may be justifiable in military practice, there is but one course for a competent abdominal surgeon to pursue when he can give his patient the advantages of thorough asepsis. After all aseptic precautions have been insured, the wound of entrance should be enlarged though it is usually best to make a median incision of sufficient length to allow the operator to quickly inspect the entire length of the intestinal tract. The small intestine should be followed from one end to the other, the assistant replacing the bowel as soon as the surgeon finishes his examination so that only a single coil is exposed at any one time. The large intestine is then to be quickly but thoroughly examined. The possibility of an extraperitoneal wound should also be remembered. All perforation should be quickly closed by Lembert or purse-string sutures. If several perforations are close together, time may be gained by resecting the gut and making an end-to-end anastomosis by means of a Murphy button. If more than half of the lumen would be encroached upon by repairing a perforation, resection is advisable. If these cases are operated upon early (within four hours) irrigation is not necessary. If extravasation has occurred, however, the peritoneal cavity must be thoroughly irrigated with a large quantity of normal saline solution. Drainage may or may not be necessary. Thoroughness and rapidity are indispensable to the success of the operation.

Give the symptoms and treatment of fracture of the base of the skull.

The general symptoms may be those of concussion, compression or laceration of the brain.

The local symptoms will depend upon the cerebral fossa involved.

In the anterior fossa, if the orbital plate be involved, there

will be subconjunctival ecchymosis and possibly a certain degree of proptosis as the eyeball may be pushed forward by retrobulbar hemorrhage. If the cribriform plate of the ethmoid be involved, blood and cerebrospinal fluid will escape from the nose. Loss of smell may be present.

In the middle fossa those signs will be present which are described upon page 409.

In the posterior fossa the symptoms are ill defined. There may be bleeding from the mouth or the blood may be swallowed and subsequently vomited. Deep-seated ecchymosis may become manifest among the muscles at the back of the neck. The cranial nerves are rarely involved.

Treatment: Absolute rest in bed. Perfect quiet, the exclusion of light and sound, a restricted diet and the administration of a brisk mercurial purge. The external auditory meatus should be thoroughly disinfected, plugged with antiseptic gauze, and further protected by an antiseptic pad over the ear of the affected side. The nares and throat should be kept as clean as possible by the use of an antiseptic spray.

Describe the varieties and the treatment of fractures of the patella.

The ordinary fracture of the patella is due to muscular action. It is transverse, almost always complete, and the fragments are usually distinctly separated.

The safest method of treatment is to fix the knee-joint, reduce the intra-articular effusion by evaporating lotions, pressure, or aspiration and then to hold the fragments in position by the use of Agnew's posterior splint, adhesive plaster, and bandages. This treatment can effect only a fibrous union.

The only way in which a perfect result may be secured is by making a free longitudinal incision over the fracture, removing the clots and fibrous tissue from between the ends of the fragments, drilling the fragments obliquely, and wiring them together. If rigid asepsis is not secured the patient may lose his leg or even his life. This is the treatment to be adopted in young active patients whose livelihood depends

upon a perfect functional result. If the patient be past middle age and of sedentary habits the treatment with the posterior splint and the resulting fibrous union may be perfectly satisfactory to him if he does not care to assume the risk of the operative procedure.

The second and rarer variety of fracture of the patella is that due to direct violence. It is usually stellate but may be oblique, longitudinal, or even transverse. It is frequently incomplete and the fibrous expansion of the quadriceps may not be torn, so that the fragments are not displaced. The overlying tissues are bruised and swollen.

The posterior splint and evaporating lotions usually give good results in these cases. They are not so favorable for operation on account of the contusion of the overlying tissues. It is exceptional that operation is required for a fracture of this type.

Describe the treatment for fracture of the shaft of the femur at the middle third.

These fractures are to be treated with a long external splint provided with a foot piece (Desault's), by three shorter splints applied to the circumference of the thigh, and by extension. The bed should be hard and firm. The foot is firmly bandaged to the foot-piece by a figure-8 bandage, all bony prominences being carefully padded. The short splints are then applied to the anterior, inner and posterior aspects of the thigh and should extend to the knee-joint or slightly beyond it. They are to be held in position by two broad pieces of elastic webbing. An assistant now makes traction upon the splint until the deformity is reduced and the extremity is of the same length as its fellow. The pieces of webbing are then tightened and secured, and the upper portion of the splint is fixed to the body of the patient, preferably by a broad piece of muslin which is sewn to the splint, passed beneath the body of the patient and then brought back to the splint where it is secured. This broad piece of muslin prevents anterior displacement of the splint. In addition to

this, most surgeons prefer to make permanent extension, the stirrup for which is applied before the extremity is fixed upon the external splint. Union should be secured in about eight weeks but no weight should be born upon the extremity until the end of the twelfth week.

Describe a cartilaginous tumor. Where are such growths most commonly found?

A cartilaginous tumor (chondroma) is a tumor composed of hyaline cartilage. They are most commonly found in connection with some of the long bones, particularly the metacarpal bones and phalanges of the hand, the humerus, the tibia, the femur, and rarely the ribs. They may also occur in the parotid gland, testicles, breast, or thyroid gland, but in these situations they are usually associated with some other variety of tumor.

Mention the inflammatory diseases of bone.

Periostitis, ostitis, and osteomyelitis.

What is inflammation? How does inflammation extend and how may it terminate?

"Inflammation is the succession of changes which occur in a living tissue when it is injured, provided that the injury is not of such a degree as to at once destroy its structure and vitality." (Burdon Sanderson.)

Inflammation may extend by continuity, by contiguity, through the blood vessels, and through the lymphatics.

Inflammation may terminate by resolution, retrogression, suppuration, ulceration, or gangrene.

State the distinction between the antiseptic and aseptic wound treatment.

In antiseptic wound treatment an effort is made to destroy the germs in a wound, as well as to prevent the entrance of more bacteria. The greatest reliance is placed upon chemical agents.

In aseptic wound treatment an effort is made to prevent the

entrance of germs into a wound. The greatest reliance is placed upon mechanical purification and upon sterilization by heat.

Mention the general characteristics of a benign tumor as distinguished from a malignant tumor.

Benign tumors, in contradistinction to malignant tumors, are usually encapsulated, grow slowly, do not infiltrate, are not painful (except by pressure), do not give metastasis, do not recur upon removal, produce no cachexia, and do not cause death (except by location).

What are the indications for ligature of the lingual artery? Give the steps of the operation, omitting aseptic details.

The lingual artery is most frequently tied as a preliminary procedure to removal of the tongue. Other indications for its ligation are to control hemorrhage from the artery or its branches, to check the growth of advanced carcinoma of the tongue, and certain cases of macroglossia.

The patient should be on his back, his shoulders raised, and his head extended and turned to the opposite side. Starting just below the symphysis of the chin, an incision is made which passes downward and outward to the greater cornu of the hyoid bone, and then upward to the angle of the jaw, ending at about the level of commencement of the incision, but not endangering the facial artery. This incision divides the integument, both layers of the superficial fascia with the enclosed platysma, and exposes a portion of the submaxillary gland. The deep fascia covering the submaxillary gland is now incised and the gland loosened and held up by a retractor. We have now exposed Lesser's triangle, formed by the hypoglossal nerve above and the two bellies of the digastric muscle below. The floor of this triangle is formed by the hyoglossus muscle. The stylo-hyoid and the tendon of the digastric are now drawn downward, the lingual vein and the hypoglossal nerve are drawn upward, and an incision is carefully made

through the hyoglossus muscle just above the hyoid bone. In making this last incision, which exposes the artery, care must be taken to avoid wounding the middle constrictor and consequently opening the pharynx. The submaxillary gland and its duct must also be protected from injury lest a salivary fistula result. The aneurism needle is now passed about the artery, the ligature tied, the external wound sutured, and an aseptic dressing applied. The artery may also be secured before it passes beneath the hyoglossus, and the danger of opening the pharynx is thus greatly lessened.

Name the different varieties of malignant tumors.

Sarcoma (round, spindle, and giant-cell, melanotic, alveolar, lympho-sarcoma, and endothelioma) and carcinoma (epithelioma, scirrhus, encephaloid, melanotic, and colloid).

What are the chief affections of the scrotum?

Intertrigo, eczema, erysipelas, ecchymosis, edema, chancre, chancroid, syphilitic eruptions, tubercular ulceration, elephantiasis (lymph-scrotum), urinary fistula, tubercular sinuses, gangrene, lipoma, sebaceous cyst, and epithelioma.

What other methods beside the use of the knife are employed to remove a carcinoma from superficial surfaces?

Caustics and the X-rays.

Name the principal operations for stone in the bladder.

Perineal lithotomy, supra-pubic lithotomy, and litholapaxy.

Name the different varieties of benign tumors.

Lipoma, fibroma, chondroma, osteoma, glioma, myxoma, angioma, lymphangioma, myoma, neuroma, adenoma, and papilloma.

Relate the causes of intestinal obstruction.

Acute obstruction: 1. Strangulation by bands, adhesions or apertures; 2. Volvulus; 3. Impaction of foreign bodies; 4. Kinking of the gut (rare); 5. Acute intussusception; 6. The termination of a chronic obstruction.

Chronic obstruction: 1. Impaction of feces, gall-stones, foreign bodies; 2. Intestinal affections, such as stricture, tumors, angulation of the gut from contraction of adhesions, matting together of intestinal coils; 3. Compression of the intestine by tumors or exudates outside of the bowel.

Describe the ligation of the femoral artery at any selected point.

Ligation at the apex of Scarpa's triangle. The line of the artery is from a point midway between the anterior superior spine of the ilium and the symphysis pubis to the adductor tubercle on the inner condyle of the femur. The patient should be on his back, with the thigh abducted, rotated outward, and slightly flexed. After all aseptic details have been carried out, an incision is commenced three inches below Poupart's ligament and carried downward for about three inches in the line of the artery, dividing the skin, superficial fascia, and fascia lata. If the lymphatic glands are exposed they may be held to one side or removed. In making the incision the internal saphenous vein should not be wounded. The sartorius muscle should now be located, and beneath this muscle the artery will be found. Remember that the fibers of the sartorius run downward and *inward,* while those of the adductor longus run downward and *outward.* The sheath should be opened upon the outer side and the crural branch of the genito-crural nerve and the long saphenous nerve avoided. The aneurysm needle is to be passed from within outward. The cutaneous wound is then sutured and aseptic dressing applied.

What are the chief surgical diseases of the groin?

Inguinal hernia, femoral hernia, lymphadenitis, and encysted hydrocele of the cord. Psoas abscess, hip disease, and pelvic abscess may give rise to swellings, which are first observed in the groin.

How are wounds classified?

Incised, lacerated, contused, punctured, poisoned, and gun-

shot. They may also be divided into septic and aseptic. Wounds in the vicinity of great serous cavities are divided into penetrating and non-penetrating. Wounds are also spoken of as being either subcutaneous or open.

Describe the anastomosis which takes place after ligation of the femoral artery at its middle third.

The profunda femoris anastomoses with the articular branches of the popliteal and with the tibial recurrent; the comes nervi ischiadici anastomoses with the perforating branches of the profunda femoris and with the articular branches of the popliteal and tibial recurrent.

Where should the opening be made in order to reach the antrum in a case of abscess of the middle ear?

In the posterior superior angle of the suprameatal triangle of Macewen, which is bounded above by the posterior root of the zygoma, in front by the upper and posterior segment of the osseous external meatus, and behind by a line drawn tangent to the bony meatus and almost at right angles to the posterior root of the zygoma. The chisel is to be directed slightly forward to avoid wounding the sigmoid sinus, and care should be taken to avoid injury to the facial nerve.

What agents are employed for the production of local anesthesia?

Ice and salt, carbolic acid, ethyl chloride, cocaine (intradermic, infiltration, perineural and paraneural methods), eucaine, and nirvanin.

What are the causes of secondary hemorrhage?

Chief cause: Septic arteritis.

Contributory causes: 1. Early absorption of ligature; 2. Faulty application of ligature; 3. Ligature too near a collateral branch; 4. A diseased condition of the arterial wall; 5. A state of the blood unfavorable to wound repair (albuminuria or diabetes); 6. Increased blood pressure (plethora,

Bright's disease, fever, excitement, injudicious administration of stimulants).

What are the causes of esophageal stricture?

Gongenital narrowing, the cicatricial contraction of healed ulcers(due to the ingestion of corrosive liquids or to syphilis), carcinoma, polypoid tumors projecting from the mucosa, and external pressure (aneurism, goitre, sarcoma of glands or of vertebræ, pericardial effusion). Strictures near the cardiac orifice may arise from the healing and contraction of a gastric ulcer.

At what point is paracentesis thoracis preferably performed?

At the most dependent point of the effusion. The site usually selected is in the seventh or eighth interspace just below the angle of the scapula or in the posterior axillary line.

What are the predisposing and what are the exciting causes of abdominal hernia?

Predisposing causes: Early life, male sex, occupations demanding great muscular exertion, structural defects (elongation of the mesentery, a patent funicular process), heredity, relaxation of the abdominal wall from disease, weakening certain portions of the abdominal wall by injury or operation, phimosis, pertussis, bronchitis, urethral stricture and constipation.

Exciting cause: Any increase of the intra-abdominal pressure.

What are angiomata?

Angiomata are tumors composed of blood vessels, some of which are of new formation.

Define volvulus and give its treatment.

By volvulus is meant a twisting of the gut in such a manner that the intestinal lumen is occluded and the circulation of the bowel affected. Treatment: Celiotomy. An attempt may be made to untwist the intestine, but this is usually impos-

sible. If the attempt succeeds a recurrence of the condition should be guarded against by shortening the mesentery. If the attempt fails one of three courses may be pursued:

1. An anastomosis may be performed between the bowel above and that below the volvulus.

2. Resection of the portion of intestine involved, followed by circular enterorrhaphy.

3. The making of an artificial anus. If the large intestine is involved, as is usually the case, the latter course is probably the best one.

What is an abscess?

An abscess is a circumscribed collection of pus in a cavity of abnormal formation.

How does a carbuncle differ from a furuncle?

A carbuncle is a gangrenous inflammation commencing in the subcutaneous tissues and extending to the skin. Carbuncles are usually single, occur most commonly after middle life, show a predilection for the back of the neck or interscapular region, and discharge through more than one opening. They are larger, flatter, and accompanied by greater constitutional disturbances than are furuncles.

A furuncle is a gangrenous inflammation commencing in the skin and extending to the subcutaneous tissues. Furuncles are usually multiple, occur most commonly during adolescence and early adult life, show no predilection for any portion of the body, and discharge through a single central opening. They are smaller, more conical, and accompanied by less constitutional disturbance than are carbuncles.

What anesthetic would you select for an operation about the mouth?

Chloroform, unless contra-indicated.

What is an adenoma?

An adenoma is a tumor, the minute structure of which resembles that of a gland. Unlike normal glands, these tumors have no secretory ducts and no physiologic function.

Through what channels is carcinoma disseminated?

Through the lymphatic channels.

Describe a dissecting aneurysm.

A dissecting aneurysm is one in which the blood breaks through an atheromatous ulcer in the intima and burrows its way through the substance of the media; the sac of the aneurysm is formed within the wall of the vessel.

What are the varieties of hydrocele?

Hydroceles of the cord: 1. Diffuse; 2. Encysted.

Hydroceles of the testicle: 1. Vaginal; 2. Congenital; 3. Infantile; 4. Hydrocele of the funicular process (lower portion); 4. Encysted; 6. Hydrocele of a hernial sac.

Enumerate the diagnostic points in intussusception.

Colicky abdominal pain, vomiting, tenesmus, the passage of blood-stained mucus or pure blood, and the presence of a sausage-shaped tumor, which usually is situated in the line of the colon, an absence of resistance being observed in the iliac fossa. In advanced cases rectal examination may reveal the presence of the intussusceptum. Acute intussusception is more common in early childhood; chronic intussusception is more frequently observed in adults.

What structures are divided in the operation for strangulated femoral hernia?

Skin, superficial layer of superficial fascia, cribriform fascia, femoral sheath, septum crurale, subserous areolar tissue, parietal peritoneum, and the seat of constriction, which is practically always the lunated edge of Gimbernat's ligament. The superficial external pudic artery is always cut and the superficial epigastric is usually divided.

With what conditions may aneurysm be confounded?

Abscesses, tumors and cysts which are situated near a blood-vessel, and pulsating tumors of bone.

Where is the swelling and fluctuation most prominent in synovitis of the ankle joint?

At both sides of the tendo Achillis and in front of both malleoli (between the external malleolus and the extensor communis digitorum tendons and between the internal malleolus and the tibialis anticus tendon).

Give a classification, either original or from competent authority, of burns.

Dupuytren's classification is the best. He divided all burns into six classes or degrees: 1. Superficial burns followed by redness and desquamation of the epidermis; 2. Burns followed by the formation of vesicles or bullae; 3. Burns destroying the cuticle and a portion of the true skin; 4. Burns extending into the subcutaneous areolar tissue; 5. Burns involving deeper structures, such as muscles and tendons; 6. Burns involving all of the constituents of the part.

Define an acute and a chronic abscess.

An acute abscess is one which develops with all the signs and symptoms of inflammation. It contains pus.

A chronic abscess is one which is formed without the signs and symptoms of inflammation. As a rule they are tubercular, and do not contain true pus unless a mixed infection has occurred.

Mention the causes of dislocation. Give the cardinal symptoms of dislocation.

Predisposing causes: 1. The anatomic peculiarities of the joint; 2. The situation of the joint; 3. Active adult life; 4. The male sex.

Exciting causes: 1. External violence (direct or indirect); 2. Muscular action.

Symptoms: 1. An alteration in the shape of the joint, the displaced articular extremity being frequently felt in an abnormal position; 2. An alteration in the length of the affected member (shortening or elongation); 3. More or less

immobility of the affected joint; 4. An alteration in the direction of the axis of the extremity.

Dislocations, like fractures, are usually accompanied by pain, swelling and ecchymosis.

How are amputations classified in regard to time of operating? What period is most favorable for operation?

Primary; the amputation is performed before the development of inflammation.

Intermediate; the amputation is performed during the existence of active inflammation.

Secondary; the amputation is performed after the subsidence of the inflammatory phenomena.

The primary period is the one most favorable for operation.

Under what circumstances should an artery be ligated in its continuity? What instruments are required for the operation?

An artery should be ligated in its continuity to check hemorrhage, to promote the cure of an aneurysm, to diminish the rate of growth of a tumor, to reduce the blood supply of an organ, and as a preliminary step to the removal of some vascular structure (such as the tongue). The instruments required are a scalpel, dissecting forceps, retractors, a grooved director, several hemostats, an aneurysm needle, ligatures, needles, and sutures.

What are the causes of stricture of the rectum?

Congenital malformation, syphilis, carcinoma, dysentery, tuberculosis, gonorrhea, traumatism or operations involving the greater portion of the circumference of the bowel, repeated attacks of inflamed hemorrhoids, chronic proctitis, inflammatory thickening outside of the gut, as in cases of pelvic cellulitis after labor, and tumors pressing upon the rectum and narrowing its lumen.

Define nephrorrhaphy, nephrotomy, nephrectomy. Give an indication for the performance of each.

By nephrorrhaphy is meant the stitching of a kidney to the posterior wall of the abdomen. Indication, floating kidney.

By nephrotomy is meant the cutting into kidney. Indication, renal calculus.

By nephrectomy is meant the excision of a kidney. Indication, a primary malignant renal growth.

Name the methods of inflating the tympanum.

Valsalva's, Politzer's, and by means of the Eustachian catheter.

What are the conditions which render excision of the lower jaw advisable?

Malignant tumors of the mandible, malignant tumors in the adjacent tissues involving the bone secondarily, traumatism, and necrosis may render excision advisable.

What are the complications of dislocation of the hip?

Fracture of the acetabulum (with or without injury to the pelvic viscera), fracture of some portion of the upper extremity of the femur, rupture of the femoral artery, paralysis from compression or rupture of a nerve-trunk, and extensive laceration of the neighboring soft parts.

What arteries need ligating in amputation at the middle third of the leg? Describe your method of ligating.

The anterior tibial, the posterior tibial, and the peroneal. The anterior tibial artery will be found just above the interosseous membrane lying between the tibialis anticus and the extensor proprius hallucis. The artery should be freed from the surrounding structures and ligated separately or together with the two venae comites, care being taken not to include the anterior tibial nerve. If the artery cannot be reached owing to excessive retraction, the patient should be turned on his face, when the weight of the stump will extend the limb and make the vessel much easier of access. The posterior tibial will be found behind the tibia lying upon the flexor longus digitorum or between it and the tibialis posticus. It should be freed from surrounding structures and ligated separately or together with its two venae comites;

care must be taken not to include the posterior tibial nerve. The peroneal artery will be found behind the fibula between the tibialis posticus and flexor longus hallucis or surrounded by the fibres of the flexor longus hallucis. It should be freed from surrounding structures and ligated separately or together with its two venae comites. Both the posterior tibial and the peroneal arteries will be found anterior to the deep transverse fascia of the leg. After these three arteries have been secured, the tourniquet should be loosened and any other bleeding point seized and tied.

Where may a ligature be applied for aneurysm of the popliteal artery?

Preferably at the apex of Scarpa's triangle or in Hunter's canal. It may also be applied in the upper portion of the popliteal space, just after the passage of the artery through the opening in the adductor magnus.

What are the indications for litholapaxy (rapid lithotrity) as compared with (a) lateral perineal lithotomy; (b) median perineal lithotomy; (c) suprapubic lithotomy?

Unless some contra-indication exists litholapaxy is the operation par excellence. The contra-indications are: 1. Encysted calculus (absolute contra-indication); 2. A stone larger than 1½ inches in diameter, though many surgeons will crush much larger stones; 3. Stones consisting of calcium oxalate are so hard that the crushing operation is difficult and sometimes impossible; 4. Excessive irritability of the urethra; 5. Urethral stricture of old standing not capable of dilatation or the existence of false passages; 6. Cystitis; 7. Enlarged prostate; 8. Sacculated or contracted bladder (holding less than six ounces); 9. Extensive renal disease (unless there is no doubt that the operation may be quickly performed).

Lateral perineal lithotomy is indicated: 1. Where cystitis and great irritability of the bladder are present; 2. In phosphatic concretions; 3. If the bladder is contracted.

Median perineal lithotomy is rarely performed, as the opening is much smaller than in the lateral operation. The advantages claimed for it are the small amount of hemorrhage and the lessened danger of urinary infiltration and injury to the ejaculatory ducts.

Suprapubic lithotomy is to be performed: 1. When the stone is too large to crush; 2. If the stone is encysted; 3. If old strictures or an enlarged prostate is present; 4. When the patient cannot assume the lithotomy position (ankylosis of left hip, rachitic contraction of pelvis, presence of a tumor); 5. When the crushing operation is not deemed advisable in young boys.

The indications for the suprapubic operation have been greatly extended in recent years at the expense of the perineal method. The only two absolute contra-indications to the procedure are severe septic cystitis and contraction of the bladder.

What fractures do not present mobility? Under what circumstances is crepitus absent?

Impacted fractures and incomplete fractures do not present preternatural mobility.

Crepitus is absent in impacted fractures, in incomplete fractures where there is great separation or over-riding of the fragments, and where portions of muscle, tendon, or periosteum are between the fragments.

What symptoms follow division of the radial nerve?

Anesthesia over the radial side of the dorsal surface of the wrist and hand and over the dorsal surface of the thumb, index, middle, and radial half of ring fingers, excepting over the terminal phalanges.

What conditions of the kidneys require nephrectomy?

Any of the following conditions may require nephrectomy: Carcinoma, sarcoma, tuberculosis, calculous pyonephrosis, hydronephrosis, traumatic lesions (particularly if compli-

cated by laceration of the peritoneum), and some cases of ruptured ureter.

How may a quart of normal salt solution be prepared at the patient's home?

By dissolving two teaspoonfuls of salt in a quart of water. The solution may be sterilized by boiling. The percentage of salt is not accurate, but it is near enough for practical purposes.

What are the principal affections of synovial bursae?

Acute simple bursitis, acute suppurative bursitis, chronic fibroid bursitis, chronic bursitis with effusion (house-maid's knee), chronic tuberculous bursitis, syphilitic and gouty deposits.

What muscles are divided in the operation for (a) diverging strabismus, (b) converging strabismus?

(a) The external rectus, (b) The internal rectus.

How would you reduce a dislocation of the inferior maxillary bone?

It is only necessary to depress the condyle below the level of the eminentia articularis, when the masseter, temporal and internal pterygoid muscles will readily draw it back into the glenoid cavity. The patient is to be seated, the surgeon stands in front of the patient and presses down upon the molar teeth with his two thumbs, which are guarded by a towel. This pressure is continued in a downward and backward direction until the condyle clears the eminentia articularis, when the chin is to be raised by the fingers. The jaw should be kept at rest for four or five days by a Barton bandage.

Name the varieties of shoulder-joint dislocations.

Anterior (subcoracoid, intracoracoid, subclavicular), downward (subglenoid, erecta), posterior (subacromial, subspinous), and upward (supraglenoid).

What are the possible mechanical obstructions in the reduction of fractures?

Muscular spasm, the interposition of muscle or periosteum between the ends of the fragments, impaction of the fragments, perforation of the skin by one of the fragments, and effusion into a joint (in fracture of patella or of olecranon).

What are the sources of wound infection?

A wound may be infected by the foreign body making the wound, by any foreign substance or fluid coming in contact with the wound, by the blood, by the skin of the patient, by the hands of the surgeon and assistants, and by instruments, ligatures, sutures or dressings. Aerial infection is very rare, though possible.

Relate the difference between a sinus and a fistula.

A sinus is an abnormal canal leading from the skin or mucous membrane to an abnormal cavity. It has but one opening.

A fistula is an abnormal communication between the skin or mucous membrane and a normal cavity. It has two openings.

Define pyemia and give its symptoms.

By pyemia is meant a general infection of the blood with pyogenic organisms. It is septicemia plus metastatic abscesses.

Symptoms: Repeated rigors with a markedly remittent temperature, exhausting diaphoresis, hyperesthesia of the skin, suppuration in joints not usually involved in other febrile affections (sterno-clavicular, sacro-iliac), and diarrhea. If there is an open wound it will become dry and glazed. Physical examination will reveal the signs of pulmonary congestion or pneumonia, metastatic abscesses may be detected in various portions of the body, and examinations of the blood show a leukocytosis. The mind is usually clear. Toward the termination of the affection the patient may fall into the typhoid state.

What are the indications for castration?

Castration may be performed for malposition, for tuberculous disease, for old standing hematoceles, for simple or malignant tumors, after some injuries, and for chronic enlargement of the prostate.

Give the causes and sequelae of suppurative middle ear disease.

Causes: Inflammations in the naso-pharynx and infected wounds of the membrana tympani.

Sequelæ: These may be divided into the extracranial, cranial and intracranial.

Extracranial: Eczema of meatus, furuncles of meatus, subperiosteal abscess and necrosis of tympanic plate.

Cranial: Necrosis of ossicles, caries or necrosis of temporal bone, polypi, facial paralysis and mastoiditis.

Intracranial: Extradural abscess, localized or diffused meningitis, thrombosis of the lateral sinus, and cerebral or cerebellar abscess. Remember that 50 per cent. of all cases of brain abscess are due to this cause.

State the causes of exophthalmos.

Paralysis of the third cranial nerve, intra-orbital aneurysm, intra-orbital tumors, thrombosis of cavernous sinus, fracture of anterior fossa with laceration of cavernous sinus, empyema of the antrum, tumors of the antrum, and exophthalmic goitre.

What are gliomata and where are they found?

Gliomata are tumors composed of neuroglia. They occur in the brain, spinal cord, and rarely in the cranial nerves. The so-called glioma of the eye-ball is really a sarcoma.

Mention obstacles to reduction of dislocations.

Muscular resistance, anatomical peculiarities of the joint, the interposition of shreds of the capsular ligament, fracture of the bone involved, and the presence of adhesions (old dislocations).

Define torticollis. Give the differential diagnosis of torticollis and cervical caries.

Torticollis or wry-neck is a deformity due to contraction of certain muscles on one side of the neck. The sterno-mastoid is first affected, but the trapezius, the splenius, the platysma, and even the cervical fascia may be involved.

In cervical caries motion in all directions is restricted, and pain is elicited by pressing upon the cervical vertebræ; in torticollis motion is restricted in but one direction, that in which the muscle involved is put upon the stretch.

Describe hypospadias, epispadias, phimosis, and paraphimosis.

Hypospadias is a malformation in which the urethra opens upon the under surface of the penis.

Epispadias is a malformation in which the urethra is partially or wholly exposed on the upper surface of the penis.

Phimosis is that condition in which the prepuce is elongated, and in which the preputial orifice is so narrow that it can not be retracted behind the corona glandis.

By paraphimosis is meant a strangulation of the glans penis by a prepuce which has been forcibly retracted and cannot be replaced.

What is genu valgum? State how genu valgum should be treated.

Genu valgum or knock-knee is a deformity in which there is an abduction of the legs from the median line, together with a certain amount of external rotation. The two inner condyles may be brought into apposition, while the two internal malleoli are separated. Young children (up to the fifth or sixth year) in whom the deformity is not great may be treated by mechanical appliances. If due to rickets appropriate constitutional treatment must be observed. When the deformity is great and the age of the patient precludes the hope of a cure by mechanical means, osteotomy is indicated. The best method of performing osteotomy is that of Macewen.

What are the symptoms when the ulnar nerve has been divided on a level with the pisiform bone?

Loss of adduction and abduction of the fingers, flexion of the last two phalanges of each finger, and hyper-extension at the metacarpophalangeal joint ("claw-hand"). The interosseous spaces become very marked from the atrophy of the muscles involved (the two inner lumbricales and all of the interossei). There is also a paralysis of the short muscles of the little finger, of some of the thumb muscles (adductor transversus, adductor obliquus, and part of flexor brevis pollicis), and of the palmaris brevis. There is anesthesia of the ulnar side of the dorsum and palm of the hand, and of both dorsal and palmar surfaces of the little and ulnar side of the ring fingers.

What tissues are divided in the operation for oblique inguinal hernia?

Skin, superficial fascia, intercolumnar fascia, cremaster muscle, infundibuliform fascia, subserous areolar tissue, and parietal peritoneum. The superficial epigastric and the superficial external pudic arteries are always divided.

What are the indications for the operation of gastrostomy?

Malignant disease of the esophagus and stricture or stenosis of the esophagus from any cause, when the patient is unable to take sufficient nourishment.

What is the differential diagnosis between septicemia and pyemia?

Septicemia occurs before the advent of suppuration, repeated rigors and metastatic abscesses are absent, and the patient is delirious.

Pyemia occurs after the advent of suppuration, repeated rigors and metastatic abscesses are present, and delirium, if present at all, is apt to be nocturnal.

A differential diagnosis is frequently impossible, but theoretically the points given above are those to be expected.

Give the differential diagnosis between sacro-iliac disease and morbus coxarius.

In sacro-iliac disease pressure upon the crests of the ilia causes pain; if the pelvis be supported, the thigh may be moved in all directions without much discomfort; apparent or real shortening of the lower extremity is never present.

In morbus coxarius pressure upon the crests of the ilia produces no pain; motion of the thigh is accompanied by pain; apparent or real shortening of the lower extremity is always present at some stage of the affection.

What are the principal affections of muscles?

Contusion, sprain, rupture of sheath, rupture of muscle or tendon, displacement of tendon, myositis (traumatic, rheumatic, acute suppurative, tubercular, syphilitic, parasitic, and myositis ossificans), primary tumors (angioma, fibroma, chondroma, myxoma, and sarcoma), and secondary tumors (carcinoma and sarcoma).

Give the indications and methods for ligature of the common carotid artery.

The common carotid artery is tied for aneurysm, for wounds of the internal or external carotid artery or their branches, to check malignant growths, and as a preparatory procedure to the removal of tumors.

Ligation in superior carotid triangle. The patient should be on his back with his shoulder elevated, the head thrown back, and the face turned slightly to the opposite side. After all aseptic precautions have been carried out an incision three inches in length is made in the line of the artery (from the sterno-clavicular articulation to a point midway between the angle of the jaw and the mastoid process), the center of the incision being opposite the cricoid cartilage. The skin, superficial fascia, platysma myoides, and superficial layer of the deep fascia are to be divided, the sterno-mastoid muscle drawn outward, the tendon of the omo-hyoid drawn downward, and the pulsations of the artery sought for beneath the sterno-

mastoid. The sheath is now opened upon the inner side, the aneurysm needle is passed from without inward, threaded, and withdrawn.

Ligation in inferior carotid triangle. Patient in same position as before. The incision is made in the line of the artery from the level of the cricoid cartilage to the sterno-clavicular articulation, and divides skin, superficial fascia, platysma, and superficial vessels and nerves. The superficial layer of the deep cervical fascia is then divided, the sterno-mastoid muscle drawn outward, and the sterno-hyoid and sterno-thyroid muscles drawn inward. The sheath is opened upon the inner side, and the aneurysm needle passed from without inward.

What operations are performed for intractable neuralgia of the fifth nerve?

Neurotomy, nerve stretching, removal of Meckel's ganglion, neurectomy, and removal of the Gasserian ganglion. According to the symptoms, one or more of the following nerves may be resected: Supra-orbital, supra-trochlear, infra-orbital, inferior maxillary division of the fifth, lingual, inferior dental, and mental.

State the most common seat of fracture of the clavicle and describe a method of treatment.

At the outer end of the middle third of the bone.

Sayre's method. Three strips of adhesive plaster three and one-half inches wide and long enough to encircle the chest and arm are required. A loop is made in the end of the first strip; this loop is secured by stitches and made to encircle the arm close to the axilla, the non-adhesive surface of the plaster being next to the skin. The shoulder is then drawn backwards and the adhesive strip carried around the chest from behind forward (adhesive surface next to skin), passing over the front of the chest, under the axilla, and finally attached to the part crossing the back. The elbow of the injured side is now brought forward and the hand placed upon the sound shoul-

der. As the loop of the first strip acts as a fulcrum, the shoulder and outer extremity of the clavicle are carried backward. With the arm in this position the end of the second strip is fixed to the sound shoulder, and the strip is then brought downwards across the back to the elbow of the injured side (a hole being cut in the plaster to accommodate the olecranon), upwards across the front of the chest and forearm, and fastened to the other end over the top of the sound shoulder. This strip holds the shoulder back and keeps it raised. The third strip is passed horizontally about the chest and forearm to hold the extremity against the body. A towel should be placed in the axilla, and all contiguous cutaneous surfaces should be separated by pieces of lint. This position is to be maintained until union occurs (about three or four weeks), and the movements of the arm should be restricted for a week or so longer.

Give the causes of atrophy.

Causes: 1. Diminished functional activity; 2. Defective nutrition; 3. Pressure; 4. Nervous influence (neuropathic atrophy); 5. Senility.

What symptoms follow division of the facial nerve?

Paralysis of the same side of the face without implication of palate or uvula (it is presumed that the nerve has been divided after its exit from the skull). The paralyzed side of the face is immobile, devoid of expression, and the natural folds and wrinkles are obscured. The eye-lids cannot be completely closed, the eye-ball rolling upward and outward when forcible closure is attempted. Epiphora is present from the drooping of the lower lid. The lips cannot be firmly closed, and whistling is impossible. If attempts are made to move the face (to show the teeth or laugh) marked asymmetry is produced, the face being drawn toward the non-paralyzed side. Owing to the paralysis of the buccinator, food collects between the teeth and the cheek.

What method of treatment affords the most prompt relief in paronychia?

Evacuation of the pus or inflammatory exudate by means of an incision, the introduction of a small strip of iodoform gauze for drainage, and the application of a moist antiseptic dressing.

Describe the operation for ligature of the subclavian artery in its second part.

The patient should be in the dorsal position, with a cushion beneath the shoulders, face turned to the opposite side, and the shoulder depressed. After all aseptic precautions have been carried out, the skin should be drawn down over the clavicle, and an incision made over the bone extending from the middle of the clavicle almost to the sterno-clavicular articulation. The skin is then allowed to retract, and the wound will be half an inch above the clavicle. This incision divides the skin, superficial fascia, platysma myoides, and the superficial layer of the deep cervical fascia. The clavicular head of the sterno-mastoid muscle should then be divided, and any veins overlying the prevertebral fascia covering the scalenus anticus ligated. The prevertebral fascia is then incised, the phrenic nerve drawn inward, and the outer two-thirds of the anterior scalenus muscle divided close to its attachment to the first rib. Care must be taken not to wound the anterior jugular, external jugular, internal jugular or subclavian veins, the phrenic nerve or the pleura. The needle is passed from before backward and from below upward.

What are the varieties of ankylosis?

Incomplete or fibrous and complete or bony. Ankylosis is also spoken of as being either *true* (involvement of articular structures) or *false* (result of extra-articular lesions).

When is operative interference advisable in the treatment of malignant tumors?

Operative interference is advisable when the tumor can be

thoroughly removed, when the operation will diminish pain or make the patient more comfortable, and when it will lengthen the life of the patient.

Describe the several varieties of clubfoot.

Talipes equinus. The heel is drawn up and the patient walks upon his toes.

Talipes calcaneus. The toes are raised from the ground and the patient walks upon his heel.

Talipes varus. The anterior half of the foot is adducted, the inner side of the foot is raised, and the patient walks upon the outer side.

Talipes valgus. The anterior half of the foot is abducted and everted, the patient resting upon the inner side of the foot. Various combinations of these forms are indicated as follows: Talipes equino-varus, talipes equino-valgus, talipes calcaneo-varus, and talipes calcaneo-valgus.

Name the most common varieties of fistula.

Fistula in ano (complete, blind internal, blind external), vesico-vaginal, urethro-vaginal, recto-vaginal, urinary, salivary, biliary, and intestinal.

What is lupus?

Lupus vulgaris is a chronic inflammatory disease of the skin and mucous membranes due to the tubercle bacillus, and characterized by the formation of nodules of granulation tissue. These nodules usually ulcerate (lupus exedens), but such is not always the case (lupus non-exedens).

What are the indications for enucleation of the globe?

Malignant disease, either primary or extending from adjacent tissues, rupture and collapse of eye-ball, a large irregular foreign body in the eye not capable of being successfully removed, a large wound in the dangerous region in which little hope of obtaining useful sight remains, a small wound in the dangerous region with commencing irido-cyclitis, a small foreign body not removable by the electro-magnet and causing

inflammation and shrinking, a wound in the dangerous region complicated with traumatic cataract, a corneal wound in which severe iritis and panophthalmitis develop in spite of treatment, and any case in which sympathetic ophthalmia is threatened. (Modified from Jacobson.)

Give the symptoms, diagnosis, and treatment of phlebitis.

Symptoms: The vessel affected becomes swollen, hard, and painful. Localized enlargements corresponding to the position of the valves are observed. The overlying tissues are dusky and congested, and there may be some edema in the area drained by the vein. The part is hot to the touch and the patient usually has fever. If suppuration occurs the symptoms are those of a localized abscess.

Diagnosis: In lymphangitis the redness is brighter and more localized, enlarged and painful glands are present, there is no hard cord-like vein, and the swelling is much less marked. In erysipelas the redness is characterized by an abrupt raised margin, and gastric disturbances are frequently present.

Treatment: Absolute rest in bed, with elevation of the affected extremity to promote the return of venous blood. The affected area is covered with a mixture of equal parts of extract of belladonna and glycerine, and the limb is swathed in a thick layer of cotton and lightly bandaged to a splint. The diet should be nutritious and non-stimulating. When the inflammatory symptoms have subsided, and the clot has had time to become organized or absorbed, massage should be practiced to get rid of the edema and inflammatory thickening. If an abscess forms it should be opened antiseptically.

In septic phlebitis, if seen early, the vein should be exposed, ligated, the whole of the infective clot turned out, the vessel swabbed out with pure carbolic acid or bichloride solution (1-500), and stuffed with antiseptic gauze. If the deeper veins are infected and this treatment is impossible, amputation may be demanded, provided that general infection has not taken place.

Give the causes, symptoms, and treatment of acute vaginitis.

Causes: The presence of irritating foreign bodies, the use of irritating injections, the contact of irritating secretions, the irritation of excessive coition, and infection with gonorrhea.

Symptoms: Local heat, pain, and muco-purulent discharge. Inspection shows congestion and sometimes excoriations of the vaginal mucous membrane.

Treatment: Rest in bed, saline cathartics, and frequent hot hip-baths. The vagina should be copiously douched twice daily with borax (one dram to a quart of water) or with liquor plumbi subacetatis (half a fluid-ounce to a quart of water). As soon as the acute symptoms have subsided the walls of the vagina should be separated by a fold of lint soaked in oxide of zinc cream. This lint should be carried well up into the posterior fornix, allowed to protrude at the vulva, and changed every 24 hours. After the disease has subsided the parts should still be douched ocasionally to prevent recurrence.

In gonorrheal vaginitis the vagina should be washed out every two or three hours, first with a pint or two of an alkaline solution, then with a pint of plain water, and then with a pint of a medicated solution (acetate of lead, acetate of zinc, sulphate of zinc, protargol, alum, tannin).

Define homologous tumor, heterologous tumor.

A homologous tumor is a tumor consisting of tissue identical with that of the part in which it grows.

A heterologous tumor is a tumor consisting of a different tissue from that of the part in which it grows. (These tumors are more properly called heterotopic tumors.)

How are dislocations distinguished from fractures?

Dislocations are characterized by more or less immobility, by the absence of crepitus, and by the fact that the deformity does not usually recur after reduction.

Fractures are characterized by preternatural mobility, by the presence of crepitus, and by the fact that the deformity usually recurs after reduction.

What is milium? Give the treatment.

Milium is an affection characterized by the appearance of small, pearly, non-inflammatory elevations, which result from the accumulation of inspissated sebum in ducts, the outlets of which have been occluded.

Treatment: The lesion should be excised, the contents expressed, and the same remedies employed as in seborrhea (improvement of general health, relief of constipation, and the application of ointments of sulphur, mercury, tar, carbolic acid, or resorcin).

Describe an operation for circumcision.

After all aseptic precautions have been carried out, the prepuce is drawn forward and grasped by a clamp placed just in front of the glans. The portion of the prepuce in front of the clamp is then cut off with a sharp bistoury and the clamp removed. It will be observed that the skin has been removed, but that the mucous surface of the prepuce still covers the glans. One blade of a pair of scissors is now introduced into the preputial orifice and the mucous layer divided down to its attachment to the corona. All adhesions between the prepuce and glans must be thoroughly broken up and the smegma removed. The entire mucous surface of the prepuce is to be trimmed away to within an eighth of an inch of its attachment to the corona. Special attention should be given to the removal of sufficient tissue from the under side of the penis in order to avoid an unsightly projection in the neighborhood of the frenum. Hemorrhage should now be controlled, the edges of the wound adjusted by a few fine catgut sutures, and the line of incision covered by some non-irritating antiseptic dressing.

Give the local treatment of venereal bubo.

Syphilitic bubo requires no local treatment.

Gonorrheal bubo may sometimes be aborted by the use of pressure and iodine. If the gland suppurates it should be incised under antiseptic precautions, curetted, and treated like any abscess. If the suppuration is *within* the gland and limited by the capsule the entire mass should be dissected out and the wound closed by primary suture. The latter treatment is the best method of dealing with suppurating buboes, provided that it is adopted at the proper time.

Give the palliative and the remedial treatment of hydrocele.

Palliative treatment: Tapping, the use of the suspensory, and evaporating lotions (when inflammation of the testicle is present).

Remedial treatment: Tapping and injection should never be employed. The open method of treatment is now generally adopted. One of two methods may be pursued: 1. The cavity of the tunica vaginalis may be opened and the tunica stitched to the skin. The cavity is drained, washed out daily, and the drainage tube gradually shortened. Instead of a tube, the cavity may be packed with iodoform gauze. 2. The parietal layer of the tunica vaginalis may be excised.

Give the differential diagnosis of congenital talipes equino-varus and paralytic talipes equino-varus.

In congenital talipes equino-varus the affection exists from birth, it is usually bilateral, the circulation is good, there is but little wasting of the muscles, the electric reactions are not much impaired, the growth of bone is much as usual, and furrows are present in the sole.

In paralytic talipes equino-varus the affection is not developed until the second or third year (ushered in by convulsions and fever), it is more frequently unilateral, the circulation is feeble, the muscles show extreme wasting, electrical reactions are almost entirely absent in the paralyzed muscles, the growth of the bones is considerably diminished, and there are no furrows in the sole (after Tubby).

Describe an approved method for the removal of impacted cerumen.

The external auditory meatus is to be syringed with warm water (105° F.), to which some bicarbonate of soda has been added, and the syringing continued until the canal has been thoroughly cleansed. The soda solution is then to be washed out with sterile water, the ear wiped dry, and a cotton plug worn until bedtime. If the mass should prove obdurate, a little warm sweet oil may be dropped into the meatus several times during the succeeding 24 hours, and the attempt renewed upon the following day.

Define malignant pustule and give treatment.

Malignant pustule or anthrax carbuncle is a local lesion produced by infection with the bacillus anthracis. It differs from ordinary carbuncle in the following respects: Presence of a central depressed blackish slough, absence of localized pain, absence of suppuration (unless mixed infection is present), and the constitutional symptoms are more marked.

Treatment: Complete excision at the earliest possible moment. The incisions should be carried wide of the disease, and the resulting wound should be carefully swabbed over with pure carbolic acid or with a solution of zinc chloride (1:8). The constitutional treatment should be of a supporting character.

What are the parietal effects of a severe blow upon the abdomen?

Swelling, discoloration, tenderness, and pain. If a vessel of considerable size is lacerated a large extravasation of blood will take place, which may descend into the scrotum. Rupture of one of the muscles of the abdominal wall may occur, and this is most frequently observed in the rectus. As far as the abdominal parietes are concerned, contusions may result in localized peritonitis, abscess, or in ventral hernia.

Describe the symptoms of fracture of the base of the skull in the middle fossa.

Hemorrhage from the external auditory meatus, or from the nose. The blood may be swallowed and subsequently vomited. Cerebro-spinal fluid may be discharged from the external auditory meatus, and, when present, is one of the most characteristic signs of fracture in this situation. If the facial and auditory nerves are injured as they lie in the external auditory meatus, there will be signs of paralysis of the muscles of expression and deafness upon the affected side. In addition to these local signs, symptoms of concussion, of compression, or of laceration of the brain may be present.

What general methods obtain in plastic operations?

Displacement: Stretching or sliding of tissues. 1. Simple approximation after freshening the edge; 2. Sliding into position after the transference of tension to adjoining localities.

Interpolation: The tissue is taken from adjacent regions, from a limb, or from another person. 1. Transferring a flap with a pedicle; 2. Transplanting without a pedicle (including skin-grafting).

Retrenchment: The removal of redundant material causing cicatricial contraction. (Abbreviated from Keen and White.)

What is the treatment of diphtheritic stenosis of the larynx?

Intubation or tracheotomy. The usual treatment of diphtheria should also be instituted or continued (injection of diphtheria antitoxin, administration of whiskey, hypodermatic injections of strychnine, absolute rest in bed, nutritious fluid diet). If tracheotomy has been performed the temperature of the room should be maintained at 80° F., and the air kept moist with steam.

Describe a compound fracture.

A compound fracture is one in which the seat of fracture

communicates with the external air. Such a fracture may be compound through the skin or through the mucous membrane. These fractures are also called *open* fractures.

Give the etiology, varieties, and symptoms of erysipelas.

Etiology: Infection with the streptococcus erysipelatis.

Varieties: Cutaneous, cellulo-cutaneous (phlegmonous), and cellular (cellulitis).

Symptoms: Cutaneous erysipelas is usually ushered in by a chill and more or less gastric disturbance. Within 24 hours a rash appears in the neighborhood of the wound. There is increased tension in the part and a sensation of itching. The rash is yellowish-red in color, disappearing upon pressure, and has a characteristic elevated border. The area affected is well defined, and the margins usually present an irregular zigzag outline. When the inflammation reaches its height the glazed area is covered with vesicles or bullæ filled with a clear fluid, which soon becomes turbid. The rash advances more or less rapidly with a continuous margin (remaining in one situation for about four days), and as it extends to new areas it fades in the region first involved and undergoes branny desquamation. The neighboring lymphatic glands are usually enlarged and painful. Fever is present as long as the rash persists. In severe cases the fever is at first sthenic, the pulse full, and the delirium noisy and active, but the pulse subsequently becomes quick and weak, and there is low muttering delirium and great prostration.

What is shock, and how should it be treated?

Shock is the immediate constitutional effect of an injury.

Treatment: In mild cases very little is needed except rest in the recumbent position and the exhibition of some pungent aromatic to the nostrils. In more severe cases the patient must be put absolutely at rest, surrounded by blankets and hot water bottles, and all external sources of irritation removed. Over-stimulation should be avoided, and in many cases a cup of hot beef tea may do as much good as a stronger

stimulant. If the patient appears to be in imminent danger, however, more active measures must be adopted. The head should be kept low and surrounded with flannel cloths wrung out of hot water and frequently renewed. The extremities should be wrapped in blankets and external heat applied, care being taken not to burn the patient. Ammonia should be exhibited to the nostrils and small quantities of brandy given by the mouth. If the patient cannot swallow, the brandy may be diluted and given by the rectum. The rectal injection of two or three pints of warm normal saline solution (100° F.) is highly recommended. Ether, digitalis, atropine, or strychnine may be given subcutaneously, the latter drugs being particularly valuable. If the shock is combined with loss of blood, a pint of sterile normal saline solution should be injected beneath the skin or into a vein. If a mangled limb seems to act as a source of depression it may be proper, under certain circumstances, to amputate at once.

What are the symptoms and treatment of a sprain?

Symptoms: The patient immediately experiences severe sickening pain. Swelling soon makes its appearance, due at first to extravasation of blood and subsequently to the effusion of inflammatory products. The patient is unable to bear any weight upon the injured extremity, and motions of the joint are attended by exacerbations of the pain.

Treatment: Early and systematic massage is invaluable in these injuries. Ten or twenty minutes is usually enough for the first treatment, and the period can be lengthened upon the following days. During the intervals between the massage of the part, it should be kept at rest upon a well-padded splint and moderate compression applied. The immediate application of cold, followed by heat, is of great advantage in some cases. If the sprain is in the ankle or wrist, the patient should be encouraged to move his toes or fingers while the massage is being performed. The old treatment consisted in keeping the part at rest until all pain and swelling

had disappeared, and then employing massage and passive motion.

How and in what part of the inferior maxillary bone is fracture most liable to occur, and what is the treatment?

The inferior maxillary bone is usually fractured by direct violence.

The most frequent site of fracture is at a point just anterior to the mental foramen.

Treatment: Reduction of the displacement, the application of a Barton bandage and the maintenance of the oral cavity in as aseptic a condition as possible. In some cases a leather or pasteboard splint may be applied over the point of the chin. If there is a great displacement a Hammond splint may be placed about the teeth or, if these are defective, Kingsley's apparatus may be employed. Some few cases may require wiring of the fragments. The parts are to be kept at rest for about three weeks, the patient being restricted to a fluid diet.

Describe enucleation of the eye-ball.

Bonnet's method: All aseptic precautions having been carried out, the conjunctiva near the cornea is grasped by forceps and divided with scissors entirely around and close to the corneal margin. The conjunctiva is loosened up from the eye-ball and the dissection carried well back in every direction. The recti muscles are now caught up separately by a strabismus hook and their tendons divided close to the ball. After the orbital tissues have been well dissected away from the ball the enucleation scissors are passed back in the orbit until they touch the optic nerve, when their blades are opened and the nerve divided as far back as possible. The oblique muscles and other remaining tissues are now quickly severed, the hemorrhage is checked by hot water or torsion, and the orbit flooded with a hot bichloride solution (1:5000).

A drainage tube is then inserted into the cavity and an antiseptic dressing applied.

How is resection of the spinal accessory nerve effected? What are the reasons for this operation?

After all aseptic precautions have been observed, an incision is made along the anterior border of the sterno-mastoid muscle, extending from the mastoid process to the cornu of the hyoid bone and avoiding the external jugular vein. This incision divides skin, superficial fascia, platysma, a branch of the auricularis magnus, and the deep fascia. The sterno-mastoid is now drawn outward, and the nerve (with its accompanying sterno-mastoid artery) can be felt just below the transverse process of the atlas. The nerve emerges from beneath the posterior belly of the digastric and lies upon the levator anguli scapulæ, beneath the prevertebral fascia. It enters the deep surface of the sterno-mastoid muscle midway between its two borders and one inch below the tip of the mastoid process. A portion of the nerve is now excised, the external wound sutured, and an aseptic dressing applied.

The spinal accessory nerve is excised for spasmodic torticollis of central origin.

What are the methods of reduction in sub-coracoid dislocation of the humerus?

1. Reduction by manipulation (Kocher's, Smith's).
2. Extension and counter-extension.
3. Traction in an outward and upward direction.

How would you arrest epistaxis?

If position, rest, cold, hot water, pressure, and spraying with peroxide or with a 5 per cent. solution of antipyrine (with 2 per cent. cocaine) are inefficient, more active measures must be adopted. If the bleeding point can be seen it should be cauterized (electricity, chromic acid). When other means fail the anterior nares should be packed with a strip of sterile gauze, the initial extremity of which is carried well back toward the naso-pharynx. In rare cases it may be necessary to plug the posterior nares by means of Belocq's cannula or a soft rubber catheter. Plugs of gauze should never be let in the nose unchanged for more than 24 hours.

Differentiate between the following forms of inflammation: Serous, sero-fibrinous, sero-hemorrhagic.

In serous inflammation there is a copious exudation of fluid with comparatively little cellular matter.

In sero-fibrinous inflammation the exudate contains more fibrin, and shows a marked tendency to clot.

In sero-hemorrhagic inflammation the exudate contains large numbers of red blood corpuscles, and is correspondingly tinged.

What is hare-lip? Give the treatment of hare-lip.

By hare-lip is meant a congenital fissure of the upper lip which may extend for a variable distance through the soft tissues. It may be associated with a cleft in the palate.

Treatment: A straight bistoury should be introduced just above the angle of the fissure, and both sides of the cleft pared by cutting through the lip in a crescentric manner so as to constitute a slight angular projection or prolabium when the freshened surfaces are brought into apposition. If the nose is much flattened more tissue should be removed from the outer than from the inner side, so that when the parts are sutured together the nostrils become as nearly symmetrical as possible. By paring the edges in a curved or angular manner the depth of the lip is increased to allow for subsequent contraction. Two deep silk-worm-gut sutures should be introduced, one just above the red margin and one close to the nose. The vermilion borders must be accurately approximated and the edges of the wound carefully brought together with cat-gut sutures. The dressing consists of gauze and collodion. The gauze is cut in the shape of a paddle, the broad ends being fastened to the cheek. This should be so applied as to prevent tension upon the wound. The silk-worm-gut sutures are removed upon the fourth day. The operation above described is that of Malgaigne. Other operations are those of Nelaton, Rose, Mirault, and König. Double hare-lip may sometimes be treated by operating upon each

side, as in a unilateral cleft, but if the os incisivum projects it must be either removed or replaced.

Give the etiology of inflammation.

Predisposing local causes: Defective circulation, loss or impairment of the nervous supply of a part, a previous attack of inflammation.

Predisposing constitutional causes: Anything producing an impairment of the general health, such as old age, weak action of the heart, an unhealthy condition of the blood, and the presence of some constitutional disease.

Exciting causes: Mechanical irritants, heat, cold, electric irritants, toxic irritants (chemical, vegetable, animal), and micro-organisms.

Give the treatment of fracture of the ribs.

The affected side should be firmly strapped with strips of adhesive plaster so as to limit its range of motion. These strips (2 inches in width) should extend beyond the median line both anteriorly and posteriorly, and are to be applied from below upward, each strip overlapping above one-half of its predecessor. Each strip should be put on while the chest is in a state of forcible expiration. If the patient has advanced pulmonary emphysema or chronic bronchitis, strapping is not advisable, as it adds to the respiratory difficulty, and in such a case the patient must be placed in bed or propped up, and the fracture left to take care of itself. Strapping is also contra-indicated if the broken fragments are driven inwards, and if the fracture is in the lower part of the chest and the pressure irritates the diaphragm, causing hiccough. If there are associated injuries of the thoracic viscera, pneumo-thorax, or hemothorax, they must be appropriately treated.

Mention the varieties of hip-joint dislocation, and describe in detail two of these varieties.

Dorsal, dorsal below the tendon (sciatic), thyroid, and pubic.

Dorsal dislocation: The head of the bone lies upon the dorsum ilii, the trochanter is above Nelaton's line and nearer to the anterior superior spine, the ilio-tibial band is relaxed, and there is a shortening of two or three inches. A marked hollow is present in the upper part of Scarpa's triangle, and the head of the bone cannot be felt in its usual position. The thigh is flexed, adducted, and inverted, so that the axis of the femur crosses the lower third of the sound thigh and the ball of the toe rests upon the opposite instep. The ligamentum teres is torn and the capsule is lacerated. The small external rotator muscles are usually lacerated, as may also be the glutei and the pectineus. The great sciatic nerve may be contused or compressed. The ileo-femoral ligament is uninjured.

Dorsal below the tendon (sciatic): The signs of this dislocation are somewhat similar but less marked than in the preceding form. There is not so much shortening, since the intact obdurator internus tendon prevents the head of the bone from traveling upward. The shortening is not more than one-half inch or an inch, but it becomes more apparent upon flexing the thigh (Allis). The thigh is flexed, adducted, and inverted, but the axis of the femur crosses the opposite knee and the great toe rests against the ball of the great toe of the sound side. The head of the bone is palpated with great difficulty owing to the greater thickness of the gluteal muscles at this level. Practically the same muscles and ligaments are injured as in the dorsal variety. The head of the bone is *below* the tendon of the obturator internus, whereas in the former dislocation it is above it.

Make a differential diagnosis of coma from injury, apoplexy, uremia, opium poisoning, and alcoholic intoxication.

Concussion: The individual is pale, the pulse is feeble and fluttering, the respirations are sighing, the skin is cold and clammy, and the urine and feces may be passed involuntarily. The pupils vary, sometimes being unequal, but they usually react to light. Convulsions occasionally occur. Paralysis is

not present, and examination of the extremities may give some evidence that they have not lost their sense of feeling. The patient can usually be aroused by shouting.

Compression: The unconsciousness is complete and the pupils are dilated and do not respond to light. The skin is usually hot and bathed in perspiration. The respirations are slow, stertorous, and have a peculiar puffing character, due to the paralysis of the muscles of the cheeks. The bladder and intestines are usually paralyzed, but the incontinence of retention may be present. The pulse is slow, full, and frequently irregular. The whole body may be paralyzed, but hemiplegia is the form most commonly observed. Monoplegias also occur, and are extremely valuable from the standpoint of localization.

Apoplexy: Absolute unconsciousness, stertor, hemiplegia or complete paralysis are present. Aid in the diagnosis is furnished by the age of the patient and the condition of the arteries. The temperature is usually higher in one axilla, and conjugate deviation may be observed. The face is flushed, the conjuctiva is injected, the pulse is full and slow, and the breathing is stertorous. Urine and feces may be passed involuntarily, and convulsive seizures are not infrequent.

Uremia: Paralysis and stertor are absent (unless apoplexy co-exists). The legs may be edematous and the urine contains albumin and casts. The breath is urinous, arterial tension is high, and the aortic second sound is accentuated.

Opium poisoning: Paralysis is not present, and the pupils are pin-point and will not dilate. The odor of laudanum may be detected upon the breath. The pulse and respirations are slow.

Alcoholic intoxication: Unconsciousness is not complete and it is usually possible to arouse the patient. Some aid may be furnished by the appearance of the patient, but this is frequently misleading. Although the breath may be alcoholic, it must be remembered that alcohol may have been

given in an attempt to revive the individual. The pupils are usually contracted but dilate when the patient is aroused. The temperature is generally subnormal.

Give the symptoms and treatment of hammer-toe.

Symptoms: Hyperextension of the first phalanx, flexion of the second to an acute angle, and either flexion or extension of the terminal phalanx. The first interphalangeal joint rubs against the upper leather of the shoe, and the patient walks upon the extremity of the terminal phalanx. Corns are present over the points of pressure, and there is a subcutaneous bursa over the head of the first phalanx, causing great pain and discomfort. The affection is most frequently observed in the second toe.

Treatment: If the case is seen early, treatment may be commenced with the wearing of correctly shaped boots, but the affection has usually progressed so far that the excision of the first interphalangeal joint or amputation of the toe is required. The first operation is the preferable one, since amputation is frequently followed by hallux valgus.

Describe dermoid cysts. In what situations are they most commonly found?

Dermoid cysts are cysts composed of structures which naturally belong to the skin or mucous membranes, but which occur in situations where these structures are not normally found. They may contain all the elements of the skin, such as stratified epidermis, a papillary layer, and even subcutaneous connective tisue. Hair follicles and sebaceous glands are frequent, and hairs of varying lengths are almost always present. Some forms of dermoids contain teeth, nerve tissue, muscle, and bone, and structures resembling intestine are not of uncommon occurrence. They have been classified by Bland Sutton into sequestration dermoids, tubulo-dermoids, and ovarian dermoids.

Dermoid cysts are found in the ovary, in the testicle, in the peritoneum, at the outer angle of the orbit, above the nose, in

the neck, in the floor of the mouth, in the membranes of the brain, and elsewhere.

Describe suprapubic lithotomy.

A silver catheter is introduced into the bladder which is to be filled with about ten ounces of a 3% solution of boric acid. Some surgeons still distend the rectum by the introduction and subsequent filling of a rubber bag. This is hardly necessary, but if the operator employ the rectal bag it should never contain more than 8 ounces, it should be inserted after the catheter has been introduced into the bladder, and *before* the bladder is distended with the boric acid solution. An incision about 2½ inches in length is made in the median line just above the symphysis and is subsequently carried down to the areolar tissue in front of the bladder. If the peritoneum bulges into the upper angle of the wound it should be displaced upward out of harm's way. There should be no difficulty in recognizing the bladder when distended and containing the curved end of the silver catheter. Two silk ligatures are now passed through the bladder-wall and the bladder is opened between them by a quick thrust of the knife. The index-finger is passed into the wound and locates the stone, which is to be removed by the finger, by the scoop, or by forceps.

Give the symptoms and treatment of any one form of acute intestinal obstruction.

Strangulated hernia. Symptoms: Pain at the hernial orifice and radiating toward the umbilicus. The hernia is hard, tense, and gives *no* impulse on coughing. Vomiting which is projectile, without preceding nausea, at first gastric, then bilious and soon assuming a stercoraceous character. Absolute constipation. Shock. Subnormal temperature.

Treatment: Immediate herniotomy.

Give any one of the dislocations of the knee-joint and the method of reduction.

The anterior dislocation of the upper end of the tibia.

The thigh should be flexed upon the pelvis, entension is made upon the leg, and the surgeon endeavors to bring the bones into their normal relation by pressure and manipulation. The parts should be massaged from the first, but passive motion should not be employed until the end of the second week and then with great caution. The patient should subsequently wear an artificial knee-cap to prevent a recurrence of the displacement.

Define necrosis and give the cause and surgical treatment.

By necrośis is meant the death of bone in mass.

Causes. Denudation of periosteum. Periostitis, ostitis, or osteomyelitis. Tuberculosis. Syphilis. Exposure to the fumes of phosphorus. The excessive administration of mercury.

Surgical treatment: Sequestrotomy.

Give the symptoms of shock, and state when the prognosis is grave.

Symptoms. The skin is pale, cool, and bathed in perspiration, the pulse is rapid and weak, the respirations are shallow and irregular, and the temperature is subnormal. Nausea and vomiting may occur, and the feces and urine may be passed involuntarily. The symptoms vary according to the severity of the injury, and the patient may suffer from anything from a sensation of momentary weakness and faintness to a most profound muscular relaxation and unconsciousness.

The prognosis is grave when a vital part is injured, when the injury is extensive, entailing a continued source of irritation and depression, when a reaction as regards temperature is not observed within four hours after the reception of the injury, when large quantities of blood have been lost, and in old people who are the subjects of degenerative changes.

How would you proceed surgically to remove the fluid in a case of ascites?

The patient is seated in a chair and the abdomen is encir-

cled with a flannel binder, the ends of which are split to within six inches of the median line. The untorn portion of the binder is placed over the front of the abdomen and the divided ends are crossed behind and held by assistants so as to make continuous pressure upon the abdominal contents. A spot is selected in the median line below the umbilicus where absolute dulness is obtained upon percussion. After all aseptic precautions have been observed, the skin over this small area is anesthetized by a drop of carbolic acid or by the intradermic injection of Schleich's solution, a small incision is made through the skin, and a suitable trochar and cannula is inserted. The fluid should be withdrawn slowly, continuous pressure being made upon the abdominal contents by means of the flannel binder. All of the fluid should not be withdrawn. After the withdrawal of the cannula the small wound should be closed with aseptic gauze and sterile collodion.

Differentially diagnose impacted and non-impacted fracture of the neck of the femur.

Impacted Fracture.	*Non-impacted Fracture.*
Crepitus is absent.	Crepitus may be obtained.
Eversion is less marked and inversion may be present (rare).	Eversion is present.
The head of the femur moves under the finger when the extremity is rotated.	The head of the femur does not move under the finger when the extremity is rotated.
The shortening is not overcome by moderate extension (danger !).	Shortening is overcome by extension.
The symptoms of fracture are not so marked.	The symptoms of fracture are more marked.
The individual may be able to walk (do not allow her to try).	The individual is unable to walk.

Name and describe the different varieties of fracture.

Simple (subcutaneous): No communication with external air.

Compound (open): Communication with external air.

Complete: The entire thickness of the bone is involved.

Incomplete: The entire thickness of the bone is not involved.

Multiple: The bone is fractured in more than one place and the lines of fracture do not communicate.

Single: The bone is fractured in but one place.

Comminuted: The bone is fractured into a number of fragments and the lines of fracture communicate with each other.

Complicated: In addition to the fracture, a neighboring joint is dislocated, the main artery or nerve of the extremity is injured, or there is a severe laceration of the soft parts.

Fissured: A linear split without displacement.

Stellate: The lines of fracture radiate from a central point.

Depressed: There is a crushing in of a portion of the bone.

Impacted: One fragment is driven into the other.

Apophyseal: A separation of a scale of bone to which a ligament or tendon is attached.

Longitudinal, transverse, oblique, and spiral: The designations indicate the directions of the line of fracture.

Give the general symptoms of brain tumor.

Headache, pain upon percussion, vomiting, vertigo, epileptic convulsions, choked disc, and finally, symptoms of compression.

Describe an operation for the cure of webbed fingers.

Didot's operation. After all aseptic precautions have been observed, a flap the length of the finger and half its width (plus the added width of the web) is taken from the dorsal surface of one finger and the palmar surface of the other. Each of these flaps is carefully applied to the denuded area upon the finger to which it is attached and secured by sutures.

How is resection of the elbow-joint performed?

After all aseptic precautions have been observed, the forearm is flexed to a right angle and held across the chest of the patient by an assistant. A vertical incision five inches in length is now made along the back of the joint, the center of the incision being a line or two to the inner side of the tip of

the olecranon. This incision goes down to the bone and divides the tendon of the triceps longitudinally. The tendon is then separated from the olecranon and this process cleared off, keeping the knife close to the bone to avoid wounding the ulnar nerve on the inner side and the extension of the triceps upon the outer side. The olecranon is now cut through and removed. With the thumb in the wound to protect the soft parts, the structures are gradually separated from the internal condyle by the knife (cutting towards the bone) or periosteal elevator. In this manner the common flexor tendon is separated from the bone and the internal lateral ligament is divided. The external condyle is now freed in a similar manner, and the end of the humerus is protruded through the wound by flexing the forearm until it touches the arm. The articular surface of the humerus is now sawn off, and if any carious areas are seen upon the surface of section they are to be thoroughly gouged out. The bones of the forearm are then forced through the wound and their cartilaginous surfaces removed. Care must be taken not to injure the insertions of the biceps and brachialis anticus. All diseased synovial membrane and granulation tissue must be dissected away, any existing sinuses thoroughly curetted, and the parts flushed with an antiseptic solution. A drainage tube is inserted in the most dependent portion of the wound, sutures are introduced, and an aseptic dressing applied.

Give the symptoms and treatment of naevus.

Capillary naevus occurs in the form of a slightly elevated mass, which varies in color from purple to bright red, according to the relative amount of contained venous or arterial blood. These growths are congenital or occur soon after birth, they may be multiple, and rarely exceed an inch or two in diameter. They are usually found upon the neck or face. They may shrink and disappear, persist unchanged, or rapidly increase in size. Treatment: Excision or electrolysis.

Cavernous naevus usually involves both skin and subcutaneuos connective tissue. It usually occurs as a lobulated

bluish or dusky red swelling, soft to the touch, easily compressible, but refilling upon the removal of the pressure. Pulsation and bruit are usually absent. Treatment: Excision wherever practical. Electrolysis when the growth cannot be excised.

What is glaucoma? Give the treatment of glaucoma.

Glaucoma is a disease of the eye characterized by increased intra-ocular tension, excavation of the optic disc, restriction of the field of vision, corneal anesthesia, colored halos about lights, and diminution of visual power that may result in blindness. Treatment: Iridectomy.

What is a tumor?

A tumor is an atypical new growth which is not the result of inflammation.

A tumor is an adventitious mass of tissue, differing from the tissue in which it grows in gross and minute structure, tending to unlimited growth, having no function, the nutrition of which is independent of the general nutrition of the body, showing no tendency to spontaneous cure, and not coincident with nor dependent upon inflammation.

Describe the following forms of sutures: Interrupted, button, continued, buried, secondary.

The interrupted suture consists of a number of single stitches, each one being independent of its neighbor.

The button suture is made by inserting a needle threaded with stout silver wire at some distance from the wound, carrying it deeply through the tissues and bringing it out at a corresponding point on the opposite side of the wound. The suture is secured at both ends to a flat lead button, the wire being pulled as tight as is deemed advisable.

In a continued suture the suture traverses the wound continuously in the same direction, being tied only at the beginning and at the end.

A buried suture is one completely covered by and not involving the skin.

Secondary sutures are those which are introduced at some time (usually two or three days) subsequent to an operation.

What are the causes of atony of the bladder?

Chronic over-distension from obstructed outflow (enlarged prostate, stricture), a single prolonged voluntary or involuntary over-distension, cystitis (particularly when gonorrheal), senility, and infective fevers.

What is the treatment of fracture united with deformity?

Osteotomy or osteoclasis. If the deformity is not great no treatment may be required.

Give the treatment for rattlesnake bite.

If the bite has been received upon a limb, a ligature should be immediately thrown around the part above the wound and drawn tight enough to prevent the entrance of the venom into the circulation. The wounded area should then be freely excised and bleeding encouraged for a short time. If the bite is upon a portion of the body which cannot be constricted by a ligature the wound should be excised as before, or if this is impracticable vigorous suction of the wound should be made. In the case of an extremity the ligature is to be slackened at intervals to allow of the admission of any remaining poison by instalments. The injection about the wound of a 1 per cent. aqueous solution of potassium permanganate has been highly recommended. Antivenene may also be employed. The constitutional treatment consists of the free administration of alcohol and hypodermatic injections of strychnine.

What circumstances demand amputation of an extremity?

Amputation is demanded: 1. To trim up a stump of a limb torn off by machinery, cut off by wheels of a railway train, or carried away by a cannon-ball; 2. When the entire limb or one of its segments has been totally disorganized; 3. Where

gangrene is imminent or has supervened (particularly if it is of the spreading type); 4. When marked symptoms of sepsis make their appearance or exhaustion supervenes from suppuration, in a case where an unsuccessful attempt has been made to save a doubtful limb; 5. In severe compound lacerations of the foot in old people, laying open the common synovial cavity and involving the bones; 6. By primary malignant growths of bone (sarcoma).

Amputation *may* be required for the relief of deformity, for the removal of benign growths (enchondroma of fingers), for laceration of the main artery of the limb, with other grave lesions of the soft parts, and in cases where the limb, if saved, would be of no practical use.

Define the terms thrombus, phlebitis, and varix, and give the causes of each.

A thrombus is a clot of blood formed within the heart or blood-vessels. It is due to alterations in the blood current, changes in the vessel-walls, and alterations in the blood itself.

By phlebitis is meant the inflammation of a vein. It may be due to injury of the coat of the vein, to the formation of a thrombus within the vein, to the extension of an inflammation from surrounding tissues, to gout, or to infection with pyogenic organisms.

By varix is meant a dilated, elongated, and more or less tortuous condition of a vein. It is due to increased pressure within the veins (long standing, habitual over-exertion, tight garters), obstruction or occlusion of the deeper veins, and to an abnormal communication with an artery (aneurysmal varix). Inherited weakness and the relaxation of the system from sedentary habits are predisposing causes.

Describe a chancroid. Give its usual symptoms and possible complications.

A chancroid is an infectious venereal sore characterized by the absence of constitutional manifestations. It commences as a pustule or ulcer, is frequently multiple, is round, oval,

or unsymmetrically irregular, is excavated or "punched out," has a rough "worm-eaten" whitish-gray surface, secretes an abundant purulent discharge which is readily autoinoculable, runs an irregular course, is painful, and usually responds to local treatment. The possible complications are phimosis, paraphimosis, lymphangitis, and bubo.

What is a dislocation? Define the various kinds of dislocation.

A dislocation is a displacement of one or more bones of a joint from its natural position. It is also the displacement of any organ from its natural position.

Traumatic, due to violence or muscular action.

Pathologic, due to disease.

Congenital, due to an error of development, as a result of which a normal relation of the bony constituents has never existed. (The term "congenital dislocation" is a misnomer; it is a congenital malformation.)

What are the methods of controlling hemorrhage?

Exposure to air, cold, hot water, elevation, direct pressure, styptics, cauterization, acupressure, forcipressure, suture, torsion, and ligation.

Define hypertrophy and give the causes.

Hypertrophy is an increase in bulk of a tissue or organ occurring independently of the general growth of the body and without any structural change of the part effected. In a true hypertrophy the function is increased.

Causes: Congenital predisposition, removal of pressure, direct stimulation or intermittent pressure, disturbances of nutrition, increased functional demand, and disturbances of the nervous system.

Give the surgical palliative treatment of carcinoma of the stomach at the pylorus.

Gastro-enterostomy, preferably by Von Hacker's method (posterior gastro-enterostomy).

Mention the causes of delayed union and give the treatment.

The constitutional causes are general debility, osteomalacia, scurvy, syphilis, senility (?), pregnancy, and the cancerous cachexia.

The local causes are faulty apposition, the interposition of fluid, muscle, or aponeurosis between the fragments, want of rest, defective blood supply, defective innervation, inflammation on the surface of the limb, faulty treatment, and local affections of bone (malignant tumors, destruction of the periosteum by inflammation).

Treatment: The removal of any local cause and the appropriate remedies for the underlying constitutional disturbance. Change of air, tonics, regulation of the diet, and the administration of the mineral acids will frequently effect a speedy union.

What glandular structures are most commonly affected in carcinoma of the anterior portion of the tongue?

The submental lymphatic glands, the submaxillary lymphatic glands, and probably those lying beneath the sternomastoid muscles. The sublingual and submaxillary salivary glands may also be involved.

What are the causes of ptosis and the remedial measures employed?

Paralysis of the oculo-motor nerve or its supra-orbital branch (syphilis, rheumatism), and faulty development or injury of the levator palpebræ.

Treatment: If due to syphilis or rheumatism the appropriate constitutional treatment is to be instituted. In the absence of constitutional causes, operations are performed to increase the vicarious action of the frontalis muscles upon the upper lid (Panas.) Wilder folds the tarso-orbital fascia upon itself and establishes a firm adhesion between the fascia and the frontalis muscle. If the action of the levator muscle is not entirely lost the principles of tendon advancement and

tendon resection may be employed. (Everbusch, Snellen, Wolff.)

What articular changes take place in dislocation? What are the general principles governing the treatment of dislocation?

One or more of the ligaments and the capsule of the joint are torn and the mutual relations of the articular ends of the bones are changed. If the dislocation remains unreduced the cavity of the joint becomes filled with granulation tissue and the displaced and lacerated connective tissues become condensed about the head of the dislocated bone, sometimes forming a new capsule. Any irregularities of the dislocated bone become rounded off and it contracts adhesions to the surrounding tissues or forms a new joint by resting against a bony surface, its pressure stimulating the bone and periosteum to the production of an osseous ring about the point of contact, which possibly becomes covered with fibro-cartilage.

Principles of treatment: Relaxation of the muscles about the joint, the reduction of the dislocation by causing the dislocated bone to enter the capsule through the same rent which it made upon leaving it (by manipulation, or by extension and counter-extension), the fixation of the parts after reduction for a sufficient length of time, and subsequent passive and active motion.

Define a fracture. Give the causes, symptoms, and varieties of fracture.

A fracture is a sudden solution of continuity of a bone.

Predisposing causes: Advancing age, male sex, and diseased conditions of the bone (atrophy, fragilitas ossium, rickets, sarcoma, secondary cancer).

Exciting causes: Direct violence, indirect violence, and muscular action.

Symptoms: A new point of motion (preternatural mobility), crepitus, deformity from displacement, partial or complete loss of function, and signs of local trauma.

Varieties: Complete and incomplete. Simple (subcutaneous), compound (open), single, multiple, complicated, comminuted, and impacted. Linear, stellate, longitudinal, transverse, and spiral.

What diseases attack the antrum maxillae (Highmore)?

Hydrops, empyema, benign tumors (chrondroma, fibroma, myxoma, osteoma), and malignant tumors (sarcoma and carcinoma).

When do the secondary symptoms of syphilis normally appear? When do the tertiary symptoms appear?

The secondary symptoms of syphilis normally appear from six to ten weeks after the beginning of the infecting chancre.

Tertiary symptoms may appear within six months of infection or not for twenty or thirty years. The time of their appearance is largely dependent upon the treatment received by the patient. In some cases which have been correctly treated they may never make their appearance.

Give a resume of the constitutional and the local treatment of inflammation.

Constitutional treatment: Rest, good hygiene, proper diet, purgatives, emetics, arterial sedatives, diaphoretics, diuretics, venesection, hypnotics, narcotics, alteratives, stimulants, and tonics.

Local treatment: Rest, position, heat, cold, counter-irritation, local blood-letting (scarifications, leeches, wet cups), moisture, stimulants, astringents, antiseptics, alteratives incisions, surgical operations, compression, and massage.

Differentially diagnose chancre, chancroid, and herpes progenitalis.

Chancre has a period of incubation not less than ten days; commences as an erosion, tubercle, papule, or ulcer; is single, or simultaneously multiple; is round, oval, or symmetrically irregular; is usually cup-shaped, saucer-shaped, or elevated; has a smooth shining red or glazed surface, and may be cov-

ered by a diphtheritic membrane or scab; has scanty, serous secretion which is practically never auto-inoculable; is almost always indurated (cartilaginous or parchment-like), the induration being circumscribed and disappearing under appropriate treatment; is accompanied by little or no pain, and often heals spontaneously.

Chancroid has no period of incubation; commences as a pustule or ulcer; is often multiple (frequently by outo-inoculation); is round, oval, or unsymmetrically irregular (with borders described by segments of large circles); is hollow, excavated, or punched out; has a rough, "worm-eaten," whitish-gray surface; has an abundant, muco-purulent secretion (readily auto-inoculable); is only exceptionally indurated (induration shades off into surrounding tissues); is painful, and runs an irregular course.

Herpes progenitalis has no period of incubation, commences as a group of vesicles which may coalesce; is multiple, is irregular in shape (edges described by segments of small circles), is always superficial, has a moderate amount of secretion (auto-inoculable with difficulty), has no more induration than any local ulcer, is painful, and usually heals promptly under mild treatment. (Condensed from Keen and White.)

How would you diagnose and reduce a backward dislocation of the forearm?

The forearm is shortened, semiflexed, and midway between pronation and supination. The forearm cannot be flexed upon the arm. The olecranon is unduly prominent behind the joint, and above it is a depression in which the tendon of the triceps may be palpated. The head of the radius may be detected as a globular swelling behind the external condyle. The lower end of the humerus forms a broad prominence in front of the articulation. This dislocation is distinguished from a supracondyloid fracture by the following points: the olecranon is behind a line connecting the two condyles, the condyles do not move with the displaced ole-

cranon, the distance between the acromion and the external condyle remains unaltered, and crepitus is absent.

Reduction: The patient is seated in a chair, the surgeon places his foot upon the chair with his knee in the bend of the elbow, and presses against the lower end of the humerus, at the same time fixing the bones of the forearm by grasping them just above the wrist. When this pressure has been maintained for some time, the forearm is slowly and forcibly flexed upon the arm. By this procedure the interlocking bony prominences are disengaged and reduction is effected.

What are the principal causes of tinnitus aurium?

Acute otitis media, chronic catarrhal otitis media, chronic suppurative otitis media, neurosis of the auditory nerve, Méniére's disease, impacted cerumen, anemia, alterations in pressure in the labyrinth, obstruction of the Eustachian tube, and large doses of quinine or of the salicylates.

What are the most approved operative procedures in the treatment of varicose veins of the lower extremity?

Excision of the entire vein, excision of a number of sections of the vein, excision of a portion of the internal saphenous vein (in certain cases), and complete division and double ligation of all the superficial veins at the junction of the upper and middle thirds of the legs (Schede's operation).

OBSTETRICS AND GYNECOLOGY.

Describe the female reproductive organs.

The *ovaries* are two small almond-shaped organs situated one on either side of the uterus (described below) and attached to the posterior surface of the broad ligaments. Each is 4 cm. long, 2 cm. broad and 1½ cm. thick, and weighs 6.4 gm. (100 grains). It consists of the oöphoron or egg-bearing portion and the paroöphoron or fibrous portion.

The *oviducts* or *Fallopian tubes* are the trumpet-shaped structures attached to the uterine cornua. Each tube is about 11½ cm. long, and surrounds the corresponding ovary. The outer end is the *fimbriated extremity*. The tube is lined with ciliated epithelium, which facilitates the passage of the ovum to the uterus.

The *vagina* or organ of copulation is the passage from the vestibule to the cervix. It lies at an angle of 60° to the horizon. It has two walls, anterior and posterior. Its mucous membrane lies in folds or rugæ.

The *hymen* is the fold of vaginal mucous membrane guarding the lower orifice of the vagina.

The *vulva* or external genitals includes the *labia majora, labia minora, clitoris, vestibule* and *mons veneris*. The labia majora are the fleshy folds on either side of the vestibule; the labia minora or nymphæ are the two small mucous folds situated within the greater lips, they unite above to form the prepuce of the clitoris. The latter is the analogue of the penis. The vestibule is the triangular space bounded above by the clitoris, laterally by the labia minora, and below by the orifice of the vagina. The mons veneris is the fleshy eminence above the symphysis pubis.

Give a description of the physiology of menstruation.

Menstruation is a periodic series of phenomena occurring normally every 28 days in the non-pregnant female from puberty to the menopause, consisting of certain symptoms (menstrual molimina) and a characteristic sero-sanguinolent discharge derived from the congested mucosæ of the tubes and uterus. The process consists in a growth of the stroma of the uterine mucosa and a breaking down of the congested vessels, with consequent formation of lacunæ, which rupture.

What is the duration of menstruation and what are the resulting changes in the uterine mucous membrane?

Menstruation normally lasts 3 to 4 days. It is accompanied by a growth in the stroma of the uterine mucosa, or congestion of the vessels which rupture, and subsequent degeneration of the superficial layers of the mucosa.

What is vicarious menstruation?

A periodic discharge of blood or other fluid from the nose, breast, stomach, or other organ during a period of suppressed menstruation.

What are the abnormalities of menstruation and give their etiology and treatment.

The abnormalities of menstruation are: *Amenorrhea*, or absence of the menstrual fluid; *scanty menstruation*, or insufficient flow; *menorrhagia*, or excessive flow at the menstrual periods; *metrorrhagia*, or a flow between the periods; and *dysmenorrhea*, or painful menstruation. *Amenorrhea* results from anemia, chlorosis, phthisis, nervous and mental diseases, change of climate, and uterine and ovarian defects of development. It is treated by diet, exercise, iron, tonics, arsenic, and the so-called emmenagogues. *Menorrhagia* and *metrorrhagia* result from endometritis, tumors, salpingitis and other causes of pelvic congestion, including subinvolution after labor. They may be treated by astringents internally, as hydrastis, ergot, oil of erigeron, thyroid extract, and

mammary extract, or by local treatment, including curettage. *Dysmenorrhea* requires dilatation and curettement and replacement of displaced organs.

What conditions have a bearing on the time of life in the female when menstruation first occurs?

Race, social development, climatic influences and predisposition. The average age of puberty in this country is about the fourteenth year.

What is the placenta? From what is it formed, what is its structure, and what are its functions?

The placenta is the essential nutritive and respiratory organ of the fetus. It is formed from the chorion frondosum and the decidua serotina, and assumes its functions by the end of the third month.

Describe the development of the placenta.

During the rapid development of the chorion frondosum, or hairy chorion, a corresponding change takes place in the decidua serotina; its tissues hypertrophy and become thick, spongy and very vascular. The chorionic villi sink deeply into this pulpy mass and become intimately connected with it, permitting of osmosis or interchange of the maternal and embryonic blood. By the third month these structures have developed into the fully formed placenta.

What are the functions of the placenta?

1. The supplying of nourishment from the mother to the fetus. 2. The oxygenation of the impure fetal blood. 3. The excretion of the effete products from the fetus.

Describe the human uterus and give its anatomic relations.

The uterus is a hollow muscular organ situated in the center of the pelvis and embraced between the folds of the broad ligaments. It is 7⅝ cm. long, 4 cm. broad, and 2⅔ cm. thick; it weighs 31 grams (7 drams). The upper portion above the

point of entrance of the Fallopian tubes is the *fundus,* the portion between the tubes and the internal os is the *body* proper, and that between the internal and external os is the *cervix.* The flattened anterior surface is in close juxtaposition with the bladder; the posterior surface is separated from the rectum by *Douglas' pouch* or *cul-de-sac.* The cavity of the uterus measures 6½ cm. (2½ in.).

How is the uterus supplied with nerves?

The uterus is supplied by filaments from the hypogastric and ovarian plexuses of the sympathetic nervous system.

Describe the normal non-gravid uterus, giving its function and relation to the other organs of generation.

The uterus has already been described. It lies above the vagina, its axis being at right angles to the axis of the vagina. The tubes are continuous with the cornua, and extend one to either side of the fundus. The ovaries are on either side of the uterus below the tubes.

Describe the semen.

The semen is a thick, viscid, yellowish or opalescent fluid, with a faint characteristic lime-like odor, secreted by the testicles and prostate gland. Its most important constituents are the spermatozoids.

Define insemination and state the conditions necessary to its accomplishment.

Insemination is the deposit of the semen within the vagina during copulation. It is not necessarily followed by impregnation.

What are spermatozoa? Where are they found? Describe their appearance and function.

The spermatozoa are microscopic, tadpole-like bodies present in immense numbers in the semen. They are about 1-500 of an inch in length, and are derived from the sperm-cells of the seminal tubules of the testicles. They have flat, oval

heads, small bodies, and immensely elongated flagella or tails, which are in constant motion. Their function is fertilization of the ovum.

Give the definition, physiology and frequency of ovulation and state whether ovulation and menstruation are synchronous.

Ovulation is the formation, development and discharge of a mature ovum from the ovary. It occurs once or twice in a month, and is not necessarily synchronous with menstruation.

What is the mechanism of the escape of the ovule and its transmission to the tubes and uterus?

Upon the establishment of puberty certain Graafian follicles assume extraordinary growth, and rapidly approach the ovarian surface. Owing to the increased intrafollicular pressure the capsule yields and the contents—an ovum and the liquor folliculi—escape. The ovum is received into the Fallopian tube either by direct introduction at the time of rupture or by suction, and is then carried into the uterine cavity by the action of the ciliated epithelium of the tube.

Define fecundation and describe its physiology.

Fecundation is the fertilization of the ovum by the spermatozoids. It is accomplished according to some in the tubes or on the ovarian surface, and according to others in the uterine fundus. The spermatozoids penetrate the vitelline membrane of the ovum through the *micropyle*. The ovum then undergoes a series of progressive changes.

Give the successive changes that take place in the ovum after fecundation, and during its passage to the uterus.

1. Absorption of the vibratile extremity of the spermatozoid, leaving the head only, which is known as the *male pronucleus*. 2. Union of the male and female pronuclei to form the *oösperm* or *blastosphere*. 3. Division of the vitelline nucleus, followed by segmentation of the vitellus, resulting in

the formation of the *morula* or *mulberry mass*. 4. Appearance in the center of the morula of a transparent fluid, which condenses the morula into a thin cellular layer (*blastoderm* or *blastodermic membrane*). 5. Division of the blastoderm into the *epiblast, mesoblast* and *hypoblast*. 6. Aggregation of the hypoblastic cells into the *germinal* or *embryonic area*. 7. Appearance in this of the *primitive trace* or *embryonic line*, surrounded by a translucent space, the *area pellucida*. 8. Incurving of the extremities of the primitive trace to form the *fetal ellipse*. 9. Development of the embryonal parts.

Describe the vitellus, the allantois, and the amnion.

The *vitellus* is the protoplasmic yelk of the ovum. The *allantois* is a small pear-shaped vesicular structure which develops from the lower portion of the embryonic alimentary canal at about the 20th day of intra-uterine life. It is a vascular structure, and is the forerunner of the placenta. It is intimately associated with the chorion. The *amnion* is a smooth, tough, transparent, glistening, fibrous structure, the innermost of the fetal membranes, surrounding the fetus and continuous with it at the umbilicus; it secretes and encloses the liquor amnii.

Describe the fully developed ovum.

The ovum is the vital element or reproductive cell of the female. It varies in size from 1-500 to 1-120 of an inch. It consists of a protoplasmic yelk or vitellus and a nucleus or germinal vesicle (*vesicula germinativa*) enclosed within a hyaline covering, the *zona pellucida* or *vitelline membrane*.

What is the character of the liquor amnii and what are its sources and uses?

The liquor amnii is an algaline fluid, about a quart in quantity, with a light specific gravity, an opaque white color, and a characteristic odor. It prevents undue pressure of the uterine walls upon the fetus, it saves the uterus from injury due to the fetal movements, it maintains an equable temper-

ature around the fetus, and it receives and dilutes the excretions of the fetus. It is derived from the fetus largely, and contains much fetal urine.

What is the umbilical cord and how is it formed?

The *funis* or umbilical cord is a cord-like structure extending from the umbilicus of the fetus to the placenta. It is developed from the pedicle of the allantois at about the fourth week of pregnancy. It measures at term about 50 cm. in length.

What structures compose the fully developed umbilical cord?

Two umbilical arteries, one umbilical vein, the vitelline duct, the pedicle of the allantois, and the jelly of Wharton.

What are uterine hydatids (hydatid pregnancy)? What are their source and treatment?

This is an unusual name for hydatidiform mole or cystic disease of the chorion, a rare affection of the chorion consisting in a proliferative degeneration of the chorionic villi with the production of a mass of grape-like vesicles attached to the placenta. The disease occurs about once in 2000 cases of pregnancy. The *treatment* consists in immediate evacuation of the uterine contents.

What changes take place in the female at puberty?

Hair appears above the pubis; the breasts develop; the function of ovulation is established; menstruation appears; the pelvis widens; and there is a growth of the sexual sense.

What are the differences between the male pelvis and the female pelvis? Give the importance of the female characteristics in labor.

Male. Heavy structure. Cavity deep and contracted. Sacrum narrow and slightly curved. Ischial tuberosities closely approximated. Subpubic angle 75°-80°. Pelvic brim triangular. Slight pelvic inclination. Thyroid foramen oval.

Female. Light structure. Cavity shallow but roomy. Sacrum wide and deeply curved. Ischial tuberosities widely separated. Subpubic angle 90°-100°. Pelvic brim cordate. Great pelvic inclination. Thyroid foramen triangular.

The female characteristics favor ready transit of a fetus through the pelvis.

Give the bones, divisions, straits and symphyses of the obstetric pelvis.

The pelvis is composed of the two innominate bones, the sacrum and the coccyx; it is divided into the *true* pelvis below and the *false* pelvis above the iliopectineal line. This line forms the boundary of the *inlet* or *superior* strait. The lower orifice is the *inferior* strait. The *symphyses* are three in number, viz., the pubic, and the two sacro-iliac synchondroses.

Give the obstetric landmarks of the superior and inferior straits.

Superior strait. The four *cardinal* points, viz., the sacro-iliac synchondroses, and the iliopectineal eminences; also the promontory of the sacrum, and the iliopectineal line. *Inferior strait.* The tips of the coccyx, the ischial tuberosities, and the subpubic angle.

Give the names and dimensions of the diameters of the pelvic inlet.

The *conjugate* or *anteroposterior*, 11cm.; the *transverse*, 13½ cm., and the two oblique diameters (between one iliopectineal eminence and the opposite sacro-iliac synchondrosis), 12¾ cm.

What are the diameters of the pelvic outlet? How is the pelvic outlet bounded?

The transverse (between the ischial tuberosities) 11 cm., and the conjugate (between the tip of the coccyx and the subpubic ligament) 9½ cm. at rest, and 11 cm. in labor. The pelvic outlet is bounded by the tip of the coccyx, the ischial tuberosities, the sacrosciatic ligaments, the thyroid foramina, and the subpubic ligament.

Differentiate the planes and axes of the pelvis and mention their obstetric importance.

The plane of the superior strait forms an angle of 50°-60° with the horizon; the plane of the inferior strait forms a line of 10° with the horizon. The roomiest portion of the pelvic cavity forms what is known as the *plane of pelvic expansion,* while the narrowest portion of the cavity forms the *plane of pelvic contraction.* The *axis* of the pelvic cavity, known as the *curve of Carus,* extends from the middle of the plane of the superior strait to the middle of the plane of the inferior strait, and follows the curve of the sacrum. The greater its curvature, the more difficult the labor; also the greater the pelvic obliquity, the more difficult the labor.

What are the varieties of deformed pelvis?

The most commonly recognized varieties are the simple flat, the spondylolisthetic, the rachitic, the coxalgic, the scoliotic, the osteomalacic, Naegele's, Robert's, the kyphotic, the kyphoscoliotic, the justo-minor, the generally contracted and flat, the justo-major, the split pelvis, and the pelves distorted by tumors and fractures.

What difficulties arise during labor from malformations of the maternal pelvis?

If the pelvis be increased in size a precipitate labor will probably result. If it be contracted there will occur all degrees of obstruction, from the slightest retardation to total blocking of the fetal progress. This will result in increased severity of the labor pains, rise of the contraction-ring, early escape of the liquor amnii, serious compression of the fetal head, malpositions and malpresentations of the fetus, and sloughing of the maternal soft parts.

What varieties of deformed pelvis are liable to interfere with obstetric procedures? How?

All pelves that are contracted in the superior or inferior straits will more or less seriously obstruct labor. This in-

cludes the vast majority of deformed pelves, whatever the cause of the deformity.

Describe and differentiate justo-minor pelvis and justo-major pelvis, and state how each may complicate labor.

The *justo-minor* pelvis is one equally contracted in all of its diameters; it is normal in shape, but undersized. The *justo-major* pelvis is one equally enlarged in all its diameters. The former obstructs labor; the latter predisposes to precipitate labor.

Describe a non-rachitic flat pelvis, and give the management of labor in such a condition.

This is a very common form of pelvic deformity, consisting in a diminution in the anteroposterior diameter of the superior strait of the pelvis without any disturbance in the size of the other diameters. As a rule, it does not result in serious interference of labor, although instrumental delivery may be required.

What structures enter into the formation of the pelvic floor?

From without inward the muscles of the pelvic floor are the transversus peronei, the ischiocavernosus, the sphincter ani, the sphincter vaginæ, the coccygeus, and the levator ani muscles, together with the pelvic fascia and the perineal wedge or body.

What changes occur in the uterus during pregnancy?

There is a general hypertrophy of all the uterine tissues, especially of the muscular substances. The blood-vessels are increased in number, size, length and tortuosity. The veins lose all their coats but the intima. The uterus slightly rotates on its axis from left to right during its development.

What are the effects of pregnancy on the maternal organisms?

In addition to the uterine changes already described there will be noted the following: A deposit of fat in the abdominal

wall, an edema of the joints of the pelvis, congestion of the pelvic viscera, an increase in the quantity of blood and of the urine, alterations in taste and disposition, and a softening of the bones of the entire body.

What changes occur during pregnancy in the external genitals and vagina?

There will be noted an increased vascularity, with edema and softening of the tissues, and bluing of the mucous membrane.

What changes occur in the breasts during pregnancy?

The breasts become enlarged generally and much engorged, and a deposit of pigment takes place in the areola. This primary ring of pigment may be surrounded by a secondary areola of light color. The glands of Montgomery become enlarged and protuberant. The nipples become prominent, and colostrum develops in the mammary glands.

What changes occur in the blood during gestation?

The general quantity of the blood is increased, while its quality decreases; in other words, there exists a combined hydremia and anemia. There is an increased tendency to clot from the large amount of fibrinogen present.

Describe the human embryo during the second month, during the fifth month, during the seventh month, and during the ninth month, giving size and weight.

At the *second* month the embryo is the size of a pigeon's egg; the visceral clefts are closed; the head forms more than two-thirds of the embryo, and all its features may be distinguished; the hands and feet are webbed; the length of the fetus is 4 cm. (1½ inches); its weight is 4 grams (60-62 grains).

At the *fifth* month the face is wrinkled and senile, the hair and nails are fully formed, the vernix caseosa appears, the eyelids begin to open; the umbilical cord is about 12 inches long; the length of the fetus is about 25 cm. (9¾ inches); its weight 273 grams (10 8-10 ounces).

At the *seventh* month the skin is still wrinkled and reddish, the lanugo begins to disappear from the face, the eyelids are open, the membrana pupillaris disappears; the length of the fetus is 35 cm. (13¾ inches); its weight 1213 grams (39 ounces).

At the *ninth* month the senile appearance of the face disappears, the lanugo begins to disappear from the body; the length of the fetus is 45 cm. (17¾ inches); its weight 1990 grams (5⅓ pounds).

Name the diseases of the fetus and its membranes in utero.

The fetus may suffer from various infectious diseases transmitted to it through the placental circulation; rarely it may develop tuberculosis in this way; fetal rickets is a common condition, as is also fetal syphilis; very rarely the fetus may develop tumors in various portions of the body; maternal impressions may be noted; and various intracranial diseases, as meningocele, hydrocephalus and the like; fetal ichthyosis is rarely noted. The diseases of the membranes include hydramnios, oligohydramnios, and cystic disease of the chorion.

How would you diagnose the death of the fetus in utero?

In about the order of value the signs of fetal death are: 1. Cessation of abdominal and uterine growth, followed by subsidence in the size of the uterus. 2. Subsidence of the signs of pregnancy. 3. Absence of fetal heart-sounds and fetal movements. 4. Absence of pulsation in the umbilical cord or fetal precordium. 5. Decrease in the cervical temperature. 6. Appearance of milk in the breasts (occasional). 7. Peptone or acetone in the urine. 8. Cranial crepitus in case of maceration of the fetus.

How may death of the fetus in utero be recognized after the period of viability? What should be done in such cases?

Fetal death may be presupposed by a suppression of all

the signs of pregnancy that have been present; by absence of the fetal heart-sounds; by cessation of the growth of the abdomen, with subsequent diminution in the size of the abdominal girth, and occasionally by the appearance of milk in the breasts. When fetal death is assured the uterine contents should be removed.

Give the obstetric anatomy of the fetal head.

The fetal head at term consists of the two frontal bones, the two parietal bones, the occiput and the bones of the face. These various bones are separated by *sutures*, as follows; The frontal, the sagittal, the coronal, the lambdoid, and by the two *fontanels,* the anterior and the posterior.

Name the various diameters of the fetal head.

The diameters of the fetal head are as follows: The bitemporal, 8 cm.; the biparietal, between the two parietal eminences, 9¼ cm.; the bimastoid, between the two mastoid processes, 7⅝ cm.; the occipito-frontal, from the root of the nose to the external occipital protuberance, 11¾ cm.; the occipito-mental, from the point of the chin to the external occipital protuberance, 13½ cm.; the suboccipito-bregmatic, from the central point of the bregma to a point midway between the occipital protuberance and the foramen magnum, 9¾ cm.; the frontomental, from the top of the forehead to the point of the chin, 8 cm.; the trachelo-bregmatic, from the central point of the bregma to the anterior margin of the foramen magnum, 9½ cm.; and the mento-bregmatic or cervico-bregmatic, from the central point of the bregma to the junction of the chin and neck, 9¼ cm.

Describe the fontanels and their diagnostic uses.

The anterior or larger fontanel or *bregma* is a diamond-shaped space left at the point of junction of the frontal, coronal and sagittal sutures. The *posterior* or *smaller fontanel* is situated at the point of junction of the lambdoid and sagittal sutures, and is triangular in shape. It is felt in all

normal vertex presentations, and by its situation determines the position of the head in labor. The bregma is never felt in a normal presentation, but may be palpated in the presentation of the top of the head, in a brow presentation, and in presentation of the occiput in the hollow of the sacrum.

What is meconium and what are its diagnostic relations?

Meconium is the peculiar greenish substance contained in the fetal bowels at birth. If it be discharged prior to the delivery of the child, it generally indicates a breech presentation. Occasionally it will escape in difficult head-deliveries.

Describe the fetal heart-sounds, give their rate, and state when and where they are best heard.

The fetal heart-sounds constitute an absolute sign of pregnancy from the sixth month of gestation on. They resemble the ticking of a watch under a pillow; their rate is about twice that of the maternal heart-beat, averaging from 120 to 160 beats a minute. The position of maximum intensity varies according to the fetal presentation. In anterior vertex presentations they are best heard at a point midway between the umbilicus and the anterior spinous process of that side upon which the fetus is resting, while in posterior vertex presentations the point of maximum intensity would be in the corresponding flank, slightly below a transverse line passing through the umbilicus.

What is ballottement, and how is it performed?

Ballottement is a balancing of the fetus *in utero* between the fingers of the two hands. In *vaginal* ballottement the index and middle fingers of the left hand are inserted into the anterior vaginal fornix, the patient lying in the dorsal position, while the fundus is steadied by the right hand placed upon the abdomen. The vaginal fingers give a sudden impulse to the anterior uterine wall, whereby the fetus is displaced upward; the latter gently falls back and strikes upon

the propelling fingers. This sign is positive, and is available from the middle of the fourth to the eighth months.

How would you diagnose pregnancy at five months, at or before the end of the third month, and at full term?

In the first *three months* of pregnancy the following signs are present: Menstrual suppression, nausea and vomiting, and the four soft signs, viz., Goodell's sign (softened cervix), Hegar's sign (softened lower uterine segment), the soft and boggy uterine body, and the soft and enlarged mammæ, with the darkened areolæ.

At the *fifth month* there will be added to the foregoing Jacquemin's sign (the bluing of the vaginal and vulvar mucosæ), Braxton Hicks' intermittent uterine contraction, ballottement, and quickening; the uterus will also be considerably more enlarged.

At *term* all the foregoing signs are present, save ballottement, and in addition the fetal heart-sounds may be detected, and palpation will reveal the fetal outlines both above and below.

What are the subjective signs of pregnancy?

The subjective signs of pregnancy are those recognized by the patient herself. This includes menstrual suppression, nausea and vomiting, vesical irritability, quickening, pain in the abdominal walls from excessive distension, vertigo, palpitation, and gastric disturbance.

What signs of pregnancy are determined by the touch?

The four "soft signs," the fetal parts and presentation, ballottement, Braxton Hicks' sign, the uterine enlargement, and the fetal movements.

What may be learned by abdominal palpation of the pregnant woman after the eighth month?

The fetal movements, the fetal parts, the position and presentation of the fetus, the size and position of the uterus, the degree of distension of the uterine and abdominal walls, the size of the pelvic inlet, the movability of the fetal head.

Classify the objective signs of pregnancy and state their relative value.

The *five positive signs* of pregnancy are ballottement, fetal movements, fetal heart-sounds, blue discoloration of the vulva and vagina, and intermittent uterine contractions. Other valuable objective signs are cervical softness (in primparæ), Hegar's softening of the lower uterine segment, darkening of the areolæ of the breasts, the presence of colostrum in the breasts, and the outlining of the fetal parts.

What are the signs of pregnancy, doubtful, probable, and certain?

The *doubtful signs* of pregnancy are vesical irritability, irregular gastric disturbances, increasing constipation, diminution but not actual suppresson of the menstrual flow, all occurring in a woman exposed to the possibility of impregnation.

The *probable signs* are total menstrual suppression, increasing size of the uterus, darkening of the mammary areolæ, development of Montgomery's tubercles, and frequency of micturition.

The *certain signs* are the positive signs already enumerated.

What is to be learned by abdominal auscultation in pregnancy?

Auscultation of the abdomen will reveal the placental souffle or uterine bruit and the fetal heart-sounds. Occasionally the umbilical souffle may be detected.

Describe the changes in position which the uterus undergoes during pregnancy.

At first the uterus sinks into the pelvis on account of its increased specific gravity. There then follows a gradual and progressive rise into the abdomen until 2 to 4 weeks before term, when a secondary sinking (*lightening*) occurs, due to the entrance of the fetal head into the superior strait.

At what period does quickening usually occur?

In the middle of the fifth month of gestation.

How should external palpation of the pregnant woman be performed?

The woman lies in the dorsal position with the limbs partly flexed. General pressure is made with the tips of the fingers and the ulnar borders of the palms upon the abdominal surface from the median line towards the flanks. The hands are permitted to dip beneath the central points of Poupart's ligaments and beneath the pelvic brim in order to determine the fetal presentation.

What is "morning sickness," when does it begin, how long does it usually continue, and what is its causation and treatment?

The nausea and vomiting of pregnancy occurs usually at the sixth week of gestation, and normally lasts for six weeks. It may begin earlier or it may not appear at all. It is believed to be due to a reflex irritation of the nerve-endings in the uterus resulting from the rapid growth of that organ. It is best treated by the exhibition of nerve-sedatives, such as sodium bromide, ingluvin, oxalate of cerium and the like.

Differentiate ordinary morning sickness from the hyperemesis of pregnancy. Mention the causes and describe the management of the latter.

The *pernicious vomiting of pregnancy* is an exaggerated gastric disturbance which appears to become uncontrollable, and may result fatally from extreme prostration. It is due to a number of conditions, including the presence of toxins of undetermined nature in the blood, probably resulting from imperfect functionating of the liver. It occurs in women whose uteri have been chronically diseased, and in those who are of a neurotic tendency. It may also result from kidney-failure, and from too frequent sexual intercourse. Its *treatment* consists in proper hygiene, the correction of uterine

displacements or cervical catarrh, restriction in diet, the use of proper therapeutic measures, and, if need be, rectal alimentation. The pregnancy should be terminated if the other measures fail.

What is the normal duration of pregnancy? What are the limits of the variations, and how should its duration be calculated?

From a number of investigations it has been found that in the human being pregnancy normally covers 280 days (10 lunar or 9 calendar months). It may be extended up to 302 days and prègnancy still be considered legitimate. Frequently the pregnancy terminates prematurely, and this may happen at any time subsequent to conception. The methods of determining the date of confinement are numerous. The Naegele rule is to count back 3 months from the date of the appearance of the last menstruation and add 7 days. The date of quickening usually occurs midway through gestation, or at 4½ months. Other methods consists in mensuration of the uterus and of the fetus, and the use of periodoscopes and tables.

How would you differentiate between the first and subsequent pregnancies?

In a primipara the fourchet is present; it is missing in a multiparous woman. The abdominal walls are relaxed and marked with striæ in the multipara, while in the primipara the abdomen is full, rounded and tense. The nipples are large and well developed in the multiparous woman, and usually small and undeveloped in the primipara.

Given a distended abdomen, how would you differentially diagnose pregnancy, ovarian disease, ascites, and gaseous accumulation?

In *ovarian cyst* there is generally an absence of the chief signs of pregnancy; the characteristic ovarian facies is present; the abdominal tumor is soft, fluctuating, usually more or less directed to one side, and does not reveal the fetal signs;

continuance of menstruation is the rule; the cervix is not unduly soft; and the history is obscure, the growth slowly developing for a longer period than the full term of gestation.

In *ascites* percussion shows dulness in the flanks, with resonance in the median abdominal line, the area of dulness changing with the position of the patient; there is free fluctuation; the usual signs of pregnancy are absent; the abdomen is flattened in the umbilical region, with bulging at the sides; the umbilicus is always depressed; palpation does not reveal any definite tumor; the cervix is not altered.

In *gaseous accumulation* or *pseudocyesis*, which most commonly occurs in elderly women at or near the menopause or in young or hysterical women, some of the important signs of pregnancy will be absent; the uterus is not enlarged, and the cervix is not soft; there is a tympanitic percussion-note over the whole abdominal surface, and if the patient be anesthetized the abdominal enlargement will disappear entirely.

Differentiate uterine bruit and umbilical souffle.

The *uterine bruit* or *placental souffle* is a rhythmic blowing sound occurring synchronously with the maternal heart-beat. It is first heard about the beginning of the fourth month, and is generally located low down and to one or the other side of the uterus. It is also known as the *placental murmur*. The *umbilical* or *funic souffle* is a peculiar high-pitched hissing sound heard most distinctly in the immediate vicinity of the fetal heart, with the beat of which it is synchronous. It is a sign of fetal danger, and indicates some stenosis of the umbilical arteries.

Describe the mammary glands and the changes they undergo in pregnancy. When the child is still-born what care should be taken of the mother's breasts?

The mammary glands are two large glandular structures on the anterior surface of the thorax. They consist of a number of lobules, each of which has an excretory or galactophorous duct which runs to the nipple. During pregnancy

the breasts enlarge and become firm and heavy. Glistening streaks appear upon the surfaces from over-distension. Pigment is deposited around the nipple in the areolæ; the glands of Montgomery enlarge and protrude from the surface; the nipples increase in size and become prominent and protruding. Colostrum appears in the breast after the third month. If the child is still-born the breasts must be strapped and applications made to prevent the development of milk.

State the medico-legal complications that may arise from an erroneous diagnosis of pregnancy.

An erroneous diagnosis of pregnancy may result in conjugal unhappiness, with divorce; it may cause the execution of an innocent woman or unnecessary confinement in prison; it may alter the terms of a will or the dividing of an estate; it may bring a law-suit against the physician.

What are the positions and attitudes of the fetus in utero, and what are their causes?

The fetus may lie parallel with or at right angles to the long axis of the woman's body; it always lies in the long axis of the uterus, whether this be horizontal or vertical. It may lie obliquely if there exist a tumor or thickening in the uterine wall, of if the uterine cavity be irregular in its outlines.

How many different presentations are liable to be met in obstetric practice? What are they?

There are three presentations of the fetal body, viz., the *cephalic* or *head*, the *pelvic*, and the *transverse* or *trunk*. The cephalic presentations include the *vertex, face, bregma* or *anterior fontanel, brow, ear*, and *parietal eminence*. The pelvic presentations include the *breech, knee*, and *foot*.

How is a vertex presentation recognized by palpation?

Examination of the abdomen shows the hard cephalic extremity of the child at the pelvic brim; vaginal examination reveals the depressed occiput and smaller fontanel at one extremity of a pelvic diameter, while the sagittal suture extends obliquely from them in the line of the diameter.

Differentiate the positions of the fetus at term as determined by external palpation.

Cephalic or *head* presentations show the fetal ellipse lying longitudinally, with the fetal back to one or the other side and the hard cephalic extremity at the pelvic brim; fetal movements are felt high up on the abdominal surface. In *pelvic* presentations the conditions are reversed, the head above and the breech below; the head may be freely moved, and the fetal movements are felt low down on the abdominal surface. In *transverse* presentations the long axis of the fetus lies at right angles to the long axis of the mother's body; both extremities of the fetal ellipse may be readily palpated.

How may the knee be distinguished from the elbow when presenting?

The knee is round and large, the elbow small and more angular; the elbow shows sharp bony processes to the sides and posterior; the popliteal space may be felt behind the knee; the arm may readily be brought down if the elbow is present; the leg is brought down with more difficulty.

What is understood by the hygiene of pregnancy? In a case of pregnancy how is the health of the patient maintained?

By the *hygiene* of pregnancy is meant the management of the patient according to the rules of health. This includes regulation of the diet, clothing, exercise, bathing and douching, and sexual intercourse; attention to the kidneys and other emunctories; the correction of constipation and proper occupation for the mind.

Describe the proper management of the breasts of the mother before labor.

Proper development of the nipples should be favored by judicious manipulation daily. The nipples should be kept clean by soap and water and a weak solution of sodium borate. If the breasts are painful they may be anointed at night with cocoa-butter or lanolin.

What is the pathology of pregnancy? Name some of the diseases to which pregnancy predisposes.

The *pathology* of pregnancy includes a study of the diseases to which a pregnant woman is exposed. The diseases she is most apt to develop are renal insufficiency, Bright's disease, gingivitis, salivation, pica, indigestion, pernicious vomiting, constipation, hemorrhoids, jaundice, appendicitis, dyspnea, cardiac palpitation, hydremia, pernicious anemia, varicose veins, hemorrhage, uterine displacements, insanity, neuralgias, and osteomalacia.

To what form of morbus Brightii are pregnant women most liable? How would you diagnose and treat it?

To acute nephritis, catarrhal or interstitial in nature. It is frequently so called when in reality the kidney of pregnancy is meant.

Give the etiology, symptoms and management, as best understood and practiced at present, of albuminuria of pregnancy. What is the prognosis?

By the *albuminuria* or *kidney of pregnancy* is meant a peculiar condition manifested by a certain proportion of pregnant women in which albumin appears in the urine in varying amounts, but which is unassociated with any grave organic change in the kidneys. The condition is one of hemic intoxication, the poisons probably originating in an imperfect metabolism on the part of the liver. The poisons irritate the kidneys, producing an arteriole contraction, whereby the kidneys appear pale and anemic, and become inadequate to perform the work devolved upon them. The treatment of renal inadequacy consists in a careful supervision of the condition of the urine, and appropriate dietetic, hygienic and therapeutic regimen. Milk diet or light diet, large draughts of Poland or lithia water, diuretics, laxatives, alteratives, Basham's mixture, irrigation of the bowel with hot normal saline solutions, and the bromides and chloral hydrate constitute the treatment. If the disease progresses labor may have to be induced. The prognosis is always anxious.

How would you measure the severity of interstitial nephritis in a pregnant woman, and how would you treat such a condition?

By the early appearance of the symptoms, by the number and nature of the urinary casts, by the development of albuminuric retinitis, and by the rapidly increasing edema. The disease requires an early evacuation of the uterine contents.

What is the cause of difficult and painful urination in pregnancy?

When present this generally results from uterine displacement backward, the cervix tilting up against the base of the bladder and interfering with micturition.

How do uterine displacements originate, and how do they influence conception and pregnancy?

Uterine displacements are generally the result of previous labors, the floor being lacerated and the uterus remaining subinvoluted and heavy. Such an organ falls back into the hollow of the sacrum. Anteflexion of the uterus may result from a ventrofixation. Any fixed displacement is apt to prevent conception by rendering the ingress of the spermatozoids impossible, and if pregnancy results and the displacement persists, abortion is apt to occur spontaneously.

What uterine displacement is especially liable to interrupt pregnancy, and what should be done to prevent it?

Retrodisplacement. Such a displaced uterus should be replaced at once, and a pessary introduced and retained until the fundus rises above the sacral promontory (fourth month); it may then be withdrawn.

What treatment would you advise for a case of continued menstruation during pregnancy?

Such a condition indicates failure of union between the decidua vera and decidua reflexa. The patient should be kept quiet, especially at the menstrual epochs. No local treatment is indicated as a rule. If the hemorrhage becomes

profuse the treatment of threatened abortion must be instituted.

Name the diseases of the endometrium, and state their effects in pregnancy.

Inflammation (*endometritis*), acute or chronic, will tend to produce abortion. Chronic endometritis, especially if syphilitic in origin, is probably the most common cause of abortion. Atrophy of the decidua (hypertrophied endometrium) causes the ovum to drop in the uterine cavity, and may result in placenta prævia. A catarrhal endometritis may cause an accumulation of fluid between the layers of the decidua, producing the condition known as *hydrorrhœa gravidarum*, or "false waters." Apoplexy of the decidua may destroy the ovum. Tumors may form in the decidua rarely; if benign they are known as *benign* deciduomata; *malignant deciduoma* is rarely encountered.

What diseases of the mother are liable to injure the fetus in utero?

Syphilis, tuberculosis, rickets, the exanthemata, renal inadequacy, puerperal eclampsia; any disease causing stagnation in the circulation, as chronic valvular disease and spasmodic maternal affections, as bronchitis, chorea and the like.

Mention some of the principal causes of sterility in woman, and state how fertility may be promoted.

Stenosis of the cervical canal from anteflexion, retrodisplacement of the uterus, cervical catarrh with profuse acrid leukorrhea, chronic salpingitis resulting in occlusion of the Fallopian tubes, and chronic endometritis. Rapid progressive dilatation of a stenosed canal, replacement of a displaced uterus, the local treatment of cervical catarrh and uterine disease will do much to restore a normal condition and promote fertility.

Define abortion, miscarriage, and premature labor.

Abortion is the discharge of the ovum during the first tri-

mester of pregnancy. *Miscarriage* is the discharge of the embryo during the second trimester. *Premature labor* is the delivery of the fetus after the period of viability and before full term.

What is the management of abortion, both preventive and curative? Give its causes, diagnosis, and indications for treatment.

The *causes* of abortion are numerous. They include certain morbid states of the ovum and fetus, as apoplexy of the ovum, disease of the umbilical vesicle, disease of the fetal membranes, malposition of the placenta, disease of the fetus, as syphilis and hydrocephalus, death of the fetus, certain paternal causes, as a diseased spermatozoid, certain maternal diseases, as the exanthemata, valvular heart-disease, renal inadequacy, convulsive disorders, as chorea and epilepsy, malformations of the uterus, profound mental shock, and traumatism.

The *symptoms* of abortion are sacral discomfort, steadily increasing hemorrhage, uterine contractions, and finally expulsion of a part or the whole of the product of conception. The *diagnosis* may be made by a study of the symptoms, by the physical signs, and by an examination of the discharged products. The *preventive treatment* consists in absolute quiet and rest in bed, lowering of the head, the administration of nerve-sedatives, as sodium bromid, and the introduction of an opium suppository. The *curative treatment* consists in vaginal and cervical tamponade to control bleeding, followed by emptying of the uterine contents.

What are the premonitory symptoms of abortion?

At the best these are vague and unreliable. They consist in a sense of discomfort or fulness in the pelvis, sacral pains, a feeling of malaise, a tendency to vesical tenesmus, chilly sensations, and beginning discharge of serum or blood from the uterus.

What are the symptoms of threatened abortion?

Pain, increasing hemorrhage, and opening of the uterine mouth.

Describe the symptoms and give the management of an incomplete abortion.

The body of the uterus will be large, soft and boggy; the cervical canal will be patulous; the finger introduced into the cavity of the uterus will detect clots, fragments of membrane and pieces of soft, pulpy, placental tissue; the discharge will be dark,. hemorrhagic and grumous, and there may or may not be a fetid odor. The *treatment* consists in the aseptic removal of the uterine contents by means of the finger or placental forceps, followed by an intra-uterine douche of mercuric chlorid, 1-4000, and the administration of small doses of ergot if the hemorrhage persist.

What are the symptoms of an inevitable abortion?

Steadily increasing hemorrhage and pain despite the preventive treatment, and the presence of *Tarnier's sign,* namely, obliteration of the angle of flexion between the upper and lower uterine segments by the descent of the detached ovum.

What means should be employed to prevent threatened abortion during the first three months of pregnancy?

The avoidance of over-exertion, the correction of uterine displacement, rest in bed at the menstrual epochs, the administration of sodium bromide, viburnum prunifolium and other sedatives, and occasionally the use of an opium suppository.

How should inevitable abortion be managed?

A vaginal and intracervical tampon should be introduced and left *in situ* for 8 hours. On its removal the ovum will probably be found attached to it. If not, a second tampon may be introduced and retained for from 6 to 8 hours. If this fails to bring the ovum away the patient should be anesthetized and the product removed by the finger or the placental forceps.

When and how should abortion be induced?

The induction of abortion is indicated when maternal life is menaced by some grave pathologic state of the fetus or of the mother, as cystic disease of the chorion, acute hydramnios, large uterine or pelvic tumors, extreme pelvic contraction, pernicious vomiting, pernicious anemia, chronic nephritis and the like. The best method of inducing abortion consists in rapid dilatation of the cervix after thorough asepsis of the vagina, with the immediate removal of the ovum by the finger and placental forceps.

Is the production of premature labor ever justifiable? If so, when and how would you accomplish that object?

The indications for the induction of premature labor include all conditions menacing fetal or maternal life, as well as those pathologic states of either mother or child that will, if the pregnancy be allowed to continue to term, be productive of grave degrees of dystocia. These are, oversize or premature ossification of the upper portion of the fetal skull, acute hydramnios occurring late in pregnancy, habitual death of the fetus during the last days or weeks of pregnancy, pelvic deformity, placenta prævia, pernicious anemia, pernicious vomiting, increasing albuminuria, eclampsia, grave valvular disease, advanced pulmonary tuberculosis, tumors in the pelvic canal. The best method of inducing labor is the introduction of an aseptic rubber catheter into the uterus. Other methods include the use of Barnes' or Champetier de Ribes' bags, and rapid digital divulsion of the cervix with the performance of podalic version.

Define and classify ectopic pregnancy. Give its causes, symptoms and treatment.

Ectopic or extra-uterine pregnancy is a generic term meaning pregnancy at any point outside of the uterus. This includes *tubal pregnancy, interstitial pregnancy, tubo-ovarian pregnancy, ovarian pregnancy*, and *primary* and *secondary abdominal pregnancy*. The causes of this condition are un-

known. The condition is generally encountered in women who are between 20 and 30 years of age, and who present a history of a protracted period of sterility following one or more pregnancies. It was formerly believed to be due to a salpingitis, but Sutton now states that it is more liable to occur in a healthy tube. Tubal diverticula may produce it. The *symptoms* are the presence of all the signs of early gestation, irregularity in the menstrual history, vaginal pulsation, lancinating, cramp-like pains in the affected side, slight elevation of temperature, and lateral displacement of the uterus by a very sensitive mass. The *treatment* consists in immediate abdominal section and removal of the gestation-sac.

What are some of the possible terminations of a tubal pregnancy?

Tubal pregnancy may terminate in rupture, which is usual. In a certain percentage of cases the embryo may die within the first few weeks of gestation; this is known as the spontaneous cure of extra-uterine pregnancy. Rarely the condition may go to term.

What are the symptoms of rupture in ectopic pregnancy? What should be done when such rupture occurs?

The symptoms of rupture are sudden and characteristic. They consist in exceedingly severe cramp-like pains in the iliac region of the affected side, associated with collapse and the symptoms of concealed hemorrhage, namely, extreme pallor of the surface, feeble runnng pulse, air-hunger, moist, clammy skin, coldness of the extremities, vomiting, and frequently coma. There is an increased discharge from the vagina; large masses of decidual tissue are usually discharged at this time. Immediate laparotomy should be performed.

What preliminary preparations would you suggest for a case of labor?

The thorough disinfection of the physician, nurse and patient according to the accepted methods, the opening of the

patient's bowels by means of a rectal enema, the proper preparation of the patient's clothing and bed. The nurse should have on hand the various drugs and instruments, as well as hot water, for whatever obstetric operation may be required.

What is labor?

Labor is that natural process by which a pregnant woman expels the product of conception at the full expiration of the period of pregnancy, 280 days after conception.

Into what stages is labor divided, and where do these stages begin and end?

There are three stages of labor. The *first* or stage of dilatation begins with the first labor pain and continues until the os is fully dilated. The *second* stage or stage of expulsion extends from full dilatation until the delivery of the child is accomplished. The *third* stage or stage of the placenta extends from the delivery of the child until the expulsion of the after-birth.

What are the prodromata of labor?

The onset of labor is indicated from 2 to 4 weeks before by the phenomenon known as *lightening*. This is produced by the entrance of the child's head into the superior strait, and occurs 2 weeks before term in multiparæ and 4 weeks before term in primiparæ. The symptoms of beginning labor are pain, beginning dilatation of the os, and a bloody discharge known as the *show*.

What is the diagnosis of false from true labor pains?

False labor pains are annoying, colicky sensations occurring during the last 2 or 3 weeks of pregnancy, which usually depend upon constipation or pressure upon nerve-trunks. They are irregular in their location, and are not accompanied by dilatation of the os. True labor pains are involuntary and painful contractions of the uterine muscles occurring intermittently and with increasing severity at decreasing in-

tervals. They are usually felt in the small of the back, and from this point pass around the abdomen. They may reverse this direction, and, commencing at the umbilicus, pass backward to the sacrum. They are cumulative in nature, of unequal intensity, and last from one-half to one minute. They result in dilatation of the os.

Give the character, situation and cause of the pains during the first and second stages of labor.

During the first stage of labor the pains are as described in the foregoing answer. They result from squeezing of the nerve-fibrils by the contracting of the uterine muscles. They are colicky in nature, and aside from opening the os do not favor the expulsion of the child. In the second stage of labor the character of the pains changes. They become bearing-down or expulsive in nature. The pain now is due to pressure upon the soft tissues of the lower parturient canal, as well as to the pressure upon the nerve-fibrils above.

What means are employed to stimulate ineffective uterine contractions?

The administration of quinine in large doses, the application of a firm abdominal binder, keeping the woman upon her feet, and the taking of a small amount of food may all result in an increase of the uterine pain. Ergot or its substitutes should not be administered.

What is meant by the mechanism of labor?

By the mechanism of labor is meant the manner in which the fetus and secundines pass through the parturient canal and are expelled.

Define and differentiate position, presentation, and rotation.

By *position* is meant: 1. The varying relationship borne by the most prominent point of the presenting part of the fetus to the cardinal points of the pelvis. 2. The relationship existing between the long axis of the fetus and that of the maternal body.

By *presentation* is meant that portion of the fetal body which is detected by the examining finger introduced to the center of the plane of the superior strait.

By *rotation* is meant the turning of the presenting part from right to left or left to right after it has struck the pelvic floor, so that it comes to present under the pubic symphysis. External rotation is a return of the presenting part to the side from which it comes after it has been delivered through the vulvar orifice.

Give the normal vertex presentations in the order of their frequency.

1. Left occipito-anterior, L. O. A.; 2. Right occipito-posterior, R. O. P.; 3. Right occipito-anterior, R. O. A.; 4. Left occipito-posterior, L. O. P.

What is the most common presentation and which the most frequent position of the presenting part in normal labor? Give the average duration of a natural labor.

The most common fetal presentation is the *occipital* or *vertex;* the most frequent position is the left occipito-anterior, L. O. A. The average duration of labor in a primipara is from 12 to 15 hours; in a multipara from 8 to 10 hours.

Give the formation of the caput succedaneum. Where does the caput succedaneum appear in the third position?

The caput succedaneum or "accessory head" is the tumor situated upon the presenting part of the fetus. It is formed by a serosanguineous infiltration of the connective tissue of the part. It is due to an edema of the part that is not compressed by the maternal structures. In the third position of the vertex, R. O. P., the caput appears on the left parietal eminence.

Describe the mechanism of labor in L. O. A. presentation.

Adaptation of the fetal presentation to the pelvic strait. It consists of three steps, namely, preliminary flexion and

moulding occurring with the phenomenon of lightening; further flexion and moulding occurring with the first labor pains; and Naegele's obliquity, or lateral inclination of the fetal head toward the maternal sacrum, the right parietal bone presenting. The birth-canal is next prepared by being dilated by means of the bag of waters. The presentation next descends to the pelvic floor, the occiput resting on the floor. Internal anterior rotation of the occiput from left to right now occurs, the occiput resting beneath the symphysis pubis. Birth of the head by a process of extension follows, the perineum retracting over the face, which appears first at the forehead and eyes and finally at the chin. Restitution or untwisting of the neck is then followed by external rotation of the head, which becomes transverse, with the occiput to the left side. The birth of the shoulders follows, the anterior or right shoulder rotating from right to left; the rest of the trunk is then rapidly expelled.

Describe the mechanism of labor in the L. O. P. position.

The steps of the mechanism are the same as in the foregoing except that the head has further to rotate in order to reach the symphysis, and this excessive rotation requires a rotation of the shoulders at the superior strait from the right into the left oblique diameter, the anterior shoulder rotating from left to right. After restitution this shoulder rotates back again to the middle line from right to left. The rest of the mechanism is as in the L. O. A. presentations.

Name and describe the various forms of head-presentation, with the management appropriate to each.

The vertex presentation is most common; its management is that of an ordinary case of labor. *Brow* and *face* presentations are always abnormal, and will be described further on. Presentation of the *bregma* is the so-called "military position" of the fetus, the head being midway between flexion and extension, and set squarely on the shoulders. The large occipito-frontal diameter of the fetal skull (11¾ cm.) pre-

sents. This presentation must be converted into an occipital presentation in order to permit labor to proceed. *Ear* presentation is a laterally deviated vertex presentation, and can generally be corrected manually or by altering the position of the patient.

Give the face and breech presentations of the fetus.

The *face* presentations are: 1. Left mento-anterior, L. M. A.; 2. Right mento-anterior, R. M. A.; 3. Right mento-posterior, R. M. P.; 4. Left mento-posterior, L. M. P. The *breech* presentations are: 1. Left sacro-anterior, L. S. A.; 2. Right sacro-anterior, R. S. A.; 3. Right sacro-posterior, R. S. P.; 4. Left sacro-posterior, L. S. P.

Give the causes of cephalic presentations, and state why vertex presentations are favorable.

The causes of cephalic presentation are: 1. The peculiar shape of the uterus and of the fetal ellipse, the smaller extremity of the fetal ellipse accommodating itself to the smaller portion of the uterine cavity; 2. The fetal center of gravity lies near the head, which becomes the dependent portion.

How would you know a head-presentation? How a breech presentation? How a transverse presentation?

In *cephalic* presentations palpation externally reveals the hard fetal skull at the superior strait; vaginal examination will reveal the dome-like projection of the brow or the vertex, or the features of the face. In *breech* presentations, if the membranes have broken, there will be a discharge of meconium; palpation will also show the soft pelvic structures, while externally the head can be felt at the upper portion of the abdominal wall. In *transverse* presentation the long axis of the fetus lies at right angles to the long axis of the maternal body; vaginal examination is liable to show an arm or elbow presenting.

Describe the mechanism of expulsion in natural labor.

Expulsion is accomplished by the direct action of the

uterine muscles upon the fetal body. The fetus is expelled because there is a decided diminution in the intra-uterine space, and the intra-uterine contents are propelled in the direction of least resistance, down the lower canal.

What is the "bag of waters," its functions and management during labor?

The bag of waters is the tough elastic membrane containing the liquor amnii, which can be felt protruding through the os during the process of dilatation. Its function in labor is to distend the cervical fibers, which it does by hydraulic pressure. It should never be ruptured in primiparous women, and in multiparæ only after full dilatation of the os has been accomplished.

State the causes of dilatation of the os and cervix uteri as related to labor.

There are two causes of cervical dilatation in labor, namely, the wedge-like action of the bag of waters acting on the edematous cervical tissues, and the upward traction exerted by the longitudinal layer of muscular fibers in the uterine walls.

Give a brief description of the three stages of labor.

During the first stage of labor the pains occur at intervals of 30 to 5 minutes; they accomplish during this time the dilatation of the os. This stage may take from 2 to 20 hours, and the patient for most of this time may remain out of bed. In the second or expulsive stage, the patient lying in bed, the pains occur every ½ to 5 minutes, and are assisted by voluntary bearing-down on the part of the patient. This drives the presentation down upon the perineum, which bulges, and by its resistance directs the presentation to the vulvar orifice, through which it finally emerges. This stage consumes from 30 minutes to 2 hours. The third stage, which seldom lasts over half an hour, consists in the expulsion of the placenta and membranes.

What may cause premature rupture of the membrane?

How may this rupture influence the progress and conduct of labor?

Undue tenuity of the membranes may cause rupture to occur with the first labor pains. They may also be ruptured by the careless introduction of the finger during a pain. When the water escapes early the labor is said to be "dry." This results in slow progress of the presenting part, and in tedious dilatation of the os. The cervix is liable to extensive lacerations in such cases.

Give the management of the second stage of labor.

The patient lies upon the side toward which the fetal back is directed. In multiparæ, if the membranes fail to rupture after full dilatation of the os, the obstetrician may break them with the finger-nail during the interval between two pains; the water should be allowed to escape slowly. As the head descends to the floor the perineum must be guarded from laceration; on delivery of the head it should be supported until the shoulders emerge, and as the child descends the hand should be placed upon the fundus uteri to maintain good contraction of the uterine muscle.

Define the third stage of labor, and state how it should be managed.

This is the period of placental expulsion. Immediately after the birth of the child the uterus contracts and the placenta sinks to the lower uterine segment. Here it lies for 15 to 30 minutes, when a strong contraction occurs and the placenta is expelled. The accoucheur may, after ligation of the cord, hasten this delivery of the secundines by the application of Crédé's method. If hemorrhage occurs or the uterus fails to contract, fluid extract of ergot may be administered, and a firm pad and binder should be applied.

Describe the delivery of the placenta after the method of Crede.

This consists in applying gentle rotatory friction to the

fundus uteri until it is felt to harden under the influence of a uterine contraction; the fundus is then grasped by the hand and compressed, while at the same time pressure is made downward and backward in the line of the axis of the parturient canal. The placenta is rapidly expelled by this process.

Describe the preparation of the bed, the woman, the physician and the nurse for a case of labor.

The bed-linen should be clean, and on the side on which the woman lies the special temporary coverings should be laid. These include a large pad, a clean sheet, and a rubber blanket. These are removed after delivery is accomplished. The woman, as soon as labor begins, is given a full bath, and the external genitalia are cleansed with green soap and alcohol. A clean garment is worn, and this is rolled up above the hips to prevent soiling. She is covered with a clean sheet. The physician and nurse disinfect themselves according to the accepted methods of aseptic surgery.

Give the causes of separation of the placenta. State how the placenta normally presents at the os uteri. Describe the treatment.

It is probable that the main cause of placental separation is a diminution in the area of placental attachment due to the excessive uterine contraction. Another view is that there occurs a partial central detachment of the placenta, with subsequent retroplacental hemorrhage. The separation does not occur until the beginning of the third stage of labor. The placenta once separated is expelled to the os uteri by passing through and inverting the membranes which drag after it; the body of the placenta bulges forward in a spherical form. Duncan's theory is that the placenta slides down the lower uterine segment edgewise. The treatment of placental separation is expulsion by Crédé's manipulation.

What is the management of retained placenta?

Retained placenta is quite distinct from *adherent placenta*.

The former means a resting of the detached placenta in the temporarily paralyzed lower uterine segment. It is a harmless condition, and is treated by Crédé's expression. *Adherent* placenta is one that is partially detached, but remains adherent at points to the original site of placental attachment. It causes post-partum hemorrhage, and requires immediate manual extraction.

How should the first examination be made at the bedside of a woman in labor?

The object of the examination is to determine the position and presentation of the child, its condition, the progress of the labor, the size of the maternal pelvis and the condition of the soft structures of the parturient canal. The abdomen is first palpated and ausculted, the patient lying on her back. A vaginal examination is then made with the patient in the left lateral recumbent posture. The finger is retained against the membranes until the patient has had a pain in order that the efficiency of the pains may be determined.

What is the perineum? How is it endangered in labor, and how should it be protected?

The *perineum* is the pelvic floor, composed mainly of muscles and fibrous tissues. The main muscle is the levator ani, a large butterfly-shaped muscle, which affords the chief support to the pelvic viscera. As the head descends it impinges on the perineum and stretches it; not infrequently serious lacerations result in consequence of too precipitate delivery, disproportion between the head and vulvar orifice, or imperfections in the mechanism of labor. There are various means of protecting the floor in labor. The head may be retarded by *Hohl's method,* which consists in pressing the thumb against the occiput above and the index and middle fingers posteriorly against that portion of the head nearest the fourchet. The forceps may be applied and the movement of the head controlled. *Ritfien's method* of elevating the head and *Olshausen's method* of rectal expression are both valuable.

What is episiotomy, and when is such interference indicated?

Episiotomy is the making of a lateral incision of the vulva for the purpose of relieving vulvar and perineal tension. The incisions are made during the height of a pain upon the mucosa just within the vulvar cleft, and are from ½ to ¾ inch long and ¼ inch deep. The operation should not be performed, simple perineal laceration being preferable.

How should laceration of the perineum occurring during labor be treated?

By immediate suturation if the tear be over ½ inch long. Simple tears of the fourchet do not require suturing. Internal tears of the sulci and tears involving the sphincter require immediate repair. If the tear is a simple median tear, and the tissues are severely bruised, a primary perineorrhaphy may not prove successful.

Give the causes and treatment of laceration of the cervix uteri.

Abortion or miscarriage when the cervix is still rigid; precipitate delivery, especially if the woman be on her feet; oversize of the fetal parts; instrumental delivery, the head not yet having escaped from the uterus. If there is no hemorrhage from the tear nothing should be done. If the circular artery has been cut a suture must be introduced at once.

Give the rules for administering anesthetics in labor, stating when they are indicated.

No anesthetic is required in a normal labor until the head is down on the perineum; it is then well, if the pains be severe and the patient suffering unduly, to administer a few drops of ether or chloroform, not sufficient to arrest the uterine contraction, but enough to dull the pain. In all operative procedures full anesthesia will be required. In puerperal eclampsia during the convulsions chloroform should be administered; also in the spasms of major chorea.

State the effects of anesthetics on the os uteri, cervix uteri, abdominal muscles, perineum and child.

If the anesthesia be complete the cervix, os and perineum become relaxed; all voluntary motion ceases, and the rigidity of the part is overcome. A certain amount of fetal asphyxia results in profound maternal anesthesia. The labor is necessarily protracted, since the uterine contractions are largely or completely abolished.

What are the antiseptic measures to be employed in the care of a case of labor? Define the terms asepsis and antisepsis, and give their proper application in the lying-in chamber.

Asepsis means absence of septic matter, or freedom from infection. *Antisepsis* means exclusion of the germs that cause putrefaction or infection. As applied to labor it means the thorough cleanliness of the patient, bed, room, water, instruments, dressings, clothing, physician and nurse. It includes the use of antiseptic agents, such as carbolic acid, mercuric chloride, creolin, lysol, and the like. It includes for some the use of rubber gloves and the exclusion, as far as possible, of the vaginal examination.

What would contraindicate the use of anesthetics in labor?

Grave renal disease and any severe pulmonary affection.

What preliminary preparations are necessary for the safe conduct of labor?

The nurse should have on hand aseptic dressings, antiseptic agents, sterile water, hemostatic remedies, as gauze, ergotin and hot water, bichloride tablets, creolin or lysol, chloroform to meet an eclamptic seizure, obstetric forceps, and whatever else may be needed to meet any emergency.

What are the dangers to the mother during the second stage of labor, and how can they be minimized?

The dangers are uterine inertia, with prolonged pressure

of the fetal head upon the maternal tissues, which might result in a slough; the onset of eclampsia; rupture of the uterus from obstruction; laceration of the cervix and perineum from disproportion between the head and vulvar orifice, or from precipitate labor; hemorrhage from premature separation of the placenta; apoplexy or syncope; rupture of varicose veins.

What are the uses and dangers of ergot in obstetric practice?

The routine administration of ergot is to be condemned. It should be employed in uterine exhaustion and inertia during the late second and third stages of labor and after delivery has been completed. If given too early it may cause an irregular hour-glass contraction of the uterus, with retention of placenta, clots, membranes, or débris. It has a retarding influence upon the development of the milk. It may, if given early, cause fetal asphyxia from tetanic uterine contraction. It also increases the danger of cervical and perineal lacerations.

State under what circumstances the vaginal douche may be employed before, during, and after labor. Give the technic.

Unless the patient be already infected, as from gonorrhea, a vaginal douche should not be given before labor, in order to avoid introduction of germs with the nozzle of the syringe and the washing away of the normal vaginal secretion. During labor a douche is given only when there is a profuse gonorrheal discharge or when some obstetric operation is about to be performed. After normal labor no douche is required as a rule. If there has been much manipulation of the parts, or version or other operation has been performed, one douche should be given, mercuric chloride 1-2000 being employed. If the lochia become offensive at any time, vaginal douching should be begun at once.

Describe the duties of the accoucheur during normal labor.

He is to act simply as an overseer. Examination should not be made too freely; only often enough to note a satisfactory progress of the labor. During the second stage he should regulate the descent of the head, institute measures to preserve the perineum, support the head after delivery until the shoulders are born, attend to the mouth and eyes of the child, ligate the cord, and superintend the discharge of the secundines. He should see that uterine relaxation does not occur, and after the patient has been cleaned he should apply the pad and binder. He should see that the proper toilet for the baby is made.

What care does the mother require after labor?

She should be covered to prevent chilling and shock. She should be cleaned as soon as possible, and the proper occlusive dressing of the vulva applied and secured to the abdominal binder. The bed should be made, and clean clothing for it and the patient be provided. If there is a tendency to relaxation of the uterus, ergot should be administered. The head should be kept low and visitors excluded. The visits should be made at suitable intervals, and careful watch kept of the pulse, temperature, discharge and breasts. The progress of involution should be noted. The bowels should be opened by the third day and the proper diet instituted.

What is involution? Define subinvolution. How long a time is usually required for involution, how may it be promoted, and what causes may operate to delay or prevent it?

By *involution*, as applied to the uterus, is meant the retrogressive change undergone by that organ after parturition, by which it returns to its normal weight and condition. It is brought about mainly by a rapid fatty degeneration of the hypertrophied muscular tissue. It is completed in six weeks,

and is favored by rest in bed, the repair of cervical and perineal lacerations, the prevention of uterine displacements, and the nursing of the child. It is delayed by early rising, bottle-feeding of the baby, neglect of the cervix, uterus and perineum, and an early resumption of household duties. *Subinvolution* is a failure of the uterus to return to its normal size.

What are after-pains? State their cause and give the treatment.

After-pains are irregular and painful contractions of the uterus produced by efforts on the part of that organ to expel clots or shreds of membrane; they indicate a partial relaxation of the uterine tissue, and are more common in multiparæ. They are relieved by pressure, and are followed by the discharge of clots. The *treatment* consists in the administration of opiates and fluid extract of ergot, embrocations of chloroform and belladonna liniments or a hypodermic injection of morphine.

What general directions should be observed in passing the catheter on a patient during the puerperal state?

Absolute cleanliness of the meatus and vestibule, as well as of the catheter, to prevent cystitis. The parts should be bathed in mercuric chloride 1-5000, and the patient should not be catheterized oftener than once in eight hours.

What changes occur in the fetal circulation at birth?

With the stopping of the feto-placental circulation there occurs a closure of the foramen ovale, the Eustachian valve atrophies, and the ductus venosus and ductus arteriosus close and atrophy; the pulmonary circulation increases at once and becomes as in the adult individual.

What indications of premature birth can be determined in the infant?

Undersize of the infant; the nails do not project over the finger-ends; there may be some lanugo present, and there is an excess of vernix caseosa; the face is senile and wrinkled,

and the development of the limbs imperfect; there is a tendency to subnormal temperature.

How soon after the birth of the child should the umbilical cord be ligated, and describe your method of procedure? How should the umbilicus be managed?

The cord should be ligated only after the pulsations have entirely ceased. A small-sized tape should be used, and the cord tied about two inches from the umbilicus, a surgeon's knot being used. It may be necessary in very thick cords to "strip" the cord so as to remove the excess of Wharton's jelly. The stump and umbilicus should be thickly dusted with a powder of salicylic acid 1 part and starch 4 parts, and then covered with salicylated cotton, through which the cord is passed. The whole is then supported by the binder.

Describe the care of the infant during the first 24 hours after birth.

After the establishment of respiration and the severing of the cord the baby should be given a bath. The vernix caseosa must be removed by rubbing with sweet oil. Castile soap and warm water are used in cleansing, and care must be taken not to irritate the delicate skin by rubbing. Diapers must be changed hourly, and plenty of talcum powder dusted on the body to prevent chafing. The breast should be given the baby every four hours. In this way it learns to nurse, consumes the colostrum, whereby the meconium will be expelled, and by reflex action causes firmer uterine contraction.

Describe the immediate care of the new-born child when for any reason the mother cannot nurse it. Give the rules for artificial feeding.

The new-born baby does not need food for the first 24-36 hours. It may be given a spoonful of water now and then, and if it seems hungry it may be given two or three spoonfuls of a mixture of condensed milk and water 1 part to 12. If it becomes necessary to feed the baby from the bottle the

latter must be kept absolutely clean, and a milk-preparation of suitable strength should be given. Germs may be destroyed by Pasteurization. The preparation usually employed consists of condensed milk 1 part, boiled water 12 parts, cream 1 part, and limewater 1 part. The baby should be fed every 2 to 2½ hours during the first month. The nursing should consume from 15 to 20 minutes.

What instructions should be given a primipara in regard to lactation?

She should be instructed as to the frequency of nursing and care of the nipple. Every 2 to 2½ hours by the clock is often enough for the feedings, and after the nursing the nipple should be bathed in warm water, thoroughly dried with a soft towel or lint, and anointed with sweet oil. The oil should be removed before the nipple is given to the infant at the next feeding.

How soon after parturition should a woman menstruate?

If she nurse her baby, menstruation does not normally return until the ninth month. An early appearance of the menstrual flow usually indicates subinvolution of the uterus or cervical laceration.

What is the puerperal state?

The puerperal state or *puerperium* is the period following the delivery of the placenta, in which the processes of involution are being carried on. It is characterized by rapid diminution in the size of the uterus and vagina, decrease in the pelvic circulation, and lessening in the quantity of blood circulating in the body.

What are the most frequent complications of the puerperal period?

Infection of the birth-canal, subinvolution, inflammation and abscess of the mammary gland, postpartum hemorrhage, and constipation.

How should a case of labor be conducted to avoid puerperal infection? What are the sources of septic infection in the puerperal state, and what would be the proper management if infection should occur?

Thorough asepsis of the woman, bed, surroundings, physician and nurse, as already delineated, must be insisted upon. The hands of the physician and nurse, the water employed, and the instruments are the chief sources of danger. Should infection occur, the vagina and uterus should be well douched with mercuric chloride 1-2000-4000, and the uterus curetted with a dull curet to remove decaying fragments of placenta and membranes. This will generally be sufficient for local treatment. Internally, quinine, stimulants and strychnine must be administered. The graver forms of puerperal sepsis require special courses of treatment.

Describe the proper method of delivering an adherent placenta at term.

The hand, which should be aseptic, must be immediately introduced into the uterine cavity to the fundus, following the umbilical cord to the placental site. The placenta should be grasped and the adherent portions pinched off rapidly. The external hand grasps the uterine fundus and the internal hand is expelled by the uterine contractions. A hot douche, intra-uterine, must then be given, and ergot administered by the mouth or hypodermatically. Firm uterine contractions must be secured before the patient is left.

How would you treat asphyxia in the new-born child? What are its causes and symptoms?

The *causes* of *asphyxia neonatorum* are syphilitic stenosis of the vessels of the cord and placenta, abnormality of the heart or great vessels, early separation of the placenta, undue pressure upon the cord, sudden maternal death, renal inadequacy, and grave maternal lung disease. The condition appears in two forms, viz., *asphyxia livida* and *asphyxia*

pallida. In the former the baby is blue or livid, there are irregular gasping efforts, the heart-beats are strong, and the reflexes are preserved. In the pale variety respiration is altogether abolished, the surface is pale, the heart-sounds are weak and irregular, and the reflexes are absent. The *treatment* consists in early ligation of the cord, suspension of the child by the feet, cleansing of the throat and mouth by the finger, slapping the back and buttocks, the pouring of water or ether on the epigastrium, and in the pronounced cases the employment of some form of artificial respiration, notably the methods of Dew, Laborde, Schultze and Prochownick. Occasionally mouth-to-mouth insufflation, catheterization of the larynx, or tracheotomy may be required.

Describe a method of resuscitation of the new-born.

Dew's method is excellent. The infant is grasped in the left hand in such a manner that the neck rests between the thumb and forefinger and the head hangs over in the position of full extension; the upper portion of the back rests in the palm of the hand, while the remaining fingers are inserted into the left axilla. The knees are grasped by the right hand, the right knee resting between the thumb and forefinger, the left knee between the index and middle fingers, and the thighs in the palm of the hand. The right hand depresses the body to favor inspiration, while to secure expiration the movement is reversed and the child doubled upon itself.

What are the results of subinvolution of the uterus, and what is its treatment?

Subinvolution of the uterus, if not corrected, results in a chronic endometritis, retrodisplacement, and subsequent prolapse of the uterus from increased specific gravity, and the development of a chronic invalidism. The treatment consists in the retention of the uterus in its normal position by means of a pessary, curettage of the uterus, suturation of all cervical and perineal lacerations, and the administration of tonics, ergot and thyroid extract.

How would you recognize retention of urine during labor and how after labor? Minutely describe the treatment that should be employed in each case.

Retention of urine during labor is exceedingly uncommon. It might result from an uncorrected retrodisplacement of the uterus that has gone on to succulation. In such a case, if catheterization of the bladder by the prostatic catheter fails, suprapubic puncture of the bladder would be required. Retention of urine after labor is not uncommon. It is characterized by inability on the part of the patient to urinate, severe pain in the bladder, and the development of a cystic tumor over the symphysis, which presents dullness on percussion. The treatment consists in aseptic catheterization, with withdrawal of one-half to three-fourths of the vesical contents, in order to avoid syncope.

Describe the technic of intra-uterine irrigation and state when its employment is justifiable.

Intra-uterine irrigation is required only after some intra-uterine manipulation, as the performance of version, manual extraction of the placenta, or high forceps application, or in case puerperal sepsis has developed. The technic consists in antiseptic douching of the vagina and vulva, followed by the introduction to the uterine fundus of the two-way catheter. Mercuric chloride 1-4000, creolin, lysol or sterile water may be employed. The douching may be resorted to once, twice or three times daily, according to the gravity of the patient's condition.

Mention the pathogenic bacteria that invade the vagina, and state how the vagina is normally protected from them.

A number of pathogenic germs have been discovered in the vagina. The most common are the streptococcus pyogenes, staphylococcus pyogenes aureus, staphylococcus pyogenes albus, bacterium coli commune, bacillus pyocyaneus, bacillus pyogenes fœtidus, and others. There normally exist in the

vagina a large number of long-rod bacilli known as Döderlein's bacilli. These secrete an acid which destroys pathogenic germs.

Define puerperal sepsis, and state how to prevent it and how to overcome it. What is auto-infection?

Puerperal sepsis is the infection of the puerperal woman by pathogenic germs. It may be prevented by careful attention to the laws of asepsis and antisepsis. If septic infection developed it should be combated in the manner already described. *Auto-infection* of the puerperal woman is a rare form of sepsis, in which the germs are already in her system before the onset of labor, and become active immediately after parturition.

State the causes, pathology, symptoms, treatment and sequelae of puerperal phlebitis.

Puerperal phlebitis is a rare form of puerperal sepsis originating in the sinuses of the uterus. The germs invade the clots in the mouths of the sinuses; these quickly liquefy, and give rise to hemorrhages and to emboli, which are carried to remote portions of the body. This may result in instant death or in pyemia, with septic pneumonia, paralysis, and other serious consequences. The treatment consists in the general treatment of puerperal sepsis, with avoidance of all local interference other than the introduction of a gauze tampon to control the hemorrhage.

How would you diagnose puerperal metritis, and what methods would you employ in its treatment?

Puerperal metritis is a late septic inflammation of the uterine muscle. It is characterized by an offensive lochial discharge, which contains fragments of necrotic tissue and detached portions of muscular fibers that have sloughed from the uterine wall. The uterus is large, soft, boggy and sensitive. There is danger of perforation of the uterine walls and the development of general peritonitis. Uterine phlebitis.

may also develop, with a resulting general pyemia. The treatment consists in hysterectomy performed with thorough asepsis.

Define hysterectomy, and state when it is applicable in obstetric complications.

Hysterectomy is excision of the uterus. It is indicated in puerperal metritis, extensive involvement of the broad ligaments, and when tubal and ovarian infection is associated with profuse hemorrhage from the uterus.

What is phlegmasia alba dolens? Give the varieties, symptoms and treatment.

Phlegmasia alba dolens or "*milky leg*" is a peculiar late manifestation of puerperal sepsis, in which there occurs a thrombosis of the iliac or femoral veins on one side, usually the left, with an immense edema of the affected limb, which presents a characteristic white or milky appearance. In the *phlebitic* or *thrombotic* form the edema first appears below at the ankle, the disease occurring as a sequel of uterine phlebitis, coagula being carried from the placental site into the hypogastric veins. In the *cellulitic* form the disease occurs as a result of a direct extension of an inflammatory process from the uterus through the broad ligament and pelvic cellular tissue, the exudate occluding the iliac veins. The *symptoms* are pains in the affected limbs along the course of the femoral vein, rapid pulse, elevation of temperature, cramp-like pains in the calf, edema, and extreme pallor of the limb, or, in a certain proportion of the cases, bluing of the leg; abscess or gangrene may follow. The *treatment* consists in the administration of stimulants and tonics, disinfection of the birth-canal, gentle laxatives, and immobilization of the limb, which should be elevated and kept warm. Anodyne poultices, and later ichthyol and belladonna ointments, may be applied. Abscesses should be opened, and if gangrene occurs amputation is necessary.

What is postpartum hemorrhage? State the causes and varieties, and give the treatment, including prophylaxis.

Postpartum hemorrhage or "flooding" is hemorrhage occurring at any time during the 24 hours after parturition. It may be *primary*, at the time of delivery, or *secondary*, when it occurs after contraction of the uterus has been secured. Its causes are retention of placental débris, adherent placenta, uterine inertia, or severe laceration of the lower birth-canal. The symptoms are free escape of blood, pallor, running pulse, restlessness, and coma. The *prophylactic* treatment includes the use of strychnine and tonics during the last trimester of pregnancy, and at the time of labor the avoidance of extreme exhaustion, and if the uterus be atonic the administration of a dram of ergot as soon as the head is born. The *active treatment* consists in the immediate removal of all clots and débris, the application of Crédé's manipulation, the hypodermic injection of ergot or ergotin, the intrauterine injection of hot water, or the introduction of a large tampon of iodoform or sterile gauze. *Herman's method* of continual manual compression of the uterus and compression of the abdominal aorta may be tried in extreme cases. Traction on the cervix with volsella-forceps will often control the bleeding. Bleeding from the lower birth-canal must be controlled by the introduction of sutures.

What is a tampon? How is it made and when is it properly used? What precautions are to be observed in its use?

A tampon is a plug of cotton, gauze, wool or oakum used to stop some canal or compress a bleeding surface. It may be made by passing a string around a portion of the substance used, or it may consist of a long strip of material packed in firmly. It is indicated in obstetrics in excessive hemorrhage, as from placenta prævia, relaxation of the uterus, or lacerations of the lower birth-canal. Care must be taken to see that the material used is thoroughly aseptic, and that the

cervix and vagina are not so distended as to give entrance to air, whereby air-embolism may be induced.

Differentiate eutocia and dystocia. Mention important varieties of the latter.

Eustocia is normal or easy labor; *dystocia* is abnormal, difficult, or painful labor. Dystocia may consist in precipitate, retarded or obstructed labor, or labor complicated by fetal or maternal accidents, or by gross fetal or maternal disease. This includes hydrocephalus, malpositions and malpresentations of the fetus, eclampsia, rupture of the uterus, prolapse of the cord, placenta prævia, premature separation of the placenta, contracted pelvis, and various other conditions on the part of the fetus and mother.

Give the causes of dystocia in the uterus, vagina, pelvis, and vulva.

In the *uterus* as causes of dystocia may be mentioned the presence of tumors, double uterus, abnormal placental attachment, rupture of the uterus, and malpresentations of the fetus. In the *vagina*, septa, stenosis, and tumors; in the *pelvis* the various forms of contraction and bony and cartilaginous tumors; in the *vulva*, hematomata, stenosis or atresia, imperforate hymen and tumors.

Describe the difficulties which arise during labor from malposition of the fetal head.

If the head lie transversely in the superior strait it will become partially extended, and cause larger diameters of the fetal skull to engage than in vertex presentations. This will cause prolongation or absolute blocking of the labor. Excessive moulding and disfiguring of the fetal presentation will follow; forceps or version may be necessitated. If the face or brow present, labor may become impossible.

How would you diagnose and manage a case of occipito-posterior presentation?

In this case the vertex may be directed to the right or to

the left sacro-iliac synchondrosis, and the sagittal suture will lie in the right or left oblique diameter respectively. The R. O. P. is the most common of the occipito-posterior presentations. The case must be treated by laying the woman upon the side toward which the fetal back is directed in order to secure full flexion of the head, and thereby prevent backward rotation of the occiput. A firm binder should be applied, and quinine must be administered and delivery accomplished. As the head rotates anteriorly, the instruments must be withdrawn and reapplied in the new oblique diameter.

How would you diagnose and deliver an occiput in the hollow of the sacrum?

In this case the small fontanel will be felt in the median line posteriorly and the large fontanel high up anteriorly. The ears may be palpated to either side in the transverse diameter. Labor will be blocked. Forceps must be applied, and as traction is made the handles must be elevated in order to overflex the head. When the occiput begins to greatly distend the perineum and the brow comes under the symphysis, the handles must be carried downward, and the head delivered with the face emerging from under the symphysis.

Describe in detail the proper procedure when the head is movable above the brim of the pelvis but does not engage.

There is probably some degree of pelvic flattening present. If so, the head will lie transversely. Axis-traction forceps should be applied and the head made to engage. If this be impossible, and the contraction of the pelvis is not too great, podalic version is indicated. In more extreme degrees of contraction Cesarean section must be performed.

Give the frequency, causes, diagnosis, prognosis, treatment and dangers to the fetus in pelvic presentations.

Pelvic presentations of the fetus occur in about 3 per cent. of all cases of labor. The *causes* of breech presentations are

reversal of the shape of the fetus or of the uterine cavity, hydrocephalus, fibroid tumors of the uterus, prematurity of the fetus, hydramnios, fetal monstrosities, and multiple pregnancy. In these cases the fetal head is freely movable and high up in the abdominal cavity; the fetal heart-sounds will be heard above the umbilicus and to either side. Vaginal examination shows an absence of a hard and protuberant presentation; the presentation is high up, and the bag of waters long and finger-like. If the membranes have ruptured, a discharge of meconium will be noted. The prognosis is serious for the fetus. Thirty per cent. of these babies perish from asphyxia or injury to the head and neck in delivery. The *treatment* consists in non-action until the birth of the umbilicus; then there must be speedy extraction of the after-coming head in order to avoid fetal death.

Describe the management of an impacted breech presentation.

If the breech become impacted, attempts may be made to decompose it by *Goodell's method*, viz., the dragging down of one leg, upon which traction is made. If this does not succeed, axis-traction forceps may be applied over the pelvis; this is a very efficient method. Other methods consist in the use of a fillet around the waist and thighs, and in dead babies the blunt hook over one thigh.

Give the frequency, causes, mechanism and treatment of face presentation, L. M. A. position.

Face presentation occurs in about ½ per cent. of all cases of labor. It results from anything which will prevent thorough flexion of the head, such as an enlarged thyroid or thymus gland or a prominent thorax, or anything that will disturb the relationship existing between the long axes of the body and head of the fetus, as dolichocephalus. The mechanism consists in full extension and moulding, descent of the chin to the pelvic floor, anterior rotation to the symphysis under which it lodges, and birth of the head by a process of

flexion; the shoulder and hip then rotate from the opposite side, and the rest of the mechanism is the same as in vertex presentations. If the chin be anterior the labor will probably be easy, since small diameters present. If the head sticks, forceps may be applied and the chin drawn down, after which labor will proceed.

Give the diagnosis of face presentation before and after rupture of the membranes.

Before rupture of the membranes the presentation will be noted as high; there is an absence of the dome-like projection of other head presentations; the features of the face may be detected. After rupture of the membranes the examining finger can be introduced into the mouth, when, if the child be living, reflex closure of the gums will be noted.

How may a face presentation be converted into a vertex presentation?

If labor have not yet begun, *Schatz's method* of cephalic version, performed by external manipulation alone, may be attempted. With one hand firm pressure is exerted against the anterior portion of the fetal neck, while counter-pressure is made with the opposite hand upon the occiput, at the same time an assistant pushes the breech in the direction in which the face is looking; the head is thus flexed upon the body and the vertex caused to present. If labor has already begun, and the os is dilating, *Baudelocque's method* of cephalic version, the "ratchet method," may be attempted under anesthesia. One hand is placed against the face, and while the thumb pushes the chin upward the fingers hook over the occiput and drag it down; an assistant at the same time carries the breech over to the side toward which the face is directed.

What is the mechanism of a mento-posterior position, and what the complications?

A persistent mento-posterior position is an absolutely im-

possible labor, and therefore there is no mechanism. For labor to advance the chin must strike the pelvic floor. The lateral height of the pelvis is 3½ inches (9 cm.), while the length of the fetal neck is only 1½ inches. The posterior height of the pelvis is 5 inches (12¾ cm.). In order for the chin to reach the floor in these cases it would be necessary for the thorax and occiput (18½ cm. or 7 inches) to enter the superior strait simultaneously. No diameter of this strait could accommodate such a bulk. The uterus becomes tetanic in action, the head and shoulders become impacted, the child perishes, and the mother is exposed to the danger of uterine rupture.

How should forceps be applied in a case of face presentation?

In the mento-occipital diameter, the chin being in apposition with the heel of the bladder; the forceps should be used only as rotators in mento-posterior positions.

How would you manage a brow presentation?

A brow presentation is an absolutely impossible case of labor. The occipito-mental diameter of the fetal head, 13½ cm., attempts to engage, but can find no accommodation in the superior strait. The treatment consists in the performance of cephalic version, bringing down the occiput and applying forceps. If this be not possible, podalic version should be tried. In impacted cases with the child dead, craniotomy, with perforation through the bregma, becomes necessary.

How would you treat a case of lateral presentation?

Lateral presentations of the head, including the parietal eminence or the ear, should be treated by manual replacement, converting the presentation into a true vertex presentation. If this be impossible forceps may be applied or podalic version performed.

Make a diagnosis of transverse presentation, and state

how it should be managed. Give the frequency, causes, mechanism and management of such a case.

A *transverse, shoulder* or *trunk* presentation occurs in about ½ per cent. of all cases of labor. The causes are oversize of the fetal head, overgrowth of the entire fetus, fetal monstrosities, mobility of the fetus, hydramnios, multiple pregnancy, uterine deformities, undue obliquity of the uterus, uterine and pelvic tumors, placenta prævia, and traumatism, such as falls or jars. There is no mechanism for such a case, the labor being absolutely impossible. The condition may be recognized readily by external palpation, the child lying at right angles to the long axis of the maternal body. Vaginal examination reveals a high position of the presentation, and the shoulder or elbow may be palpated through the membranes. There is but one thing to do in all transverse presentations, namely, podalic version under full anesthesia.

How should a hand presentation be managed? What course would you pursue if you found an arm projecting from the vulvar orifice?

This would indicate a cross-birth. The arm should be left alone, and podalic version performed. A tape may be tied around the wrist in order to prevent extension of the extremity during the process of turning; if the tape be held taut the arm is carried in front of the face and descends with the shoulders.

What are the causes of precipitate labor, what are its dangers, and what is the treatment?

Precipitate labor may be caused by an excess in the expulsive power of labor or a deficiency in the resistant powers. The dangers to the fetus are asphyxiation from rupture of the cord or premature detachment of the placenta and injury from a fall upon the floor or into a commode. The maternal dangers are hemorrhage, fatal syncope from sudden evacuation of the uterine contents, inversion of the uterus, lacera-

tion of the cervix or perineum, and post-partum hemorrhage. The *treatment* of precipitate labor consists in a retardation of the advancing presentation in order to avoid the foregoing accidents. When the head is on the floor short forceps may be applied and the progress of the head arrested.

What are the causes of delay in labor (a) on the part of the mother; (b) on the part of the child?

The maternal causes of delayed labor are uterine inertia and obstruction in the birth-canal from any cause. The fetal causes are malposition and malpresentation, oversize, hydrocephalus, fetal syphilis, fetal ascites, and other diseases causing overgrowth of organs or distension of cavities.

State the dangers and symptoms of a prolonged labor.

The symptoms of prolonged labor are those of uterine inertia (see below). The dangers are, for the fetus, fatal compression of the brain-centers and intra-uterine respiration, with inspiration of liquor amnii or other substances. The maternal dangers are pressure-necrosis, the development of sepsis, exhaustion and death, and post-partum hemorrhage.

Give the causes, diagnosis and management of uterine inertia.

Uterine inertia is that condition in which the uterine contractions are irregular, weak and ineffectual, not sufficing to induce dilatation of the os or expulsion of the fetus. The causes are idiosyncrasy, advanced age of the woman, multiparity, emotion, temporary paralysis of the uterine muscles, as from over-distension, weakness of the muscle, and any cause preventing the hydraulic action of the liquor amnii. The symptoms are weak, infrequent and irregular contractions, slight suffering, and slow or no advance of the fetal presentation. In the first stage of labor quinine may be administered in large doses and a firm abdominal binder applied; strychnine during the last weeks of pregnancy has a tendency to increase the efficiency of the uterine contraction.

In the second stage of labor forceps should be applied, and after the delivery of the child ergot must be used in large doses to prevent post-partum hemorrhage.

What is the proper management of rigidity of the os uteri in labor?

Rigidity of the cervix is common in elderly primiparæ and in those suffering from uterine inertia; it may result from cicatrices and from cancerous involvement of the cervix. The treatment consists in the administration of large doses of chloral, hot vaginal douches, anesthesia, cocaine to the cervix, digital divulsion, or incision.

Give the diagnosis and treatment of hour-glass contraction of the uterus.

Hour-glass contraction of the uterus is an irregular contraction of the uterus, usually occurring before the escape of the placenta, which is retained above the ring of Bandl. The latter appears to be in an abnormal state of contraction. Digital exploration traces the cord up to the contracted ring. Treatment consists in digital divulsion of the contracted portion, followed by removal of the placenta and antisepsis of the cavity.

Give the causes, symptoms, diagnosis and prognosis of rupture of the uterus during labor, and state how such an accident should be managed.

The exciting causes of uterine rupture during labor are some insuperable obstruction to the delivery of the child, misdirected or injudicious efforts at version, and tetanic action of the muscle of the upper uterine segment from the administration of ergot. The predisposing causes are diminished tonicity of the uterine walls, undue prolongation of labor, fatty degeneration of the uterine muscle, or a previous operation upon the uterus. The site of the rupture is usually in the lower uterine segment. The *symptoms* are sudden, acute, lancinating pain, immediate collapse, signs of internal hemor-

rhage, an anxious expression, pallor, rapid running pulse, recession of the presenting part, the presence of two distinct tumors, and the ability to detect the rent by the examining finger. The *prognosis* is grave; the maternal mortality is 55 to 60 per cent. The *treatment* consists in immediate evacuation of the uterine contents, and if the tear has not completely perforated the uterus the patient may be watched carefully for the development of sepsis. In complete laceration an abdominal section must be performed and the tear sutured aseptically.

Make a differential diagnosis of intra-uterine and extra-uterine hemorrhage.

In the former there will be noted either a free escape of blood *per vaginam* or a rapidly distending uterine body, associated with the symptoms of hemorrhage. In the latter the signs of concealed hemorrhage will be present, and vaginal examination will reveal the presence of a boggy mass in the abdominal cavity and in Douglass' cul-de-sac.

Give the diagnosis, causes and treatment of pelvic hematocele.

Pelvic hematocele results generally from rupture of an extra-uterine pregnancy. It may result from rupture of varicose veins in the broad ligament. It is recognized by the signs of concealed hemorrhage and a rapidly increasing boggy mass in Douglass' cul-de-sac. The only treatment is abdominal section and ligation of the bleeding point.

Name three important forms of hemorrhage occurring in obstetric practice.

Antepartum hemorrhage, or that occurring in the last trimester of pregnancy. This may be due to placenta prævia or premature separation of the placenta. *Intrapartum hemorrhage* is that occurring during the progress of labor, as in the case of uterine rupture or inversion of the uterus. *Postpartum hemorrhage* is that form occurring immediately after labor.

What is placenta praevia? Name its causes, varieties, symptoms, dangers and management.

Placenta prævia is that condition in which the placenta is attached to the lower uterine segment, and presents in front of the fetus. It may be *complete* or *central* (*placenta centralis*), *lateral, marginal* and *parietal.* The cause of placenta prævia is unknown. It has been said to be due to uterine subinvolution, low fixation of the ovum, and downward growth of the decidua reflexa. There is but one symptom, namely, free and painless hemorrhage, occurring at decreasing intervals and in increasing quantity. The dangers are fetal and maternal death from asphyxia, hemorrhage, air-embolism, and septic infection. The *treatment* consists in rapid dilatation of the os and delivery of the fetus by version, or in the marginal form the application of the forceps and rapid engagement of the head. In the central variety the hand must be carried directly through the placenta.

Mention two distinct methods of dilatation of the cervix uteri in obstetric practice.

Edgar's method consists in bimanual stretching and paralyzing of the cervical muscle. The index and middle fingers of both hands are introduced into the cervix, which is gradually but forcibly stretched in various directions. Another method is the use of bags, such as Barnes' or those of Champetier de Ribes and Voorhees.

What are the dangers of traction on the child and on the placenta?

Traction on the cord may cause premature separation of the placenta. It may cause rupture of the cord or avulsion of the cord from the placenta, or it may result in inversion of the uterus.

What is inversion of the uterus, what its causes and symptoms, and how is it recognized?

By this term is meant a turning of the uterus inside out,

either completely or in part. It may occur spontaneously, the uterine fundus or placental site being temporarily paralyzed and sinking in; it may result from traction on the cord, the placenta not yet having separated; or it may follow suction from close fitting of the detached placenta in the lower uterine segment and traction being made upon the cord. Other causes are vigorous Crédé manipulations and violent bearing down on the part of the woman. The symptoms are acute pain, hemorrhage, shock, bearing down, and the appearance of a tumor in the vagina. This may be mistaken for a uterine polyp, but the surface of the latter will be covered with the normal uterine mucosa, while the inverted uterus will show decidual tissue and the site of the placental attachment; the orifices of the Fallopian tubes may also be detected. The *treatment* of acute inversion consists in immediate replacement, followed by the introduction of a strip of gauze to prevent recurrence.

Give the causes, pathology, symptoms and prognosis of eclampsia gravidarum, and state the relative frequency in primiparae and multiparae. What is the treatment?

Puerperal eclampsia or puerperal convulsion is a convulsive or epileptiform seizure appearing suddenly in a woman prior to, during or shortly after labor, and characterized by tonic and then clonic convulsions of the muscles, with albuminuria, coma and death. The great majority of cases occur in primiparæ—about 75 per cent. Other causes are heredity, climatic influence, multiple pregnancy, extreme anemia, and nervous excitability, all acting as predisposing influences. The true cause is the presence in the blood of toxins, probably of hepatic origin, which cause a general arteriole contraction; as a consequence there follows an anemia of the base of the brain and a corresponding cortical congestion. The *symptoms* are fixing of the eyes, tonic contraction of the facial muscles (*sardonic grin*), lividity, rapid involvement of all the trunk muscles, distension of the superficial veins, and

frothing at the mouth. The paroxysm lasts from ½ to 2 minutes. It is followed by increasing coma and a rise of temperature. The urine becomes loaded with albumin. The *prognosis* is grave; 30 per cent. of the women and 50 to 74 per cent. of the children perish. The *causes* of maternal death are asphyxia, cerebral apoplexy, syncope, pulmonary edema, and exhaustion. The fetus dies of asphyxia. The *prophylactic* treatment is the treatment of the kidney of pregnancy. During the attack chloroform must be administered. After the spasm, if the patient be plethoric, venesection to the amount of 20-25 ounces may be performed, followed by the introduction of normal saline solution into the tissues. Croton oil 1 to 3 drops, chloral hydrate 30 grains by the rectum, and veratrum viride 15 drops of the fluid extract hypodermically may be administered. A hot pack aids in the elimination of the poison. The uterus should be emptied as soon as possible in order to still further relieve the system.

Give the danger-signals of impending eclampsia.

Rapidly lessening amount of urates in the urine; lessened urinary toxicity, the development of eye-symptoms, including muscæ volitantes, scintillations and blindness, and neuralgic pains over the eyes, under the clavicles and in the epigastrium.

In case eclampsia gravidarum appears before the end of the eighth month, how should it be managed?

By dilatation of the os and removal of the child by forceps or version. The course of treatment already indicated should be adopted.

What are the varieties of puerperal convulsions, and how are they differentially diagnosed?

A puerperal woman may suffer from various convulsive seizures, including the true puerperal eclampsia. She may have an anemia or an hysteric convulsion, or one due to nervous irritability. A true epileptic convulsion may occur,

but this is not accompanied by albuminuria, has not the same prodromata nor the rise of temperature, and there is, as a rule, a definite history of previous attacks. Meningitis is accompanied by vomiting, optic neuritis, opisthotonos, and a rise of temperature before the onset of the convulsion.

When is curettage of the uterus justifiable in obstetric practice, and how should it be performed?

Curettage is required whenever there has occurred a retention of some of the products of conception either after abortion or labor. The best curet is the finger of the obstetrician, but if this will not answer, the dull curet may be employed or the placental forceps, under thorough asepsis and antisepsis. In curetting the uterine cavity the walls should be scraped systematically and without great pressure. The dangers are hemorrhage and perforation.

Define puerperal mania. Give its etiology, symptoms and treatment.

Puerperal mania is the most common form of puerperal insanity, or insanity occurring during the lying-in period. It may result from heredity, primiparity, anxiety, dystocia, and septic infection. Some authorities attribute all the cases to septic infection. The disease appears with alarming abruptness. Without warning the patient becomes maniacal or wildly delirious, and suffers from the most peculiar hallucinations. A homicidal or suicidal tendency is common. 25 to 35 per cent. of the cases die from exhaustion or from septicemia, or remain permanently insane. The patient should be confined in a hospital and given nerve-sedatives, bromides, hyoscine, trional, sulfonal and tonics. Rest and mental diversion are essential.

What hygienic precautions are necessary for a nursing child if the mother has sore nipples?

If the nipples are fissured the child may suck in blood and suffer from hematemesis. It should temporarily be fed on the

bottle or from a spoon, but returned to the breast as soon as the nipple will permit. An artificial nipple may also be used.

Give the management in a case of (a) flat or inverted nipples, and (b) cracked nipples.

A *flat* or *inverted* nipple requires gentle traction and manipulation during the last weeks of pregnancy, or more powerful suction through a breast-pump. If this does not succeed an artificial nipple must be employed. *Fissured nipples* should be kept clean and dry, and anointed between the nursing with sweet oil. In worse cases healing applications are necessary, as ichthyol in lanolin or glycerin, or 1 dram each of bismuth subnitrate and castor oil, compound tincture of benzoin, or a 4 to 8 per cent. solution of silver nitrate after cocainization. The child should not nurse from these nipples.

Give the varieties, pathology, symptoms and treatment of puerperal mastitis.

Mastitis, or inflammation of the mammary gland, may be suppurative or non-suppurative. It is almost always due to septic infection occurring through a fissured nipple. Occasionally it may result from caking of the breasts or milk-stasis. The pathology consists essentially in an acute inflammation of the cellular tissue of the gland. The symptoms are acute pain, inflammation, reddening of the surface, induration, malaise, elevation of temperature, and headache. The *treatment* consists in hot compresses of lead-water and laudanum, the ice-bag, the application of a mammary binder, and ichthyol or belladonna locally; the child should not nurse. The bowels should be opened.

Give the symptoms and treatment of mammary abscess.

If mastitis advances to suppuration the symptoms will change. This is most common in the third or fourth week of the puerperium. The pain becomes dull and throbbing; rigor or chills are noted; the fever becomes hectic in type; the indurated portion of the breast becomes softer at a certain

point, and fluctuation may be noted; the surface of the gland becomes edematous, livid and glazed. When the abscess is situated deeply in the areolar tissue just above the pectoral muscles a *postmammary* or *submammary abscess* results. In this case the pus is very apt to burrow, and the gland is raised from the chest and becomes protuberant. The *treatment* of abscess is early incision, the line of incision radiating from the nipple; the wound should be bathed in mercuric chloride (1:4000) and packed with sterile gauze.

What is the treatment of galactorrhea?

Galactorrhea is an excessive flow of milk from the engorged breasts. It may be corrected by feeding the infant at regular intervals, and between the feedings the breast-pump may be employed to remove the excessive flow. Ergot may be administered in small amounts, potassium iodide given in doses of 10 grains three times daily, and belladonna ointment applied locally, or a 5 per cent. solution of cocaine in equal parts of glycerin and water.

To what dangers in pregnancy and labor does gonorrhea of the mother expose her and her offspring?

During pregnancy a gonorrheal woman may develop a pustube, which may rupture or cause an abortion and expose her to the development of septic infection. A gonorrheal woman is always in imminent danger of puerperal sepsis after the delivery of her child. The child is exposed to the danger of ophthalmia neonatorum.

Give the symptoms, treatment and prognosis of ophthalmia neonatorum. State its causes and the means of prevention.

Ophthalmia neonatorum is a purulent inflammation of the conjunctiva of the infant due to infection at birth by gonorrheal virus contained in the uterine and vaginal discharges. It is very virulent, and frequently results in total loss of sight from perforation of the cornea and destruction of the

superficial tissues. The *symptoms* are reddening and edema of the palpebræ, agglutination of the lids, profuse purulent discharge, a bright-red appearance of the conjunctivæ, and later ulceration and perforation of the cornea. The prognosis is good unless corneal ulceration occurs. The *treatment* is mainly prophylactic, and this consists in frequent vaginal douching during labor, and, immediately after the birth of the head, cleansing of the eyes with warm sterilized water, followed by the instillation of a few drops of a 2 per cent. solution of silver nitrate. After the disease has appeared the cleaning must be done hourly (*Crédé's method*) with warm water, followed in alternate hours by mercuric chloride 1 to 5000 to 8000, and a saturated solution of boric acid. Twice daily an application of silver nitrate 4 per cent. solution may be used. The well eye should be protected with a collodion dressing.

Give the pathology of hydrocephalus. State how hydrocephalus may be recognized before delivery, and how such a complication should be dealt with.

Hydrocephalus is a collection of serous fluid at some point within the cerebral substance (*internal hydrocephalus*) or outside the brain-substance (*external hydrocephalus*), preventing closure of the fontanels and causing enlargement of the skull. It is probably a sequel of some obscure form of inflammation of the cerebral meninges. The vaginal finger detects bulging fontanels and widely separated sutures, both yielding the sensation of fluctuation. Occasionally crepitation may be noted. Abdominal palpation reveals an unusual size of the head. The treatment consists in aseptic puncture through a fontanel or suture; if this fails craniotomy is indicated.

How may multiple (twin) pregnancy be recognized? State how it may complicate labor, and show how labor should be managed when this condition exists.

A twin pregnancy may be recognized by the unusual size

of the abdomen, by the presence of two distinct fetal heart-beats, heard best at different points of the abdominal surface; there may be two distinct placental souffles, irregularity in the outline of the uterus, the presence of a number of fetal extremities or parts, and the ability to outline two fetuses. The *dangers* are uterine inertia, abnormal presentations, imperfect development of the fetuses, the formation of monstrosities, and locking of the babies. The first child presenting normally, labor should proceed normally; after its birth the second child should be made to present in a proper manner, and then 1 dram of the fluid extract of ergot should be administered. Not infrequently a forceps-delivery is required.

What complications may arise in a twin labor, and how may they be overcome?

Malpresentation and malposition are frequent and must be corrected. Locking of the heads requires separation of the chins, the application of forceps or decapitation.

What is superfetation, and how does it take place?

Superfetation is the supposed fertilization of an ovum when there is another from a previous ovulation in uterogestation. There is considerable doubt as to the possibility of such an occurrence. If it does occur it will probably take place within the first few days after the primary conception, *i. e.*, before the formation of the decidua. The occurrence of superfetation at a more advanced stage in the development of the primarily fertilized ovum seems, however, to have been proved by remarkable cases reported by eminent men.

What is meant by prolapse of the funis? When does it occur? What are its dangers? How would you manage such a case?

Prolapse of the cord consists in the descent of a loop of the umbilical cord in advance of the presenting fetal portion. It occurs in certain malpositions and malpresentations of the

fetus, in multiple pregnancy, in hydramnios with sudden escape of the liquor amnii, and in contracted pelvis when the fetal head does not properly fit into the superior strait. The danger is fetal death from asphyxiation due to pressure on the cord. The treatment consists in replacement of the cord, the woman resting in the knee-chest or Trendelenburg posture. This may be accomplished by gravity, aided by the hand or by a respositor. If this fails, podalic version may be performed or the child hastily delivered by forceps.

What is premature respiration?

The establishment of the function of respiration before delivery of the child has been accomplished. This is due to the entrance of air into the birth-canal, and occurs in cases of dystocia or during the performance of version. The danger is insufflation of liquor amnii or clots, with the development of fetal pneumonia.

How does constitutional syphilis in the parents affect the infant, and how can you detect its presence in the infant?

The offspring of syphilitic parents is generally infected by the disease. Congenital syphilis will be shown by the following symptoms: Undersize of the fetus, delivery at term of a still-born baby, syphilitic pemphigus on the palms and soles, enlargement of the liver and glands of the body, catarrhal or white pneumonia, and a line of fatty tissue between the epiphysis and diaphysis of the long bones. If the child be born alive and apparently healthy it will develop a coryza or "snuffles" at the expiration of four or five weeks, followed by the appearance of eruptions over the body and the development of marasmus.

Give the causes and treatment of umbilical hemorrhage of the new-born child.

Primary omphalorrhagia results from loose ligature or laceration of the cord, and occurs immediately after birth.

Secondary hemorrhage occurs at the time of separation of the cord, and is due to a dislodgement of the clots or to the hemorrhagic diathesis. The *treatment* consists in religation of the cord, the application of a firm compress with an astringent solution, the application of a firm plaster of Paris dressing, or of a figure-eight ligature applied over hare-lip pins.

How would you decide whether a dead infant had been born alive?

By the presence of air in the lungs (*hypostatic test*).

What are the causes of still-birth, and how should a still-born child be treated?

The causes of still-birth are various intra-uterine diseases, asphyxia from pressure on the cord or interference with the fetoplacental circulation, as in eclampsia or premature separation of the placenta, and traumatism during some obstetric operation. Such a child should be handled tenderly and be given a decent burial. The term "still-birth" should not be confounded with asphyxia neonatorum.

Give the etymology and uses of the forceps, and name the conditions for their application, together with the rules therefor and precautions to be observed in the same.

The obstetric forceps (a Latin word) is an instrument with two blades and handles for pulling, grasping or compressing the fetus. Its use is indicated by the presence of uterine inertia, minor degrees of pelvic contraction, threatened fetal or maternal death, and to correct malpositions of the fetal head. In order that the instrument may be applied the os must be dilated, the membranes ruptured, there must not be too great disproportion between the head and the birth-canal, the part should be engaged, and the labor must be possible. The left blade is always introduced first, and must be grasped in the left hand and carried to the left side of the patient. It must not be forcibly thrust in, but must be slightly rotated in order to accommodate it to the pelvic and fetal curves. The blade

that corresponds in name to the pelvic diameter in which the fetal presentation is lying must be pried forward in order to grasp the fetal head on the sides.

Describe the common varieties of obstetric forceps.

A *short* forceps is one in which the blades are attached directly to the handles without the intervention of a shank; it has the cephalic curve only, and is used only when the head is on the pelvic floor (*low forceps operation*). The *long* forceps is one in which a shank is placed between the handles and the blades; it has a pelvic curve, as well as the cephalic. It may be used at the superior strait, but usually applied to the head in the pelvic cavity (*median forceps operation*). The *axis traction* forceps is a long forceps, in which, by an appliance or supplementary handle attached to the under surface of the blades, the traction force is constantly exerted in the line of the axis of the parturient canal. It is used at the superior strait (*high forceps operation*).

Describe the position of patient and physician for the readiest means of applying the forceps.

The patient lies upon her back in the lithotomy position, with the limbs flexed and the buttocks over the side of the bed. The physician sits on a chair between the thighs, which are separated and held by assistants.

In what direction should traction be made when the fetal head is in the cavity of the pelvis?

At first downward and outward, then upward and backward.

What powers may be exerted by the forceps?

The forceps are generally used as tractors. They may be employed as levers, rotators, and compressors.

What are the dangers in the use of forceps, and how are such dangers to be avoided?

The dangers are slipping of the instrument, septic infec-

tion, laceration of the cervix and soft tissues, and fatal compression of the fetal head. If applied gently, without force, and in the proper (less) diameters of the fetal skull, and if thorough asepsis be employed, these dangers may be obviated.

Describe the technic of the high forceps operation.

The instrument (axis-traction forceps) must be introduced through the cervix, and applied to the head in the best diameter possible. The grip is a vicious one, because a large diameter must be seized and there is danger of slipping. Traction is made well down at first, and as the head descends and the upper handles of the instrument rise the extra handles must be raised in order to keep the two handles together. When the head is low enough the instrument should be withdrawn and reapplied in a better position, or a simple instrument used.

Describe the occasion for the application of the forceps in the inferior strait.

This is a low operation. The blades are introduced in the manner already described, and traction made outward and downward until the floor is reached. The head is then pulled upward and outward and then upward and backward until it emerges through the vulvar orifice. The instrument in the last stage of delivery is grasped in the right hand only, as a dagger would be held, and the left hand spans the perineum in order to regulate the degree of distension.

Describe the use of the forceps in the occipito-posterior position.

This is a double forceps-operation. The occiput generally lies in the right oblique diameter (R. O. P.). After applying the forceps in the manner already described traction is made downward and outward until the head impinges upon the pelvic floor. In the intervals of relaxation a certain amount of anterior rotation will take place. This will carry the occiput through the transverse and into the left oblique diameter.

The forceps must then be removed and reapplied in the new diameter to prevent inversion of the instrument. The final traction and delivery are as in the ordinary anterior forceps-delivery.

What indications would lead you to insert a hand into the uterus, and what precautions should you observe?

Failure of the placenta to descend, active post-partum hemorrhage, and the necessity for the performance of version are the indications for the introduction of the hand into the uterus. Thorough asepsis and antisepsis must be observed, and the hand must be anointed with an antiseptic ointment.

Define version. Give the varieties, indications and dangers of version, together with the preliminaries and the method of operating.

Version or *turning* is an obstetric operation whereby by manual efforts the position of the fetus *in utero* is altered so that one extremity of the fetal ellipse is made to take the place occupied by the other extremity or by some portion of the trunk. The *varieties* of version are: 1. *Cephalic*, in which the head is made to present; 2. *Pelvic*, in which the breech is caused to present at the superior strait; and 3. *Podalic*, in which one or both feet are grasped and drawn down into the parturient canal. The *indications* for version are malposition of the head and malpresentations, minor degrees of pelvic contraction, placenta prævia, anything indicating speedy delivery of the child, as threatened fetal or maternal death. The *dangers* of the operation are the introduction of septic matter or of air, with the production of air-embolism, rupture of the uterus, laceration of the cervix, and serious fetal injury. The patient should be anesthetized, and every antiseptic precaution observed. The membranes should not be ruptured until the hand is ready to be introduced. One foot should be grasped with the heel in the palmar surface and the child gently turned to avoid undue distension of the lower uterine segment. After the body is turned the case is treated as a breech presentation.

Compare version with the employment of forceps, and state when each is preferable.

Version is a shorter operation, and one that is to be preferred when haste is required. The dangers of sepsis are greater than in the use of forceps, and also the danger of uterine rupture. Version should be used when the forceps fail to engage the head in minor degrees of pelvic contraction. Version cannot be employed when engagement has occurred or when there is a high position of Bandl's ring.

Describe symphyseotomy, and give the indications for its performance.

Symphyseotomy or division of the pubic symphysis is an extremely limited operation. It should be done, if done at all, only in those cases of pelvic contraction in which the conjugate diameter of the superior strait measures from 7 to 8 cm. The operation of choice is the *indirect* method, in which an incision 1½ to 2 inches long is made above the symphysis in the median line, and after separation of the muscles the Galbiati knife is passed down beneath the symphysis and the bone divided from below upward and from within outward. As the symphysis separates gauze is packed in to arrest hemorrhage. The forceps is then applied and the child extracted. After delivery the wound is closed and the bones held in apposition by means of a firm pelvic binder.

Define embryotomy and craniotomy, and give the indications for and method of operating in each.

Embryotomy is any mutilating operation upon the fetus. It includes *decapitation* or beheading of the fetus, *amputations* of the fetal extremities, *evisceration*, or removal of the viscera piecemeal, and *craniotomy*, or opening of the fetal skull, with evacuation of the brain. The *technic of craniotomy* is as follows: Vaginal asepsis, fixation of the head and scalp with volsella-forceps, perforation through a suture or fontanel, enlargement of the perforation, disorganization of the brain-mass, decerebration by intra-cranial injections of

warm carbolized water, crushing of the skull, and extraction of the head by the craniotractor.

Give the various steps in embryotomy in the transverse presentation.

If the fetus presents by the back, the operation of *spondylotomy* or division of the vertebræ is indicated, followed by evisceration or by delivery of the fetal body doubled upon itself. Spondylotomy or *rachiotomy* is performed by means of scissors, as is also evisceration. Occasionally in impacted shoulder presentations the operation of *decapitation* will be indicated. This can be accomplished by means of the blunt or the sharp hook or by scissors. The body is readily removed, and the head must then be grasped by forceps, crushed and extracted.

Give the condition requiring Cesarean section or hysterectomy, and describe a modified form of the operation.

Cesarean section or delivery of the child through an abdominal and uterine incision is indicated in grave degrees of pelvic contraction, in labor obstructed by tumors of the uterus and pelvis, in irreducible vaginal tumors, in rupture of the uterus, and in sudden maternal death. The original Cesarean section, in which an incision was made into the uterine wall and the child extracted, has been modified by Sänger as follows: The abdomen is opened in the median line, the uterus delivered and towels packed around it. Then while the uterine arteries are controlled by an assistant an incision is made into the uterus and the child and placenta extracted. The uterine cavity is cleaned out and sutures introduced to close the uterine incision, after which the abdominal wound is closed.

Define Porro's operation, state when it is applicable, and describe the method of its performance.

The *Porro operation* or *celiohysterectomy* consists in the extirpation of the uterus and its appendages after the ex-

traction of the fetus, as in the simple Cesarean section. The *indications* for this operation are extreme degrees of pelvic contraction, marked atresia of the cervix, vagina or vulva, the presence of large bony growths in the pelvic canal, large fibrous or myomatous tumors of the uterus, extensive rupture of the uterus, with involvement of adjacent structures, a relaxed and flabby condition of the uterus after the section, and a septic condition of the uterus, with threatened general septic infection. The operation is the same up to extraction of the child. The ovarian and uterine arteries are then ligated and the uterus amputated at the cervical junction. The case is then treated as an ordinary abdominal section.

What complications in labor justify abdominal section? Give the technic of the operation.

The conditions that indicate Cesarean section, rupture of the uterus, retrodisplacement of the uterus with incarceration, extra-uterine pregnancy, labor complicated with tumors, grave septic infection of the uterus, appendages or broad ligament, all indicate abdominal section. The technic is that of Cesarean section with or without the removal of the uterus.

Describe the malformations of the uterus.

Owing to failure of development of the ducts of Müller we have varying degrees of *double uterus.* The slightest degrees are known as *uterus incudiformis* and *uterus cordiformis.* From these minor degrees the uterine deformity may advance through the stages of *uterus septus, subseptus, partitus, bipartitus, bilocularis* and *semipartitus.* In the *uterus bicornis* the two tubes unite below, but are separated above. The *uterus unicornis* results from a lack of development of one of the Müllerian ducts, its fellow undergoing the normal process of evolution.

Describe and differentiate anteversion, retroversion and prolapsus of the uterus. State the obstetric significance of each.

Anteversion of the uterus is a bending of that organ for-

ward; *retroversion* is a bending backward; *prolapsus* is a falling down or descent of the organ. Anteversion may prevent a rising of the uterus if the organ be fixed, and so interfere with pregnancy. Retroversion of a pregnant womb may result in incarceration with serious results. Prolapse does not as a rule interfere with gestation; the uterus returns to its normal position as gestation advances.

Mention the symptoms and give the management of long-retained excretions due to imperforate hymen.

In addition to menstrual suppression there will be noted cramp-like pains and a steadily growing cystic tumor in the median line of the abdomen. Palpation will elicit pain. Vaginal examination will show the imperforate condition of the hymen. The *treatment* consists of thorough asepsis, followed by cervical incision into the hymen. As the tarry fluid escapes a two-way catheter should be introduced and an antiseptic solution allowed to flow into the uterus in order to prevent shock from sudden evacuation and to prevent septic infection.

What is vaginismus? How may it be recognized and treated?

Vaginismus is painful spasm of the vagina and vulva. It results from rigid hymen, fissure, and other local conditions, and appears at the time of coitus or digital exploration. It is best treated by dilatation under anesthesia.

What method should be employed to dilate the non-pregnant uterus, and under what circumstances is the operation justifiable?

The best method of dilating the uterus is the use of the dilator of Goodell or Wathens, the glove-stretching apparatus. This is required whenever there is stenosis of the cervical canal, or as a preliminary step to the operation of curettage.

Is ventrofixation of the uterus justifiable? If so, state under what circumstances, and describe the operation.

It is a safe and proper operation for the correction of retrodisplacement of the uterus in women past the child-bearing period. An abdominal opening is made, the uterus is brought forward, and a stitch is passed through the peritoneal and subperitoneal tissues on one side of the incision, then through the fundus of the uterus on a line with the Fallopian tubes and through the corresponding tissues on the other side. A second suture must be passed a little back of this and firmly secured. The abdominal wound is then closed.

Under what conditions may shortening of the round ligament become justifiable, and how should the operation be performed?

Shortening of the round ligament may be performed when there is a retrodisplacement of the uterus. It is best performed by Wylie's method or some other of the intraperitoneal methods, the ligaments being folded upon themselves or implanted further back upon the uterus. *Alexander's operation* is shortening of these ligaments in the inguinal canals.

Define salpingitis, state its causes and pathology, and give its management.

Salpingitis is inflammation of the Fallopian tubes. It may be septic, gonorrheal, or tuberculous in origin, or merely a catarrhal condition. The mucosa swells, secretes a fluid, and if the edges of the fimbriæ adhere a retension-cyst is formed. The treatment may be derivative, and consist in purgation, with local applications to the cervix and vaginal vault, or abdominal section may be performed and the appendages removed.

Give the pathology of (a) hydrosalpinx, (b) hematosalpinx. Give the diagnosis and treatment of each.

Hydrosalpinx, or a watery collection in the tube, results

from an old pyosalpinx or purulent collection. The pyogenic membrane has become destroyed, and the fluid slowly assumes the watery nature. *Hematosalpinx*, or blood in the tube, results almost invariably from an extra-uterine pregnancy. The treatment of each is excision. The diagnosis is made by the presence of a sensitive tumor in the situation of the tube, with pain on the affected side.

Define endometritis, and give its causes, varieties and treatment.

Endometritis, or inflammation of the lining membrane of the uterus, may be septic, gonorrheal, traumatic, catarrhal or tuberculous in origin, and occur as a glandular or as an interstitial affection, or as both combined. It may be treated by local applications, depletion, curettement, intra-uterine applications, or by excision of the uterus.

Give the causes of pelvic inflammation, and state its relation to involvement of the ovary.

Pelvic inflammation is generally septic or gonorrheal in origin. It may result from exposure to cold or wet or from abrupt stopping of the menstrual discharge. If active and virulent or long continued there follows a thickening and chronic inflammation of the ovarian capsule, which will result in follicular cysts forming in the ovarian stroma from inability of the Graafian follicles to rupture.

Give a differential diagnosis between ovaritis and ovaralgia.

Ovaritis, or inflammation of the ovary, is associated with all the symptoms of pelvic inflammation, including pain, leukorrhea, hemorrhage, menstrual disturbance, and swelling of the ovary or tumor-formation. There will also be general symptoms, as fever and prostration. *Ovaralgia* is neuralgia of the ovary, and may exist independently of any appreciable local lesion. It is more apt to occur at or near the menstrual period.

Give the pathology and treatment of an ovarian cyst.

An ovarian cyst may be follicular, as already described. It may be a multilocular cyst arising from rudimentary Graafian follicles, and consisting of two or more loculi or compartments; it may be a unilocular cyst springing from the parovarium, or it may be a papillary growth arising in the vertical tubules of the paroöphoron. Whatever its origin and pathology, it should be removed by abdominal section.

Give a description of cystocele and rectocele. State how each may complicate labor, and what should be done in the arising contingency.

Cystocele is a prolapse of the anterior vaginal wall and posterior bladder wall; *rectocele* is a prolapse of the posterior vaginal wall and anterior rectal wall. Both cystocele and rectocele encroach upon the calibre of the vagina, and may be caught by the advancing fetal head either arresting its progress or being pushed before the head; in the latter case the submucous tissue is torn and the vaginal prolapse made worse. The treatment consists in applying forceps to the head and drawing it over the relaxed vaginal walls.

How would you diagnose cystic degeneration of the ovaries from other forms of disease which simulate it?

From *ascites* ovarian cyst may be distinguished by the centrally situated tumor, the area of central dulness with coronal resonance, the immovability of the tumor, and the protuberant abdomen when the woman assumes the dorsal position. In ascites the abdomen flattens and the flanks bulge when the woman lies upon her back; a change of position causes a corresponding change in the area of dulness; fluctuation is marked; there is an area of central resonance with coronal dulness, and an associated grave organic disease may be detected. In *phantom tumor* the percussion-note is hyperresonant, and examination under an anesthetic reveals the true condition.

Give the early diagnosis and the treatment of cancer of the uterus.

A recurrence of bleeding after the menopause; an angry appearance of the cervix, which bleeds on the slightest touch; a peculiar hardness of the mucous membrane due to cellular infiltration; an acid and irritating discharge, which may or may not be fetid, and dull sacral pains would lead to the suspicion of cancer. A microscopic examination would then complete the diagnosis. The only treatment consists in total extirpation of the uterus.

Give the diagnosis and treatment of anemia and chlorosis.

Chlorosis is the "green sickness" of young girls. These girls are generally stout and well nourished, but present a peculiar green color; they suffer from nosebleed not infrequently and attacks of vertigo and syncope. In true *anemia* there is an extreme pallor, with marked diminution in the red blood-corpuscles and hemoglobin and more or less wasting. Anemia is generally associated with some grave organic disease. The treatment of both conditions consists in good food, change of scene, rest and tonics, including iron, strychnine and arsenic.

What are the symptoms and treatment of amenorrhea?

Amenorrhea is a total suppression of the menstrual flow. It is generally associated with anemic conditions, and may be accompanied by leukorrhea and vague pelvic pains. The treatment consists in tonics, good food, and the use of iron, oxalic acid, potassium permanganate, manganese, and the other so-called emmenagogues.

What is the menopause, and in what manner would you explain the theory that it is a critical period in a woman's life?

The *menopause* is the cessation of the phenomenon of menstruation, occurring usually at the age of 43 to 45. At this

time the ovarian influence ceases, and because of the tendency to the development of obesity and of uterine cancer at or after this period it has long been regarded as a critical period in the life of the woman. Various forms of insanity may also develop at this time. The post-climacteric diseases may assume a very serious aspect.

Enumerate the perils of premature parturition.

Premature labor subjects the woman to the dangers of hemorrhage from partial detachment of the placenta, cervical laceration because of rigidity of the parts, and sepsis from retention of placental débris.

What are the conditions liable to produce sepsis after abortion?

Imperfect expulsion of the product of conception and the necessity in many cases of digital assistance.

Before the head engages, how would you convert an L. O. P. into an L. O. A. position?

If possible by the position of the mother, who should lie upon the left side. If this fails, the head may be rotated forward by the hand or by forceps applied to the sides and gently turned, not, however, reversing their normal position in the pelvis. One blade of the forceps, the vectis, may be employed for the purpose in suitable cases.

What injuries may happen to the vagina and rectum during labor, and how may they be avoided?

The vaginal walls may be pushed or drawn ahead of the advancing part and partially detached from their support; they may be cut or torn by the blades of the forceps, which may also cut through the rectovaginal septum and produce a complete perineal laceration. These accidents may be prevented largely by preservation of the bag of waters as long as possible, by thorough lubrication of the parts, and by the proper use of the forceps when these become necessary.

Describe the method of applying forceps in R. O. A. presentation.

The head lies in the left oblique pelvic diameter; therefore the left blade first introduced is pried forward until the blade rests over the upper fetal ear, the handle of the instrument looking downward and outward to the operator's left. The right blade is then introduced and depressed without rotation until it fits into the slot of the other blade.

Describe the operation in detail for the immediate repair of complete laceration of the perineum.

After cleansing the parts, the patient being under an anesthetic, a stitch is passed well behind the anal orifice and toward the median line with an outward sweep, so as to embrace the retracted sphincter fibers; it is then carried up to the apex of the tear and caused to traverse a similar course upon the other side of the fissure, emerging at the point of introduction. A second stitch is then introduced at the point of retraction of the outermost sphincter-fibers and carried in and toward the apex of the tear, traversing a similar course on the other side to emerge at the outermost retracted sphincter-fibers of that side. These two stitches close the sphincter. The perineum above is then closed by transverse sutures introduced in the usual manner. If the rectal septum is torn, it must first be closed by a running catgut suture.

Give the mechanism of delivery of a R. O. P. presentation.

After great labor-pains the head descends until the occiput strikes the pelvic floor high up posteriorly; it is then rotated anteriorly through ¾ of a half circle until it rests under the pubic symphysis. While doing this the shoulders rotate high up in the false pelvis from right to left until they rest in the right oblique diameter, having primarily rested in the line of the left oblique diameter. The head is then delivered by extension, rotation occurs toward the right, the anterior

shoulder advances from the left side to the median line, and the shoulders and body are then delivered.

What abnormal conditions in pregnant women are prejudicial to the life of mother or child?

Syphilis, tuberculosis, anemia, vomiting, zymotic diseases, placenta prævia, pelvic deformities, renal disease, tumors, and degenerations of the membranes.

Describe the method of delivery in a leg-presentation.

This is a modified breech-presentation. The leg should be drawn down and the other made to engage. The labor may proceed as a breech delivery, or the child may be rapidly extracted as after version.

State the conditions compelling artificial feeding, and describe the proper method of modifying cow's milk for the newly born.

Lack of milk-formation; refusal of the child to nurse; tuberculosis or other grave maternal disease; high fever. Normal cow's milk should be diluted by 10 or 12 parts of water, some sugar of milk added, lime-water 1 or 2 drams to the mixture, and the whole subjected to Pasteurization before being administered in sterile bottles.

Give the relations of the cephalic and pelvic diameter at 3 points during the birth of a L. O. A. presentation.

At the beginning of the labor the suboccipito-bregmatic and bitemporal diameters of the head are concerned, the sagittal suture running in the right oblique pelvic diameter. After engagement perfect flexion causes the trachelobregmatic and biparietal diameters to engage. After anterior rotation the head rests in the conjugate pelvic diameter and the head is delivered by extending under the subpubic ligament.

Diagnose pregnancy in the sixth month from phantom tumor.

In phantom tumor there is general tympany over the dis-

tended abdomen, there are no hard parts to be felt, and under ether the entire condition clears up. The pregnancy at six months will give all the absolute signs of pregnancy, including movements, heart-beats, and ability to outline the fetal parts.

Differentiate an ovarian cyst, a uterine fibroid, and pregnancy at the fifth month.

At the fifth month of pregnancy there will be found a pyramidal tumor almost reaching to the umbilicus, cystic upon one side and firm upon the other, alternately hardening and contracting. The fetal outlines may be determined indistinctly, ballottement is present, and the soft signs of pregnancy may be found.

An ovarian cyst is of slower growth, is entirely cystic to the feel, fluctuation will be present, the tumor will be more or less to one side of the median line; none of the signs of pregnancy will exist; menstruation may persist.

A uterine fibroid will be much harder, irregular in outline, without the signs of pregnancy. Menstruation will be frequent and irregular, and increased in amount.

Give the management of a pregnancy and labor complicated by a fibroid tumor of the uterus.

If the tumor is large and the pregnancy early, abortion may be induced. In later pregnancies, the tumor being situated on the anterior uterine wall, the patient may be allowed to go to term and may spontaneously deliver herself. If not, Cesarean section is indicated. If the tumor is lodged in the pelvis or is in the posterior uterine wall, elective Cesarean section with the Porro operation may be performed.

Define multiple pregnancy.

Pregnancy in which more than one fetus is present in the uterine cavity or in the maternal abdomen.

Give the management of delay in the second stage of labor.

If due to inertia, rest, firm abdominal binder, quinine, friction over the uterine fundus. If due to obstruction, as from rigid perineum, rigid cervix, tumor, or pelvic contraction, correct the existing cause and deliver wth forceps or by some other operative procedure.

To what diseases is the puerperal breast liable?

Fissure of the nipple, mastitis, abscess, septic infection, caking of the milk.

Describe the vulva. Differentiate the vulva of a parous woman and the vulva of a non-parous woman.

The vulva consists of the mons veneris and the two rolls of fatty tissue known as the labia majora. These parts are covered with hair. In a non-parous woman the labia are in close contact, even when the thighs are separated; in a woman who has given birth to children the labia are either lightly in contact or the orifice is patulous and relaxed.

Describe pelvimetry and state its obstetric uses and value.

By pelvimetry is meant the measurement of the dimensions and capacity of the pelvis. It is employed to determine the degree of pelvic contraction that may be present, and the relationship existing between the respective sizes of fetus and pelvis. By its use grave major obstetric operations may be avoided by the premature induction of labor, or the operation of choice may be selected and both fetal and maternal life saved.

Describe the genupectoral posture and mention some of its important uses.

The genupectoral or knee-chest posture is that in which the patient, resting upon her knees with the thighs vertical, inclines her body forward until she rests upon the upper

portion of the chest with the head turned to the side and the arms resting above the head. This position favors gravitation of the viscera out of the pelvis, permits a replacement of a retro-displaced uterus, the return of a hernia through the ring, and the replacement of a prolapsed funis.

Describe the causes and management of a "head-last" labor.

This is a breech-labor, and results from a reversal of the shape of the fetal ellipse, the cephalic extremity of the child becoming the larger; it may also depend upon a deformed uterus or a mild degree of pelvic contraction. The treatment consists in efforts at version before labor, if this be deemed best; inaction during the first and second stages of labor until the child is delivered as far as the umbilicus, and then a rapid delivery of the shoulders and head.

Mention the salts of lithium and describe their medicinal uses.

Benzoate, bromide, carbonate, citrate, and salicylate. The carbonate and citrate are used extensively in gout and the lithemic diathesis. The lithium salts have strong alkaline qualities, and act on the system as other alkalies. Lithium bromide is prescribed for the effects of bromide.

What are the therapeutic uses of lobelia?

It is used as an expectorant, diaphoretic, emetic, purgative, and anti-spasmodic.

Mention the official preparations of copper. Give the dose of each.

There is but one official preparation, the sulphate, which is given as an emetic in doses of 0.250 Gm. (4 grains), and as a tonic in dose of 0.010 Gm. (⅕ grain).

What are the therapeutic uses of oleum tiglii or Croton oil?

Externally it is applied as a counter-irritant in bronchitis, neuritis, rheumatism, and ovaritis. Internally it is used as a prompt hydragogue cathartic and revulsant in acute cerebral congestion, apoplexy and uremia. In these cases it not only causes general depletion, but also a rapid efflux of blood from the brain.

What are the uses of the bromides?

The bromides are used as sedatives to the nervous system, to lower reflex activity, to produce sleep, to subdue excite-

ment of the genital apparatus, and to antagonize congestion of the brain.

Give the indications for the use of corrosive sublimate internally.

As an antisyphilitic, as a hematinic, in gastric ulcer and early stages of hepatic cirrhosis and in dysentery.

What remedies are employed to correct anemic conditions and how are they used?

Nux vomica, stimulates the blood-making organs, and is used as an adjunct to restorative remedies. *Iron*, the chief value of which is to improve digestion and to furnish hematin to the blood. The astringent preparations are the best, and should be given after meals. *Arsenic* as an adjunct to iron. Arsenic increases the number of blood cells, while the iron increases the hemoglobin contained in each. *Bichloride of mercury*, *quinine* and *manganese* increase the number of red blood cells. In the treatment of anemia it is of importance to determine the cause when possible. This will frequently be found to be due to gastro-intestinal irritation or constipation. General tonic treatment, with the proper diet and hygienic surroundings, are often more valuable than drug treatment.

Describe the therapeutic uses of the preparations of phosphorus.

Phosphorus is chiefly used to promote the nutrition of osseous and nervous tissue. Very small doses of the drug have been found of excellent service in functional impotence, in certain skin diseases, in pernicious anemia and in neuralgia. Calcium phosphate and the hypophosphites are used with benefit in all diseases of malnutrition and where the repair or development of the bones is required. They are particularly useful in protracted suppuration, osteomalacia, rachitis, caries, chronic phthisis, and in the anemia and bone-softening of lactation. Sodium phosphate is a well-known purgative.

Indicate the manner in which ethylic ether (sulphuric ether?) should be applied to produce general anesthesia.

As an anesthetic it may be administered from a sponge, a folded towel surrounded by a cone of pasteboard, or from an inhaler made especially for the purpose. At first the inhaler should be held some distance from the nose, to accustom the patient to the irritant effects of the ether, but soon it should be brought close to the nose, so that the anesthetic may be taken in concentrated form. Insensibility of the conjunctiva and muscular relaxation are the indications that the patient is properly prepared for the operation. Many surgeons now employ preliminary anesthesia with nitrous oxide gas. This greatly shortens the first stage and allows the patient to be anesthetized with a comparatively small amount of ether.

In what manner is the system affected by an overdose of chloral hydrate?

The ingestion of a toxic dose produces sleep, which soon deepens into coma; the pulse becomes feeble and thready, the respiration embarrassed, the surface cold and clammy, the pupils at first contracted and then dilated, and finally death results from cardiac and respiratory paralysis.

Name three general anodynes and give the dose of some official preparation of each.

Opium, belladonna, cannabis indica. Morphine sulphate, 0.015 Gm. (¼ grain). Sulphate of atropine, 0.0004 Gm. ($^1/_{160}$ grain). Extract cannabis, 0.010 Gm. (⅙ grain).

State the precautions which should ordinarily be observed in administering medicines by the hypodermic method.

The medicine must be in solution, and the latter should be neutral in reaction and freshly prepared. The skin of the patient should be rendered aseptic at the place selected for the injection. The solution is to be injected beneath the skin and not into it, and the blood-vessels and nerve points are to be especially avoided.

Give the physiological effects of cinchona.

Cinchona is an astringent bitter and a stomach tonic. At first it promotes appetite, digestion, the flow of saliva and gastric juice; long continued it sets up a gastric catarrh, impeding digestion and causing constipation. Its action is more astringent and irritating than that of its alkaloid, quinine. Its active principles are more slowly absorbed by reason of its bulk. In large doses quinine causes headache, ringing in the ears and some deafness. It is antipyretic and a heart depressant. On the nervous system it causes congestion of the brain and acts as a cerebral excitant; moderate doses lessen reflex activity by stimulating Setschenow's inhibitory center. Toxic doses permanently abolish the reflexes by depressing the spinal cord and peripheral nerves. Small doses exert no influence on the respiratory system, but large doses paralyze the respiratory center.

Mention the conditions that contra-indicate the administration of aconite.

It is contra-indicated when there is adynamic action of the heart, cardiac degeneration or dilatation, and gastro-intestinal irritation or inflammation.

Mention the alkaloids of nux vomica.

It contains two alkaloids, strychnine and brucine. The latter resembles the former in its action, but is less powerful.

For what pathologic conditions is salicylic acid administered? What symptoms indicate the discontinuance of the use of salicylic acid?

Externally it is used as an antiseptic in the dressing of wounds. Dissolved in collodion it is a valuable application for the removal of corns. The ointment is of service in chronic eczema. Internally, salicylic acid is of the greatest value in acute rheumatism. In neuralgia and neuritis of rheumatic origin it is of service, as it is in tonsilitis, pleurisy with serous effusion and in diabetes of gouty origin. It

should be discontinued if the patient suffers from headache, ringing in the ears, deafness, paralysis of the ocular muscles, great fall of temperature, excessive sweating, difficult respiration, weak pulse, convulsions, and olive-green urine. These are the symptoms resulting from a poisonous dose.

For what conditions should (a) tincture of digitalis be given, (b) infusion of digitalis be given? Mention the dose of each.

When the cardiac action of digitalis is desired the tincture should be employed, and no fluid should be taken within twenty minutes either before or after swallowing. If the diuretic action is required the proper preparation is the infusion. The dose of the tincture is 1 Cc. (15 minims). The dose of the infusion is 8 Cc. (2 fluidrachms).

Write a prescription illustrating chemical incompatibility.

Salicylic acid is incompatible with the salts of iron; a prescription containing tincture of iron and salicylic acid would furnish an example of such incompatibility.

Mention the principal physiologic effects of jaborandi. Give the alkaloids of jaborandi.

Jaborandi is a powerful diaphoretic and sialogogue, a cardiac depressant, by stimulation of the vagus-ends; it is also myotic, emetic, and under some circumstances abortifacient. Jaborandi contains four alkaloids, pilocarpine, jaborine, pilocarpidine, and jaboridine.

What are the earliest signs of poisoning from the external use of carbolic acid?

Early symptoms are smoky color of the urine, lumbar pain, slight cerebral disturbance, after which develops impairment of respiration and stupor. Applied in concentrated form it is irritant and superficially escharotic, and produces at the point of application a white spot, changing to red if the acid is soon removed. If the application is prolonged a white

slough results from coagulation of the albumin of the tissue; this is bordered by a red zone of inflammation.

Mention the ingredients and the dose of pulvis glycyrrhizae compositus.

Compound liquorice powder contains senna 18, glycyrrhiza 23.6, oil of fennel 0.4, washed sulphur 8, sugar 50; the dose is 4 Gm. (60 grains).

For what conditions should blisters be applied? Describe the application of blisters.

Blisters are applied for the purpose of producing counter-irritation. The proper manner of employing a counter-irritant to affect inflammation is not to apply it directly to an actually inflamed area, but a little to one side of it, at a spot known to be connected intimately with the diseased area by nerve fibers.

By what other name is liquor potassii hydroxidi known? State the dose.

Liquor potassii hydroxidi is also called solution of potassium hydroxide. Its dose is 1 Cc. (15 minims), well diluted with water.

Mention the antagonist of cocaine.

Ammonia and amyl nitrite combat the earliest symptoms of cardiac depression produced by cocaine. The most direct antagonist is chloral; then follow chloroform, ether and morphine.

In what conditions is gallic acid useful?

Gallic acid and its congener, tannic acid, are astringents, the former being the feebler of the two. They constringe the muscular tissue in the walls of the minute vessels, thus checking secretion and hemorrhage and cutting short local inflammation. Gallic acid is useful in hematuria, passive hemorrhages, chronic cystitis, chronic diarrhea, bronchorrhea and night sweats.

Describe the treatment of night sweats.

The following drugs are found useful in the treatment of night sweats: Sulphate of atropine, in doses of 1-75th gr. at bed-time; gallic acid, in 15 gr. doses; camphoric acid, in 10 gr. doses; and agaricine, in doses of $\frac{1}{12}$ to $\frac{1}{3}$ gr. Sponge baths with weak solutions of alum and other astringents are sometimes employed.

For what purposes are diuretics employed?

Diuretics are administered with the object of increasing the quantity of urine excreted: to promote the elimination of waste products and other poisons from the blood: to dilute the urine and to alter morbid conditions of the urine.

Give the source, the common name and the principal therapeutic uses of oleum theobromatis.

Oil of theobroma is commonly called cacao-butter. It is a fixed oil expressed from the seeds of *theobroma cacao*, the chocolate tree, which is found in Mexico, the West Indies, and South America. Oil of theobroma consists chiefly of stearin with a little olein. It has a demulcent action. Its chief use is as a base for making suppositories.

What are the varieties of sinapis used in medicine? How are they used and for what purpose?

There are two varieties of sinapis (mustard), *sinapis alba* and *sinapis nigra*. It is directed, however, that pharmacopœial preparations be made from black mustard only. Locally used, mustard is rubefacient, counter-irritant, and a nerve stimulant, causing heat, redness and severe burning pain. Its prolonged application produces vesication by inducing local inflammation. Internally it is a local emetic in full doses; in smaller doses it has a carminative action. On the gastric mucous membrane its irritant effect is much less powerful than on the skin. Mustard is commonly used as an application to relieve local pain and to produce counter-irritation. Internally it may be employed as an emetic in

indigestion or narcotic poisoning. Its use as a condiment is general. The oil of mustard is one of the most irritant of the volatile oils, producing severe gastro-enteritis.

What are the causes and treatment of urticaria?

Urticaria is an inflammatory affection, characterized by the eruption of pale-red, evanescent wheals, which are associated with severe itching. It is due to gastro-intestinal disturbances and emotional excitement. Chronic visceral diseases predispose. It is produced in susceptible individuals by certain articles of food, as well as the bites of insects, and by certain drugs. Treatment: Remove the cause when possible. Especial attention should be paid to removing gastric irritation and securing a free movement of the bowels with a saline laxative. The special remedies recommended are the alkalies, salicylate of sodium, quinine, iodide of potassium, atropine, and antipyrine. Locally, lotions of water and alcohol, carbolic acid, boric acid or hydrocyanic acid are very useful.

Name three drugs belonging to each of the following classes: narcotics, diaphoretics, ecbolics.

Narcotics: opium, hyoscyamus and alcohol. Diaphoretics: pilocarpine, aconite and cocaine. Ecbolics: ergot, oil of rue, and savin.

What are the physiological effects and the therapeutic uses of phytolacca?

Phytolacca is an emeto-cathartic possessing slow but persistent action, with great nausea and considerable depression. It lowers the rate of respiration and of cardiac action, and is a motor depressant, paralyzing the spinal cord and the medulla. Death occurs from paralysis of respiration preceded by tetanic convulsions. The drug is said to possess alterative properties, and has been used internally and externally in chronic rheumatism and chronic skin affection. It produces the absorption of adipose tissue, and has been used as a remedy in obesity. Considering its physiologic action its employment is not justifiable.

From what source besides nux vomica is strychnine obtained? What other alkaloid is obtained from the same source?

Strychnine is derived from Ignatia, St. Ignatius' Bean, which contains the alkaloids, strychnine and brucine, about 1 per cent. of each.

How do borax and boric acid differ chemically and therapeutically?

Boric acid, H_3BO_3, is a weak acid occurring in transparent, colorless, six-sided plates. It is odorless, of a slightly bitter taste, and is soluble in 18 parts of water, in 15.3 of alcohol and in 4.6 of glycerine at 25° C. Borax is the sodium borate $Na_2B_4O_7 + 10H_2O$; it occurs in colorless, transparent prisms of cooling and sweetish taste and alkaline reaction. It is soluble in 20.4 parts of water at 25° C., and is insoluble in alcohol. Boric acid may be produced from borax by the action of sulphuric acid. The action of borax differs from that of boric acid in being a more powerful antiseptic and disinfectant, as well as being far more irritating when locally applied.

Name the official preparations of gold and describe its therapeutic uses.

Gold, *aurum*, has but one official salt, the gold and sodium chloride, but triturations of the metal itself may be prepared according to the general pharmacopœial formulæ for such preparations. Gold has been recommended in certain forms of gastric disturbance, in chronic Bright's disease, in certain nervous disorders, in impotence, and in pertussis. It is not generally employed.

What is the adult dose of (a) sulphate of atropine, (b) tincture of cantharides, (c) tincture of colchicum?

(a) 0.0004 Gm. ($^1/_{160}$ grain). (b) 0.3 Cc. (5 minims). (c) 2 Cc. (30 minims).

Mention three alkaloids which are chemically alike and almost identical in physiologic effect.

Cinchoninæ Sulphas, Cinchonidinæ Sulphas and Quinidinæ Sulphas.

State the cause and give the treatment of trichinosis.

Trichinosis is a typhoid condition resulting from the entrance of a parasite, the *trichina spiralis*, into the intestinal canal and the subsequent migration of these parasites into the muscular structure. The *trichinæ* are introduced into the human body by eating infected hog's flesh, either raw or imperfectly cooked. The preventive treatment consists in eating no pork that has not been perfectly cooked. If the parasites have been recently taken, emetics and purgatives are indicated. After migration has begun the powers of life should be sustained by nourishing food, stimulants and tonics.

What drug is antagonistic to pilocarpine?

Atropine in dose of 1-100 gr. for each ⅙ gr. of pilocarpine.

Where is the habitat of belladonna?

It is indigenous in the mountainous districts of central and southern Europe and Asia, and is cultivated in Europe and in the United States.

What are the sources of sulphur?

Sulphur is obtained native in several volcanic districts or from the native sulphides of iron and copper by roasting, as it sublimes at about 238° F.

In what dose may the oil of wintergreen be administered to an adult for rheumatism?

Average dose, 1 Cc. (15 minims).

How is nitrite of amyl administered and for what purpose?

Nitrite of amyl is indicated for the same general conditions as nitro-glycerin. It is generally prescribed in glass pearls containing 3-5 minims, and these are broken in a handker-

chief and inhaled. It is a valuable heart stimulant, checks spasms and dilates peripheral vessels. It is especially employed for the relief of attacks of angina pectoris.

Describe the therapeutic uses of sparteine and state the dose of the sulphate for hypodermic uses.

Sparteine is the alkaloid of Scoparius, Broom, and is a valuable diuretic and heart stimulant. Its dose hypodermically is 0.010 Gm. (⅙ grain).

What are the physiologic effects and the thereapeutic uses of the balsam of Peru?

Balsam of Peru is employed locally as a sedative and parasiticide. Internally it is of value as an expectorant in chronic bronchitis. This balsam is antiseptic, disinfectant, stimulant to the circulation and sedative to the nervous system, acting chiefly on the mucous membrane; it is a tonic and expectorant, diuretic and diaphoretic.

Give the common name, therapeutic uses and dose of sodium sulphate.

Glauber's salt; it is a powerful purgative; average dose, 16 Gm. (240 grains).

Describe the therapeutic uses of sodium chloride.

A bath may be made more stimulating for debilitated patients by the addition of a few ounces of salt to the water. An enema containing one or two tablespoonfuls of salt to the pint of water is sometimes used effectively against threadworms. The subcutaneous or intravenous injection of a three-tenth per cent. solution of sodium chloride has proven of marked benefit in cholera, uremia and acute anemia from hemorrhages.

State the composition and therapeutic uses of pulvis jalapae compositus.

Compound powder of jalap contains of jalap 35 parts, of potassium bitartrate 65 parts, rubbed together until thor-

oughly mixed. It is much employed to produce free watery evacuations in ascites and anasarca. Since it is nearly tasteless, it is a useful cathartic for children.

What is a physiologic action of camphor in medicinal doses on (a) the skin, (b) the circulation?

(a) Rubefacient; (b) increases the pulse-rate and raises arterial tension.

Describe the forms of poisoning by ergot.

There are two forms, the acute ergotism and chronic ergotism. The symptoms of the acute form are nausea, vomiting, colic, difficult micturition, and purging. The drug slows the heart, raises arterial tension, dilates the pupil, and produces vertigo. It stimulates the contraction of unstriped muscle fiber, especially affecting the sphincters and uterus. In very large dose it produces cerebral and spinal anemia and violent convulsions. There are two varieties of the chronic ergot poisoning, the convulsive and the gangrenous. The convulsions are tetanoid spasms of the flexor muscles, the uterus, the intestinal fibers and muscles of respiration, ending in coma and death by asphyxia. The gangrenous form begins with coldness and numbness of the limbs, formication of the skin, loss of sensibility and abolishment of the special senses, bullæ of blood and ichor, followed by dry or moist gangrene of the lower extremities, buttocks and other parts, epileptiform convulsions, coma and death.

In what pathologic condition is veratrum viride useful?

Locally, veratrum is of value in neuralgia. Internally the drug is advised by some in the early stages of sthenic pneumonia and in puerperal eclampsia.

Mention the therapeutic uses of phenacetine.

It is antipyretic, analgesic, and hypnotic. It is useful in whooping-cough and in rheumatic and other fevers.

Give the name of the alkaloid of Calabar and state its dose.

Physostigmine (or eserine). The dose of the sulphate is 0.001 Gm. ($^1/_{64}$ grain).

Mention three vegetable emmenagogues and state the dose of each.

Ergot, the dose of the fluid extract is 2 Cc. (30 minims); savin, the dose of the fluid extract is 0.3 Cc. (5 minims); tansy, the dose of the oil is 1 to 3 drops.

Define therapeutic incompatibility, chemical incompatibility.

Therapeutic incompatibility arises when two agents are administered together which oppose each other in their physiologic actions. Chemical incompatibility is due to the union of two or more substances in combination whereby chemical change results.

Write a prescription containing dilute hydrochloric acid, syrup of wild cherry and camphor water for a cough. Write on this prescription the dose for an adult.

JAN. 1, 1903. MR. JOHN SMITH.

℞. Acidi hydrochlorid dil ..... f℥ v
Aquæ camphoræ ..... f℥ i
Syr. Pruni virginianæ q. s. ad. ..... f℥ iv
M. Sig.—Teaspoonful every four hours.

WM. JONES, M. D.

State the dose of (a) fluid extract of belladonna, (b) extract of conium.

(a) 0.05 Cc. (1 minim). (b) 0.2 Cc. (3 minims).

In what pathologic conditions is uva ursae used?

Uva ursæ is employed as an antiseptic and stimulating diuretic in chronic inflammatory affections of the genito-urinary tract, such as pyelitis, cystitis, and urethritis.

State the name and the dose of each of five official preparations of opium.

Opii pulvis, 0.065 Gm. (1 grain); extract of opium, 0.030 Gm. (½ grain); tincture of opium, 0.5 Cc. (8 minims); camphorated tincture of opium (paregoric), 8 Cc. (2 fluidrachms); wine of opium, 0.5 Cc. (8 minims).

In what diseases are preparations of arsenic useful?

Locally, arsenic is useful in lupus and epithelioma. It is a valuable alterative in diabetes, chronic rheumatism, phthisis and asthma. In malaria it ranks next to quinine; in the simple chorea of childhood it is almost a specific. It is of great value in anemic conditions.

State the name and dose of a drug belonging to each of the following classes: (a) emetics, (b) diuretics, (c) diaphoretics, (d) cathartics.

(a) Ipecac, the emetic dose of the fluid extract is 1 Cc. (15 minims); (b) digitalis, the dose of the infusion is 8 Cc. (2 fluidrachms); (c) pilocarpus, dose of fluid extract is 2 Cc. (30 minims); (d) jalap, the dose of the compound jalap powder is 2 Gm. (30 grains).

State the name and the alterative dose of a preparation of mercury capable of producing acute poisoning. Mention the chemical antidote for this preparation.

Bichloride of mercury; dose, 0.003 Gm. ($^1/_{20}$ grain). In cases of poisoning by corrosive sublimate the stomach should be evacuated, the body temperature maintained, and egg albumin given in large quantities as an antidote.

How should asthma of cardiac origin be treated?

The term cardiac asthma is applied to any shortness of breath which is the result of deranged cardiac action. The treatment is, of course, the treatment of the diseases which are responsible for it. Rest in bed is most important. The cardiac condition may indicate the need of digitalis if, for instance, mitral regurgitation exists with loss of compensa-

tion; strychnine should be given if the heart muscle is weak; nitro-glycerine may be given in the early stages of arterial sclerosis. The particular treatment will depend upon the condition of the circulation.

Outline the treatment of uremia.

The name uremia is applied to a group of symptoms resulting from the retention of toxic materials in the blood which should have been eliminated by the kidneys. Sweating should be encouraged by the use of hot-air or vapor baths. Catharsis should be induced by croton oil in one-drop doses or by elaterium in $\frac{1}{8}$ grain doses. The renal engorgement may be relieved by a dry or wet cup to the loins. Venesection is indicated if the patient is robust and the pulse is strong. If the pulse is weak, heart stimulants should be administered. If convulsions occur, 30 to 40-grain doses of chloral may be given by the rectum, or nitrite of amyl inhaled.

Describe the treatment of apoplexy due to cerebral hemorrhage.

During the attack the head and shoulders should be slightly elevated and an ice-bag applied to the head. Prompt catharsis should be produced by croton oil, in a little glycerin, placed on the back of the tongue. If the pulse be strong, bleeding is indicated; if the pulse is feeble, hypodermic injection of such stimulants as strychnine should be employed. Bed sores must be prevented by frequently changing the patient's position and sponging with alcohol the parts exposed to pressure. During convalescence those predisposed to such attacks should lead a quiet life and avoid excitement. Iodide of potash should be administered over a long period. After the primary rigidity has appeared in the affected muscles galvanism and massage may assist in restoring lost functions.

State the official name and the minimum poisoning dose

of (a) strychnine sulphate, (b) morphine sulphate, (c) chloral. State the antidote for each.

(a) Strychninæ sulphas. The fatal dose of strychnine sulphate is placed by Taylor at ½ to 2 grains for an adult, but recovery has taken place after much larger doses. The antidotes are chloral hydrate, tannic acid and animal charcoal. (b) Morphinæ sulphas. Toxic dose depends on personal susceptibility; ⅙ grain of morphine sulphate has killed an adult. Potassium permanganate is the best antidote if the morphine is in the stomach; black coffee and atropine are of value. (c) Chloral hydrate has caused death in several instances by a 30-grain dose. Atropine is its antidote.

Write a prescription containing the tincture of the chloride of iron and the chlorate of potash, with the proper dose for a child four years old.

JAN. 1. 1903. JOHN SMITH.

℞. Potassii chloratis ..... gr. xvi.
Tincturæ ferri chloridi ..... f℥iss
Ext. glycerrhizæ ..... ℥i
Aquæ, q. s. ad ..... f℥iv
Sig.—A teaspoonful in water every three hours.

JOHN JONES, M. D.

Criticize the following prescription:

Tr. guaiac ..... f℥i
Aq. cinnamon ..... f℥ii
Sig.—A teaspoonful every four hours.

5, 12, '99. DR. J.

This is an example of pharmaceutical incompatibility. An alcoholic tincture should not be prescribed with aqueous solutions, nor should resinous tinctures be combined with aqueous solutions.

What is the source of carbo ligni? What are the therapeutic uses of carbo ligni?

Carbo ligni is charcoal derived from soft wood. It is employed as an absorbent of foul gases and as a deodorant and

disinfectant. Internally it is useful in affections of the gastro-intestinal tract associated with hyperacidity and flatulent distension.

Give the dose of (a) caffeine, (b) wine of ipecac.

(a) 0.065 Gm. (1 grain); (b) 1 Cc. (15 minims).

What are the therapeutic uses of convallaria majalis?

Lily-of-the-valley possesses actions analogous to digitalis, strengthening the heart and increasing the flow of urine; it does not disturb the stomach and is not cumulative in its effects.

Define a general anesthetic. Mention three general anesthetics in common use.

A general anesthetic is a drug which when inhaled sufficiently produces complete unconsciousness and loss of sensation, also lessened motor power. The general anesthetics mostly belong to the alcohols and ethers. Ether, chloroform and nitrous oxide are three examples of such drugs.

Mention three principal salts of potassium used in medicine and give the dose of each.

Potassium bromide, dose 1 Gm. (15 grains); potassium acetate, dose 2 Gm. (30 grains); potassium bicarbonate, dose 2 Gm. (30 grains).

Of what is duboisine an alkaloid? What are the physiologic effects of duboisine?

Duboisine is the alkaloid of duboisia; it is believed to be identical with hyoscyamine, and strongly resembles atropine. It is a prompt mydriatic. In moderate doses it induces quiet and refreshing sleep, and is not dangerous. When given in large doses it may produce vertigo, nausea or syncope. It is less irritating to mucous membranes than atropine.

What are the therapeutic uses of nitro-glycerin? By what other names is nitro-glycerin known?

Nitro-glycerin is also known as glonoin and trinitrin. It

is valuable in certain forms of cardiac disease, especially in sudden heart failure, angina pectoris and fatty degeneration of the heart. It relieves the high arterial tension and the dyspnea of chronic nephritis.

Define materia medica, therapeutics.

Materia medica treats of the substances used as medicines and describes their origin, composition, chemical properties, modes of preparation and administration, also their physiologic and toxicologic actions. Therapeutics comprises all the science and art of healing, including the use of medicines and all other agents given with the object of curing disease.

What are the therapeutic uses of sulphur?

Externally it is of value as a stimulant and parasiticide in diseases of the skin of chronic type. Internally it is a mild laxative. It is of use both internally and externally in chronic articular rheumatism.

Outline the general treatment of acute articular rheumatism. Write a prescription containing at least two ingredients for an adult to relieve pain in acute articular rheumatism.

Rest in bed is essential. The joints should be wrapped in cotton-wool. The nourishment should consist of milk, beef tea, broths and gruel. The free use of lemonade or mineral waters is advisable. The best remedies are the salicylates and the alkaline salts of potassium. The following is a useful combination:

℞. Sodii salicylat. ..... ℥ ii
Potass. citrat. ..... ℥ iii
Glycerini.
Tinct. cardamom. comp ..... āā f℥ ss
Aquæ, q. s. ad. ..... f℥ v. M.
Sig.—A tablespoonful every two hours.

What are the therapeutic uses of strophanthus? Mention the dose of the tincture of strophanthus.

Strophanthus is a valuable cardiac tonic, and may be em-

ployed in the class of cases in which digitalis is indicated. The dose of the tincture is 0.5 Cc. (8 minims).

Define official preparations as applied to preparations of medicinal agents.

All of those drugs which have gained entrance to the Pharmacopœia are termed official preparations.

What are the therapeutic uses of cardamom?

It is used as an agreeable aromatic for disguising the taste of other drugs and as a carminative.

Describe gelsemium. State the dose of the preparations of gelsemium.

Yellow jasmine is the rhizome and roots of gelsemium sempervirens, a climbing plant of the natural order Loganiceæ, with showy yellow flowers. It grows in the forests of the southern United States. It contains a volatile oil, a resin and an alkaloid, gelsemine, in combination with gelsemic acid. Preparations are the fluid extract, dose 0.05 Cc. (1 minim); the tincture, dose 0.5 Cc. (8 minims). Gelsemium itself is given in dose of 0.065 Gm. (1 grain).

Mention the therapeutic uses of iodine.

Iodine is a useful counter-irritant. Internally it is used chiefly for its alterative effect. In the form of Lugol's solution (2 or 3 drops) it will sometimes control obstinate vomiting.

State the physiologic effects of physostigma on the respiration, the heart and the pupil of the eye.

Small doses do not affect the circulation or respiration, but toxic doses kill by paralyzing the respiratory center. The arterial pressure is raised by the drug stimulating the heart or its contained ganglia, and probably also by stimulating the vasomotor center. Toxic doses paralyze the heart. Physostigmine powerfully contracts the pupil. This results from stimulation of the peripheral fibers of the oculo-motor nerve

and from paralysis of the peripheral filaments of the sympathetic nerve.

Describe the physiologic action of phosphorus.

In small doses phosphorus stimulates the brain and circulation, the functions of the stomach and the genital organs and the growth of bones. It aids digestion by irritating the end organs of the gastric nerve, but produces eructations of hydrogen phosphide.

Outline the therapeutic uses of atropine.

Atropine is used in poisoning by opium, physostigma and hydrocyanic acid. In ptyalism from mercury, pregnancy, etc., in the sweats of phthisis, in sudden cardiac failure, and as a mydriatic. It is very useful in lead-poisoning, combined with potassium iodide. It is useful as hemostatic in profuse metrorrhagia after abortion, in metrorrhagia of obscure origin, and in the hemoptysis of phthisis.

Define sialagogue. Give an example of (a) topical sialagogue, (b) general sialagogue.

Sialagogues are agents which increase the secretion and flow of saliva and buccal mucus. Topical sialagogues act by reflex stimulation, as tobacco and mustard. General sialagogues act through their influence on the glands or their secretory nerves, as pilocarpine and the mercurials.

For what pathologic conditions is camphor used?

Camphor may be employed in diarrhea, cholera, vomiting, cardiac depression, nervousness and nervous headache, the infectious fevers, dysmenorrhea, after-pains, and catarrhal conditions. Locally it is of use wherever counter-irritation or a local anodyne is required.

Give the official name and the composition of (a) Fowler's solution, (b) Donovan's solution.

Solution of potassium arsenite is a 1 per cent. solution prepared by boiling together arsenous acid 1, potassium bicarbonate 2, compound tincture of lavender 3, and distilled

water to 100 parts. The solution of arsenous and mercuric iodides (Donovan's solution) contains arsenous iodide and mercuric iodide, of each 1 part in 100 of distilled water.

State the dose of (a) spirit of nitro-glycerin, (b) wine of colchicum (sem.), (c) extract of colocynth.

(a) 0.05 Cc. (1 minim); (b) 2 Cc. (30 minims); (c) 0.030 Gm. (½ grain).

Describe the therapeutic applications of sulphate of copper.

It is a prompt and efficient emetic, and is so used in croup and narcotic poisoning. In phosphorus poisoning it forms a comparatively insoluble phosphide of copper, besides producing emesis. It is of value in acute diarrhea and chronic dysentery combined with opium. Locally it is employed in throat affections, gonorrhea, granular lids, corneal ulcers, and chronic inflammation of mucous membranes.

Mention (a) a hydrogogue, (b) a cholagogue. State the dose of each.

(a) Elaterium, the active principle, elaterin, is given in doses of 0.005 Gm. ($^1/_{10}$ grain); (b) podophyllum, dose 0.500 Gm. (7½ grains).

Mention four remedies used to control vomiting and state the dose of each.

Cerium oxalate, 0.065 Gm. (1 grain); subnitrate of bismuth, 0.500 Gm. (7½ grains); cocaine hydrochloride, 0.030 Gm. (½ grain); acid carbolic, 0.065 Gm. (1 grain).

Write a compound prescription for an adult suffering from insomnia.

JAN. 1, 1903. MR. JOHN SMITH.

℞. Potassii bromidi ..... ℥iv
Chloralis hydratis. ..... ℥iii
Tincturæ assafoetidæ ..... f℥iv
Syrupi ..... f℥vi
Aquae, q. s. ad ..... f℥vi
M. Sig.—Tablespoonful every two hours until sleep is induced.

JOS. JONES, M. D.

What are the uses of apomorphine?

In narcotic poisoning, such as from opium or alcohol, apomorphine is a valuable emetic. When the circulation is weak it must be given cautiously. It is of service as an expectorant in the dry stage of acute bronchitis and in chronic bronchitis when the expectoration is viscid and scanty. The emetic dose of apomorphine hydrochloride is 0.005 Gm. ($^1/_{10}$ grain) in alcohol. As an expectorant by the mouth the dose is 0.002 Gm. ($^1/_{30}$ grain).

State the effect of amyl nitrite on the vascular system.

The inhalation of nitrite of amyl is speedily followed by flushing of the face, fulness in the head, quickening of the pulse and a fall of the blood-pressure. The flushing is due to dilatation of the arterioles, brought about partly by depression of the vasomotor centers and partly by direct action on the blood-vessel walls. The quickening of the pulse results from a depression of the cardiac inhibitory centers in the medulla. The fall of blood-pressure is mainly due to dilatation of the vessels. Upon the heart the drug acts primarily as a stimulant, but in large amounts it soon acts as a cardiac depressant.

Describe asafetida and outline its physiologic effects.

Asafetida is a gum-resin obtained by incision from the living root of ferula fetida, a perennial herb of the natural order Umbelliferæ, native of Persia and Afghanistan. Its principal constituent is a sulphuretted volatile oil; it also contains a gum and a resin. It is a powerful anti-spasmodic, a stimulant to the brain and nervous system, a stimulant expectorant; also tonic, laxative, diuretic, diaphoretic, emmenagogue, aphrodisiac and anthelmintic in action.

State the effect of the bromides on the respiration and on the action of the heart. What effect is the long continued use of the bromides liable to produce on the mental faculties?

The bromides reduce the number of the respirations, and

the heart's action and force, and lower the arterial tension. The continued use lessens the activity of the brain-cells, producing weakness of mind and somnolence.

In what diseases is conium used?

It is especially indicated in diseases characterized by excessive motor activity. It is useful in chorea, paralysis agitans, in acute mania, and delirium tremens; it is also employed in tetanus, asthma, whooping-cough, and other spasmodic affections.

Define diaphoresis. Mention three diaphoretics and state the dose of each.

Diaphoresis is a condition of sweating. Aconite, veratrum viride, and the salicylate of sodium. The dose of aconitine is 0.00015 Gm. ($^1/_{400}$ grain). The tincture of veratrum, 1 Cc. (15 minims). Salicylate of sodium, 1 Gm. (15 grains).

Mention ten drugs, the use of any one of which may cause skin eruption.

Aconite, antimony, antipyrine, atropine, quinine, tar, turpentine, salicylic acid, mercury, opium.

Write a prescription containing a stomachic to be used in alcoholism.

℞. Tinct. Nucis Vomicæ..... f℥ii
Tinct. Gentianæ Co..... f℥iv
M. Sig.—Teaspoonful before meals.

What is the alkaloid of hyoscyamus? What is the dose of hyoscine hydrobromide for hypodermic use?

It contains an alkaloid, hyoscyamine. The dose of hyoscine hydrobromide for hypodermic use is 0.0005 Gm. ($^1/_{128}$ grain).

In what form is iodine most frequently administered internally? What is the antidote for free iodine?

Potassium iodide. Starch is the antidote to free iodine, but

the stomach must be immediately evacuated, as the iodide of starch is not inactive.

Mention three commonly used myotics.

Eserine is the only myotic generally employed in ophthalmic practice. Opium and pilocarpine are two other drugs possessing myotic effects.

State the effects of alcohol and strychnine on the arterioles.

Alcohol causes a dilatation of the arterioles, while strychnine contracts the arterioles, except in very large doses, when it produces relaxation of the smaller vessels.

Describe the symptoms and give the treatment of gastro-duodenitis.

The symptoms of gastro-duodenitis partake of gastritis with an enteritis added, fever, gastric pain and vomiting, in addition to which there may be colic and diarrhea. Simple catarrhal jaundice will result from an extension of a gastro-duodenitis into the common duct. The general symptoms of this condition are jaundice, loss of appetite, nausea, vomiting, a sense of fulness and constipation or irregular action of the bowels; there may also be slight fever. The treatment consists in saline aperients, which reduce the catarrhal inflammation; and second, the use of such foods as do not require the bile to facilitate digestion. Skimmed milk, animal broths and egg albumen and copious drinking of water are advised.

Mention the chief alkaloids and the therapeutic class of belladonna and of Calabar bean.

Belladonna contains two alkaloids, the official atropine and hyoscyamine. Belladonna is a delirifacient. Calabar bean contains physostigmine (eserine). It is a depressomotor.

Mention a soluble salt of lead. To what therapeutic class does bismuth subnitrate belong?

Lead acetate. Bismuth subnitrate is classed with astringents.

What is the physiologic action of Indian hemp?

Cannabis indica, Indian hemp, produces in full doses a condition of mental exhilaration associated with hallucinations and disordered consciousness of time, locality and personality. This stage of excitement finally gives way to sleep, which may last for several hours. Sensation is perverted and benumbed, and before sleep is induced there is often more or less general anesthesia. The drug has little influence upon circulation and respiration.

What is the physiologic action of veratrum viride on the circulation?

It lessens greatly the force and rate of cardiac pulsation and reduces arterial tension by depression of the vasomotor center and of the heart itself.

Give the physiologic action of senna and state what part of it is used in medicine. Where does senna grow most abundantly?

The leaflets of *Cassia acutifolia* and of *Cassia angustifolia;* the former grows in Egypt and the latter in southern India. Senna is a brisk cathartic, producing in three or four hours after its ingestion copious watery stools. It acts by increasing both peristalsis and the intestinal secretion. It is absorbed by the circulation.

Describe bromism and state how it is produced.

Bromism is produced by the continuous administration of bromides. The condition is characterized by anemia, fetor of the breath, gastric disturbance, diminution of the reflexes, unsteady gait, impairment of tactile sensibility, abolition of sexual function, mental depression, failure of memory, somnolence, and a general eruption of acne.

What are the therapeutic uses of sodium salicylate?

It is of value as an antipyretic, as an anti-rheumatic and anti-neuralgic. It is of the greatest service in pleurisy with serous effusion, and is often useful in diabetes. When given early it will often abort tonsilitis. It is of service as a gastro-intestinal disinfectant.

Give the dose of pilocarpine.

The dose of pilocarpine hydrochloride is 0.01 Gm. (⅙ grain).

Describe the therapeutic uses of hydrochloric acid.

It is employed internally in the treatment of dyspepsia associated with subacidity. It is useful as a refrigerant and digestant in the continued fevers. In conjunction with strychnia it is of value in intestinal indigestion. The strong acid is also an escharotic.

What are the principal uses of calcium chloride? To which ingredient does it owe its energy?

Calcium chloride is of value as an internal remedy in the various manifestations of the strumous diathesis and to arrest bleeding. It often causes the resolution of glandular enlargement, and is of value in chorea, lupus and eczema. It owes its energy to the calcium contained.

What are the symptoms of opium poisoning?

Unless the dose has been very large there is at first a stage of excitement, in which the imagination is stimulated and the feelings exalted. This stage is soon followed by depression; the patient becomes stupid and drowsy, and finally falls asleep. The sleep deepens into coma, the pulse becomes slow and full, the pupils contracted, the respiration slow and heavy and the face suffused. At this time it is still possible to arouse the patient by a loud noise, flagellation or shaking. In the third stage the coma becomes absolute, the pulse rapid and feeble, the breathing shallow and irregular, the skin

moist, the muscles relaxed, the pupils dilated, and finally death results from paralysis of the respiration.

Mention the remedy which will arrest the secretion of milk and state how it should be employed.

Camphor used locally by inunction in saturated solution of olive oil is efficient in checking the secretion of milk, as is belladonna.

Give the methods and the therapy of cold water treatment applied externally.

Cold water may be applied in the form of cloths saturated with it, by sponging, bathing or packing with ice. The cold bath is the most frequently employed. A bath-tub half full of water at 70° F. is kept in readiness at the bedside of the patient, and whenever the temperature rises above 102.4° F. the patient is wrapped in a sheet and carefully lifted into the tub. While in the bath cold affusions should be applied to the head, and the body should be constantly subjected to gentle friction and massage, so as to bring new relays of blood to the surface. A stimulant is often necessary to counteract the shock. After remaining in the water 15 to 20 minutes he is placed in a dry sheet and covered with a light blanket.

What are the therapeutic uses of alchohol?

The question of the advisability of employing alcohol in medicine has given rise to never-ending controversy. Many give it a high place, while others do not employ it at all. The external and local use of alcohol includes many applications of its antiseptic, refrigerant and rubefacient qualities. In the form of champagne it is especially valuable in controlling vomiting. A single dose of whisky or brandy is an efficient combatant of fainting or of collapse. In fevers it acts as an antipyretic, a food, and promotes sleep. It is well to withhold it until the first sound of the heart becomes feeble and dull, and then to use it boldly. It is of especial value in the treatment of pneumonia, typhoid fever and snake-bite.

Mention the physiologic effects of bryonia. What is the dose of the tincture of bryonia?

Bryonia is a pure irritant, setting up local inflammation wherever it is applied. It has a vesicant action on the skin, and is violently irritant to the serous and mucous membranes. It produces cerebral congestion, with frontal headache and vertigo. It is a drastic purgative and a powerful diuretic. It causes in full dose hepatic and renal congestion, vesical tenesmus, and depression of the heart's action. The dose of the tincture is 5 drops to ½ ounce.

State the dose of aconitine.

0.00015 Gm. ($^1/_{400}$ grain).

Give the composition and state the uses of lotio hydrargyri flava.

Yellow wash is a favorite application for syphilitic sores. It is prepared by adding 18 grains of corrosive sublimate to 10 ounces of lime-water, producing the yellow oxide.

Give indications for the internal use of bichloride of mercury. State the dose of bichloride of mercury for internal use.

It is of value in anemia, as an absorbent in diphtheria, as a general alterative, and is highly prized as an anti-syphilitic remedy in the secondary and tertiary stages. The dose is 0.003 Gm. ($^1/_{20}$ grain).

What are the principal therapeutic uses of the salt of lead?

Lead salts are chiefly used as astringents and hemostatics. The acetate is an efficient internal styptic. The nitrate is of value locally in epithelioma and unhealthy granulations. The iodide is employed locally to enlarged lymphatic glands and in chronic skin affections. The carbonate is only used externally to protect irritated surfaces, such as intertrigo, etc.

Explain the constipating action of opium.

Opium arrests all the secretions except the milk and the sweat, and retards the digestive juices. The biliary and glycogenic functions of the liver are affected and metabolism greatly reduced. Its constipating action is produced chiefly by stimulation of the inhibitory nerves of the intestines through the splanchnics.

Mention the symptoms of poisoning by phosphorus.

Toxic doses of phosphorus produce, after the lapse of a few hours, a garlicky taste in the mouth, thirst, intense abdominal pain, obstinate vomiting, restlessness and prostration. The ejected materials contain mucus, bile, and occasionally disintegrated blood, and are luminous in the dark. At the end of 24 or 36 hours the symptoms gradually subside and the patient feels comparatively comfortable, but soon jaundice develops, the vomiting and pain return, the liver becomes enlarged and painful, the urine contains albumin, bile, hypophosphoric acid and crystals of leucin and tyrosin. The tongue is coated, the breath offensive, the belly distended, the bowels either constipated or loose, and the stools clay-colored. Death is generally preceded by grave nervous symptoms, such as headache, delirium, convulsions, stupor and coma. When recovery follows, convalescence is protracted.

Write a prescription containing a sedative and an expectorant for a bronchial cough in a three-year-old child.

JAN. 1, 1903. FOR WALTER SMITH.

℞. Tinctura opii camphoratæ ..... gtt. lxiv
Potassii citratis ..... ʒ ii
Syrupi pruni virginianæ, q. s. ad ..... f ʒ iv.
M. Sig.—Teaspoonful every four hours.

WM. JONES, M. D.

In what pathologic condition is jaborandi useful?

It is of use in dropsy, especially of renal origin, in uremia, inflammation of the serous membranes, in diabetes insipidus,

but is contra-indicated when the heart's action is weak. It is useful in the form of a lotion for alopecia.

What is the dose of carbolic acid for internal administration?

Dose 0.065 Gm. (1 grain), well diluted.

What is the common name of lactucarium? State the physiologic action of lactucarium.

Lettuce. Lactucarium is feebly hynotic and somewhat sedative and diuretic. The syrup is a good vehicle for expectorants and anti-spasmodics.

What is the physiologic action of colchicum?

Emetic, diuretic, diaphoretic, a drastic purgative and cardiac depressant, gastro-intestinal irritant. In small doses it is an emeto-cathartic.

What serious results may ensue from indiscriminate use of acetanilide?

A toxic dose destroys the oxygen-carrying function of the blood and forms methyl-hemoglobin, causes fatty degeneration of the heart, liver and kidneys in animals poisoned by it. When administered continuously or in too great dose it is apt to cause subnormal temperature, cyanosis and collapse.

What is cascara sagrada? State the dose of the fluid extract of cascara sagrada.

It is the bark of *Rhamnus purshiana*, California buckthorn. The dose of the fluid extract is 1 Cc. (15 minims).

What are the therapeutic uses of tincture of capsicum internally administered? State the dose of the tincture of capsicum.

It is employed chiefly as a stomachic and carminative. A weak solution of the tincture is also a much used gargle in sore throat with relaxed uvula. The drug is especially valu-

able in alcoholic gastritis and obstinate constipation. The dose of the tincture is 0.5 Cc. (8 minims).

What part of aconite is used in medicine? What is the alkaloid of aconite?

Aconite is derived from the root of the aconitum napellus. Its most important alkaloid is aconitine.

Write a prescription for corrosive sublimate to be used as a parasiticide.

JAN. 1, 1903. FOR JOHN JONES.

Hydrargyri bichloridi..... gr. ii
Unguenti petrolati..... f℥i.
M. et Sig.—Use locally.

JOHN SMITH, M. D.

How is liquor ammonii acetatis prepared? In what conditions is this preparation useful?

Spirit of Mindererus is prepared by neutralizing dilute acetic acid with ammonium carbonate; it should be freshly made, as it soon deteriorates. It is an active diuretic if the body be cool, and a diaphoretic if the body be warm. In wineglassful doses it will counteract many of the immediate effects of alcohol.

What is the common name of staphisagria? What are the therapeutic uses of staphisagria?

Staphisagria, commonly known as stavesacre, is a violent emetic, cathartic and parasiticide.

Mention the preparations of ammonia. What effect has ammonia on the heart?

The official preparations are aqua ammoniæ, aqua ammoniæ fortior, linimentum ammoniæ, spiritus ammoniæ, spiritus ammoniæ aromaticus. Moderate doses of ammonia increase the strength and rapidity of the heart, and this effect is produced by a direct stimulation of the heart and its accelerator nerves.

Write a compound prescription for an adult containing iron, quinine and opium in pill form for neuralgia.

JAN. 1, 1903. JOHN SMITH.

℞. Pulveris opii..... gr. x
Ferri sulphatis exsiccatæ,
Quininæ sulphatis..... āā gr. xx.
M. et fiant in pilulæ No. 20.
Sig.—One every four hours. JOHN JONES, M. D.

Define tincture and spirits.

Tinctures are alcoholic solutions of medicinal substances. Spirits are alcoholic solutions of volatile substances, which may be solids, liquids or gases. Tinctures, with the exception of the tincture of iodine, are made from non-volatile bodies.

Mention three drugs used to accelerate the action of the heart and give the dose of some preparation of each.

Atropine; dose of atropine sulphate, 0.0004 Gm. ($^1/_{160}$ grain). Nitro-glycerin; dose of spirit, 0.05 Cc. (1 minim). Ammonia; dose of the aromatic spirits, 2 Cc. (30 minims).

Give the treatment of obstinate hiccough.

Rhythmic traction of the tongue will often arrest obstinate hiccough. Ether as a spray to the epigastrium for ten minutes, then to the site of the phrenic in the neck, is also advised. Morphine hypodermatically, either alone or in combination with atropine, has sometimes proven effective.

What is the physiologic effect of cocaine on the ocular conjunctiva, the pupil of the eye and the salivary and sweat glands.

Cocaine dropped upon the conjunctiva causes dilatation of the pupil and profound anesthesia of that membrane; it also produces partial paralysis of accommodation, slight lachrymation, and sometimes temporary ptosis. It lessens the secretion of the salivary glands and the sweat glands.

Write a prescription for a syphilitic adult containing corrosive sublimate and iodide of potassium in solution.

JAN. 1, 1903. FOR JOHN JONES.

℞. Hydrargyri chloridi corrosivi ..... gr. i
Potassii iodidi ..... ʒ ii
Tincturæ gentianæ comp ..... f ʒ iii.
M. et Sig.—A teaspoonful thrice daily after meals.

JOHN SMITH, M. D.

What are the therapeutic uses of tar?

Tar is used as a stimulating expectorant and as a stimulant to the skin in certain chronic inflammatory diseases.

What are the physiologic effects and therapeutic uses of chromic acid?

Chromic acid exerts a powerful caustic effect upon all animal tissue. It has a destructive action upon micro-organisms, and from the readiness with which it parts with its oxygen it rapidly decomposes organic matter, and so serves as a disinfectant. It is not employed internally. It is a useful escharotic for destroying corns, warts, syphilitic vegetations, and the like.

Give the source and state the uses of thymol.

Thymol is a phenol obtained from the volatile oil of thyme and certain other volatile oils. Thymol is used as a disinfectant in the form of a wash, as an ointment in chronic skin diseases, and internally as an efficient antiseptic.

What is the dose of croton oil as a cathartic? What are the contra-indications to its use?

The dose is 0.05 Cc. (1 minim), given in glycerin or olive oil. It is contra-indicated when either debility, organic obstruction, or inflammatory conditions of the stomach or bowels exist.

What are the physiologic effects and therapeutic uses of cubebs?

Cubebs is an aromatic stomachic and a stimulant diuretic

in small or medium dose, but large amounts derange digestion and may act as a gastro-intestinal irritant. Its constituents are eliminated by the bronchial mucous membranes, the skin and the kidneys, stimulating and disinfecting the genito-urinary passages, increasing the bronchial mucus, sweat and urine, and frequently causing an urticarial or vesicular eruption. It increases the action of the heart and the vascular system and promotes the menstrual discharge. Cubebs is used in the acute stage of gonorrhea, in chronic cystitis and chronic bronchitis. It is applied in powder form in hay fever, chronic nasal catarrh and follicular pharyngitis.

Mention the therapeutic uses of carbolic acid except as an antiseptic.

It is used as a caustic, local anesthetic, as an anti-emetic and carminative.

What is the treatment of scabies?

Sulphur, styrax and naphthol are efficient local applications as ointments.

An excellent formula is the following:

Sulphur sublimat	℥j
Balsam Peruvianæ	ʒss
Adipis	℥j

M. et Sig.—Rub in thoroughly twice a day.

How does an antagonist differ from an antidote?

Antagonists are agents which oppose each other in their physiologic action, and may be employed against each other as counter poisons to neutralize their effects upon the organism. They do their work in the blood and tissues after absorption, and are especially available against poisons administered hypodermically, in which case antidotes are useless. Antidotes affect a poison so as to remove it from the body or alter its character before absorption, and thereby prevent its toxic action on the organism. They do their work in the alimentary canal or in the respiratory passages. (Potter.)

Name and describe the methods of introducing medicines into the circulation.

Medicines may be introduced into the circulation by various routes, including the mouth, the stomach, the rectum, the respiratory tract, the veins and arteries, the subcutaneous cellular tissues, and the skin. Intravenous medication is only used in emergencies where immediate action is desired. Saline solution is the usual remedy introduced by this route. The rectum will absorb any substances applied in the form of enemata or suppositories. The hypodermic method is the introduction of medicines into the organism by injecting them into the subcutaneous tissue, from which they are quickly absorbed by the lymphatic and capillary vessels. The respiratory tract admits of the rapid absorption of medicinal substances through its extensive blood supply, especially by inhalation. The stomach is the most convenient organ for the absorption of medicine. The remedies find their way into the current of the circulation through the walls of the gastro-intestinal blood-vessels and the lacteals.

How do strophanthus and digitalis differ in physiologic action?

Compared with digitalis, strophanthus is a powerful cardiac stimulant, differing from digitalis in not producing vasomotor constriction of the arterioles. It reduces the pulse, lowers body temperature somewhat, is not cumulative in action, and does not cause any gastro-intestinal disturbance. It is a diuretic by direct stimulation of the renal circulation, and has power over rigors by its rapid cardiac action, stopping them and preventing their recurrence.

Mention the official turpentines. State from whence they are obtained.

There are two official turpentines, terebinthina, a concrete oleoresin from Pinus palustris, the yellow pine, and other species of Pinus, natural order Coniferæ; Terebinthina cana-

densis, a liquid oleoresin obtained from Abies balsamæ, the balm of Gilead.

Compare opium and belladonna as to action on the heart.

Medicinal doses of belladonna quicken the pulse and raise the arterial pressure; the quickening of the pulse results from depression of the inhibitory nerves and stimulation of the accelerators. The increased blood pressure is due to stimulation of the vasomotor centers and the heart itself. Toxic doses paralyze the heart. Opium in moderate doses has little effect upon the circulation. Large doses, however, stimulate the inhibitory nerves, centrally and peripherally, and thus slow the pulse; at the same time the latter becomes full and strong from stimulation of the heart or its contained ganglia, and possibly also from stimulation of the vasomotor centers in the medulla. Toxic doses finally paralyze both the heart and vagi and produce a rapid, feeble pulse.

What are the therapeutic uses of ammonium carbonate?

It is used principally as a stimulant in low fevers, like typhoid, and in acute pulmonary diseases associated with cardiac and respiratory weakness, such as croupous pneumonia, catarrhal pneumonia and capillary bronchitis.

Define solvent. Mention three principal solvents.

Solvent is the term applied to the liquid before the substance is added to it, by which addition after the operation is completed the combined preparation is called a solution. The chief solvents are water, alcohol and glycerin.

What is the source of aloes? By what part of the intestinal tract is it eliminated?

Aloes is the inspissated juice of the leaves of the *Aloe socotrina* and other species of *aloe*. It acts chiefly on the lower half of the large intestine.

Describe the physiologic action of alum. In what pathologic conditions is alum useful?

Alum is an astringent, coagulating the albumin and stim-

ulating muscular contraction. At first it excites the flow of saliva and then diminishes it. It coagulates pepsin and arrests digestion, stops peristalsis and usually causes constipation, although sometimes it produces diarrhea. Although coagulating albumin even in weak solution, it enters the blood, arrests secretion, especially those of mucous surfaces, and stops capillary hemorrhages. It is used locally as an astringent in chronic catarrh, leucorrhea, gonorrhea, hemorrhoids, bed sores, colliquative sweats, etc. The dried powder is escharotic, destroying granulation and warty growths. Alum is used as an emetic in smaller doses in gastric catarrh, gastralgia, lead colic, etc.

Mention the ingredients of (a) Tully's powder, (b) Dover's powder.

(a) Tully's powder is the compound powder of morphine. It is composed of morphine sulphate 1 part, to 19 of camphor and 20 each of liquorice and calcium carbonate. (b) Dover's powder contains 10 parts ipecac, 10 parts of powdered opium and 80 parts of sugar of milk.

Why is atropine combined with morphine when the latter is administered? What is the dose of atropine when combined with morphine?

Atropine has long been regarded as the physiological antagonist of opium. It especially combats the depressing effect of opium on the circulation. The hypodermic dose of atropine sulphate when combined with morphine is 1-150 grain.

Give the therapeutic uses of sodium phosphate.

In doses of ½ ounce it is a mild purgative. It has been recommended in catarrhal jaundice and cholelithiasis.

State the ingredients and uses of sulphur ointment.

Sulphur ointment is made up of 15 parts of washed sulphur and 85 parts of benzoinated lard thoroughly mixed. Sulphur ointment is used in certain forms of skin diseases

and as a means of administering sulphur when it is not well borne by the stomach.

Give the composition and the chief use of lotio hydrargyri nigra.

Black-wash is prepared by adding 30 grains of calomel to 10 ounces of lime-water, thereby producing the black oxide, and is used as an application to syphilitic sores.

What are the therapeutic uses of pulsatilla?

Some therapeutists regard the drug as of no value whatever; others claim good effects from its employment as an emmenagogue, a diuretic and diaphoretic; it is also a cardiac and vascular sedative, and possesses some antipyretic action.

Where is quassia indigenous? What part of the plant is used in medicine?

The West Indies. The wood is used.

What is the common name of ferrous sulphate? Give the chief uses of ferrous sulphate.

Copperas: it is impure ferrous sulphate. It is chiefly used to make the dry sulphate and other preparations. It is sometimes employed as a tonic astringent.

Describe the physiologic action and the therapeutic use of guarana.

Guarana has similar actions to those of coffee, the active principle of both plants being perhaps identical. It may be used in migraine, in convalescence in acute diseases, in diarrhea of phthisis, etc.

Give the composition of Vienna paste (pasta caustica Viennensis).

It is a grayish-white deliquescent powder consisting of equal parts of potassa and lime rubbed together.

Explain the distinction between physiologic action and the therapeutic use of medicinal agents.

The physiologic action of a drug is its effect upon the

economy in health, and includes its action upon the nervous centers, respiration, circulation and metabolism. From its physiologic action is deduced its therapeutic indication or employment in certain diseased states.

Define a mydriatic. Give three examples, with the dose for the local application in each case.

Mydriatics are agents which produce dilatation of the pupils. Atropine is used locally in solutions of 8 grains to the ounce. Homatropine, in strength of 4 grains to the ounce. Cocaine locally in a 5 per cent. solution.

Define germicides, parasiticides.

Germicides are agents that destroy germs, as solutions of bichloride of mercury, permanganate of potash, carbolic acid, etc. Parasiticides are agents which are destructive to parasites; the principal parasiticides are mercurial ointment, sulphur and acetic acid.

What results from combining silver nitrate and creosote?

An explosive compound, which is white in color, without odor, and has the appearance of an emulsion.

What symptoms are produced by toxic doses of tartar emetic?

Pain, vomiting, diarrhea, with watery stools and collapse, motor and sensory paralysis and suppression of the urine.

Mention two remedies commonly used to increase intestinal peristalsis.

Senna and rhubarb.

What are the therapeutic uses of buchu?

Chronic affections of the genito-urinary mucous membranes, lithiasis, prostatic affections, atonic dyspepsia and chronic rheumatism.

What is the ultimate effect on the heart's action of medicinal doses of belladonna?

Following the ingestion of belladonna the heart rate is at first slowed, but soon becomes rapid and vigorous, and the arterial tension is increased; this is accomplished by stimulation of the cardiac sympathetic and paralysis of the pneumogastric, thus stimulating the accelerator apparatus while lessening the inhibitory.

Compare the strength of dilute hydrochloric acid with that of the absolute acid. What is the dose of the former?

Dilute hydrochloric acid is a 10 per cent. solution of the absolute acid in water. Its dose is 1 Cc. (15 minims).

How do styptics and hemostatics differ? Give an example of each.

These are agents which arrest bleeding, styptics being those which are applied locally, as alum, and hemostatics those which are administered internally, as gallic acid.

What part of zingiber is used in medicine? What are its therapeutic uses?

The rhizome. The official preparations are fluid extract, tincture, syrup, and the oleoresin. It is employed as a carminative and as an adjunct to purgative medicine to prevent griping; the syrup is commonly employed as a flavoring adjuvant.

Define pharmacy.

Pharmacy is the art of selecting and preserving medicines and preparing them for administration.

How do therapeutic agents act to promote waste?

Destructive metamorphosis of the tissues is promoted by alteratives and astringents. The manner in which alteratives act has never been determined. We know that of such drugs as mercury and iodine, the former being endowed with the power of breaking up newly-deposited fibrin and disorganiz-

ing syphilitic deposits, and the latter acts energetically upon the lymphatic system and promotes absorption.

Mention the principal therapeutic application of antipyrine.

Antipyretic, analgesic, antiseptic, as a local anesthetic and to diminish secretion, as an anti-galactagogue.

What is the dose of curare for hypodermic use? What are the antagonists of curare?

Dose $^1/_{20}$ to $^1/_6$ grain. Strychnine, atropine, and more effective still, artificial respiration.

What is codeine? State the dose of codeine. What are the advantages of codeine over opium?

Codeine is an alkaloid of opium, differing from morphine in having the radical CH_3 replacing an atom of hydrogen. It is less irritating to the digestive tract than opium. Its dose is 0.030 Gm. (½ grain).

Mention the therapeutic uses of creosote.

Locally as an anesthetic and antiseptic. Internally as an antiseptic, in chronic gastric catarrh, in diarrhea, dysentery and phthisis.

What is the common name of hamamelis? State the dose of the fluid extract of hamamelis.

Witch-hazel. The dose of the fluid extract is 2 Cc. (30 minims).

What part of buchu is used in medicine? State the dose of the fluid extract of buchu.

The leaves. Dose of the fluid extract 2 Cc. (30 minims).

What is the official name of tartar emetic? State the dose of tartar emetic.

Antimonii et potassii tartras. Dose as expectorant, 0.005 Gm. ($^1/_{10}$ grain); as emetic, 0.030 Gm. (½ grain).

What are the uses of cantharis (a) externally applied, (b) internally administered?

Externally it is employed as a vesicant and internally as a stimulant to the genito-urinary tract.

What is pepo? State its therapeutic use.

Pumpkin-seed. It is used as an anthelmintic against tape-worms.

Describe the physiologic action and the therapeutic uses of scammonium.

Scammony is a powerful irritating hydragogue cathartic. It may be used in combination with other cathartics in obstinate constipation.

Mention the preparations of ergot and give the dose of each preparation.

The extract of ergot, dose 0.250 Gm. (4 grains); the fluid extract, dose 2 Cc. (30 minims); the wine, dose 8 Cc. (2 fluid-drachms).

Define hematics. Mention two principal hematics.

These are medicines which increase the quantity of hematin in the blood. They consist chiefly of iron and manganese and their compounds.

What are the physiologic effects of iodoform internally administered? State the therapeutic uses of iodoform when externally applied.

In small doses internally iodoform is considered to be a tonic and alterative. If taken over a protracted period it may cause profuse salivation. In toxic doses it causes pyrexia, then headache, quick and feeble pulse, marked anxiety and restlessness; collapse and death may suddenly supervene. Locally its action is anesthetic and powerfully antiseptic. It is one of the best agents to prevent decomposition, and it destroys the germs of putrefaction and of disease, but must be carefully employed.

Give the dose of (a) liquor potassii arsenitis, (b) liquor sodii arsenatis.

(a) 0.2 Cc. (3 minims). (b) 0.2 Cc. (3 minims).

Define emulsion.

Emulsions are liquid preparations containing an insoluble medicinal substance, as an oil or a resin, in a state of minute subdivision, and suspended by the aid of some viscid excipient, as gum, which may be contained in the medicinal ingredient itself or be added by the pharmaceutist.

Where is the habitat and what are the physiologic effects of digitalis?

It grows wild in Europe and is cultivated in this country. The dominant action of digitalis is on the circulation. In therapeutic doses it slows the pulse and raises the blood pressure. The slowing of the pulse results from a prolongation of the diastole, and this in turn is due to stimulation of the vagi or inhibitory nerves. The increased blood pressure is due to a powerful stimulant effect on the heart and to a contraction of the arterioles resulting indirectly from stimulation of the vasomotor center and directly from the action of the drug on the vessel wall. Toxic doses quicken the pulse by paralyzing the vagi and lower the arterial pressure by causing a powerful systolic contraction so that the diastole becomes too imperfect to permit the ventricles to be completely filled. Therapeutic doses have no effect on the nervous system, but toxic doses lessen the reflexes, first by stimulating Setschenow's inhibitory centers, and later by depressing the spinal cord. It requires toxic doses to influence the respiration, and then slowing occurs. Large doses occasionally produce nausea, vomiting and diarrhea. In health, digitalis has little or no diuretic action. When the urine is diminished from embarrassment of the circulation it produces free diuresis, which is attributed to its effect on the heart and vessels, and not to a direct influence on the secreting structure of the kidney.

State the source of ichthyol and give its uses in medicine.

Ichthyol is prepared from the product of the distillation of bituminous rocks from the Tyrol, which contain fossil fishes. It is useful in certain chronic skin diseases, particularly eczema and psoriasis. It is extensively used externally for its antiseptic and alterative properties in rheumatism, erysipelas and lymphatic enlargements. Combined with glycerin, it is valuable, locally applied, in the various inflammatory affections of the female genital organs.

What are the therapeutic uses of aconite? Give the dose of the fluid extract of this drug.

Aconite is used locally in neuralgia; internally in hyperemesis, in acute inflammation, such as tonsillitis, bronchitis and pneumonia, in excessive hypertrophy of the heart, in nervous palpation, in the tachycardia of exophthalmic goiter and in active cerebral congestion with high arterial tension. Dose of fluid extract is 0.05 Cc. (1 minim).

What part of scoparius is used in medicine? What alkaloid is derived from scoparius?

The tops of *cytisus scoparius*. Its alkaloid is sparteine.

Give the common name of taraxacum and state what part of this plant is used in medicine.

Dandelion. The root is used in medicine.

What is the physiologic action of tincture of the chloride of iron upon the kidneys?

The tincture of the chloride is considered diuretic.

Give the chief source and the dose of gallic acid.

It is prepared from a paste of powdered galls by fermenting for six weeks, boiling and reboiling in water, filtering and crystallizing. Dose, 1 Gm. (15 grains).

Give the dose of hyoscine for hypodermic use. For what purpose is hyoscine used?

The dose of hyoscine hydrobromide hypodermically is 0.0005 Gm. ($^1/_{128}$ grain). Hyoscine is a cerebral and spinal sedative, a powerful hypnotic. It is employed as anodyne when opium is contra-indicated.

What is an excipient? Give examples.

Excipients are substances which give form and consistence to prescriptions, and serve as vehicles for the exhibition of the other ingredients. Examples are syrups, acacia and the various flavoring agents, such as syrup of lemon.

Describe the technique of venesection.

The patient having been placed in a semi-recumbent position, the arm should be constricted three or four inches above the elbow by a few turns of a roller or a twisted handkerchief; if this is not sufficient to render the veins prominent, the arm may be rubbed for a few minutes from below upwards. A large vein having been selected, it should be incised by a thumb-lancet or a spring-lancet in a direction oblique to the long axis of the vessel. The amount of blood abstracted will depend entirely upon the pulse, which should be carefully observed during the operation, and when it lessens in force and becomes more compressible the bleeding must be suspended.

Define glucosides and give two examples.

Glucosides form a group of organic principles existing in plants, and are generally neutral in character. Examples are *salicin*, obtained from willow and other barks, and *glycyrrhizin*, from liquorice root.

What is the most active laxative ingredient in pulvis glycyrrhizae compositus?

Senna.

By what methods do antipyretics act? Give an example of one that acts by each method.

Antipyretics reduce the body temperature in fever: (a) by lessening the production of heat—(1) by diminishing tissue change, (2) reducing the circulation; or (b) promoting the loss of heat—by (3) dilating the cutaneous vessels;, (4) producing perspiration, and (5) abstracting heat from the body. Examples of antipyretics acting in the order named are as follows: Quinine (1), digitalis (2), carbolic acid (1 and 3), antipyrine (1 and 4), cold sponging (5).

Indicate the common name and give the preparations of serpentaria.

Virginia snake-root. The preparations are the fluid extract and the tincture. It also is one of the components of compound tincture of cinchona.

What are the therapeutic uses and the official preparations of oleic acid?

Oleic acid is used only in making the oleates. Three preparations are official, the oleate of mercury, the oleate of veratrine and the oleate of zinc.

What is the antidote for strychnine?

Chloral hydrate.

Describe the manner of making barley water as food for the patient.

It may be made as follows: Grind ½ ounce of pearl barley in a coffee-mill, add 6 ounces of water, boil 20 minutes, add salt and strain.

What are the therapeutic uses of the preparations of silver?

The nitrate is the most soluble of the silver salts; it is antiseptic, astringent, hemostatic, irritant, and a limited escharotic, also anti-phlogistic, anti-spasmodic and tonic. The oxide is the least irritant, and does not discolor the skin so

quickly. Internally it has been used in gastric neuralgia, irritable dyspepsia, pyrosis, gastric and pulmonary hemorrhages, dysmenorrhea, menorrhagia, to check profuse sweating, to control vomiting, and in diarrhea depending on reflex nervous irritation. The iodide is similarly employed.

How would you distinguish chemically between ether and chloroform?

Ether is ethyl oxide $(C_2H_5)_2O$. Chloroform is trichlormethane, $CHCl_3$.

Name four drugs used in the treatment of chronic interstitial nephritis.

Nitroglycerin, Basham's mixture, caffeine, and magnesium sulphate.

Give the therapeutic uses of caffeine.

Cardiac stimulant in cardiac and renal dropsy, and alone or in combination with antipyrine or the bromides in nervous headache and migraine.

Describe the physiologic action of aconite.

It is a powerful depressant of the sensory nerve ends, the nervous and muscular apparatus of the heart and respiration, and the spinal nervous system. It is also antipyretic, diaphoretic and diuretic.

Name the official preparations and doses of digitalis, cascara sagrada and ipecacuanha.

Digitalis, the extract, dose 0.010 Gm. (⅙ grain); the fluid extract, 0.05 Cc. (1 minim); the infusion, 8 Cc. (2 fluidrachms); the tincture, 1 Cc. (15 minims). Cascara sagrada, the fluid extract, dose 1 Cc. (15 minims). Ipecacuanha, the fluid extract, emetic dose 1 Cc. (15 minims); expectorant dose 0.05 Cc. (1 minim); Dover's powder, 0.500 Gm. (7½ grains); the syrup, emetic dose 15 Cc. (4 fluidrachms), expectorant dose 1 Cc. (15 minims); wine of ipecac, dose 1 Cc. (15 minims).

Name four efficient hypnotics and give the source and dose of each.

Sulphate of morphine derived from opium, dose 0.015 Gm. (¼ grain); hyoscine, an alkaloid of hyoscyamus, dose of the hydrochloride, 0.0005 Gm. ($^1/_{128}$ grain); chloral hydrate obtained from the action of chlorine on aldehyde, dose 1 Gm. (15 grains); sulphonmethane, or sulphonal, a synthetic product obtained by the oxidation of a mixture of ethyl-mercaptan and acetone, dose 1 Gm. (15 grains).

Write a prescription for (a) a collyrium, (b) a suppository, and (c) a mouth-wash.

(a) ℞. Acidi borici ..... gr. x
Aquæ camphoræ.
Aquæ destillatæ āā q. s. ad ..... f℥j
Sig.—Fifteen drops in both eyes thrice daily.

(b) ℞. Pulveris opii ..... gr. j
Iodoformi ..... gr. j
Olei theobrom. q. s.
Fr. in suppositoria No. 1.
Sig.—Use on retiring.

(c) ℞. Potassii chloratis ..... gr. lxxx
Aquæ laurocerasi ..... f℥ viij
M. S.—Use as mouth-wash.

Name five antiseptics and tell in what proportions each should be diluted for surgical purposes.

Bichloride of mercury, 1 to 1000. Permanganate of potassium, 25 grains to the pint. Boric acid, 15 grains to the ounce. Carbolic acid, 5 per cent. solution in glycerin and water. Peroxide of hydrogen, the full strength of the official preparation is 3 per cent.

Describe the physiologic action of hyoscine and name a physiologic antidote.

It is a cerebral and spinal sedative and powerful hypnotic, directly depressing the higher function of the brain and affecting the heart but feebly. Tannin and morphine.

Give the composition of the official compound cathartic pill.

Compound extract of colocynth, 80 parts; resin of jalap, 20 parts; mild chloride of mercury, 60 parts; gamboge, 15 parts.

Describe two escharotics and tell how you would apply them.

Nitrate of silver applied in the form of lunar caustic is an efficient superficial escharotic; carbolic acid is escharotic, and should be used in strong solution, 1 to 10.

Write a correct prescription containing nitrate of silver.

Argenti nitratis..... gr. iij
Gum Tragacanth, q s.
Ft.—In pil. no. xii.
Sig.—One before meals. JOHN JONES, M. D.

State the direct and indirect effect of pilocarpine in dropsical effusion.

It causes prompt and profuse perspiration and salivation, increases the bronchial and lachrymal secretion, and sometimes causes serous diarrhea. Full doses cause a decrease in arterial tension. The elimination of urea is greatly increased, but not the quantity of the urine.

What are the physiological effects of nux vomica on the nerves and circulatory system?

It is a powerful stimulant of the spinal cord, especially the motor columns. In toxic doses it produces spinal convulsions. Small amounts stimulate the brain and increase the mental powers. In moderate doses the heart is stimulated and the arterial pressure raised by stimulation of the vasomotor center in the medulla.

What is wrong with the following prescription?

℞. Argentæ nitratis..... drams, one.
Sodi chloridum..... drams, four.
Syrupus lemonis, q. s..... ounces, four.
Sig.—Take a tablespoonful after meals in water.

Argentæ should read *argenti; sodi chloridum* should read *sodii chloridi; syrupus lemonis* should read *syrupus limonis.* This prescription affords the example of a pharmaceutical incompatibility. Nitrate of silver should not be compounded with sodium chloride, for there results the insoluble chloride of silver.

Write for an adult a complete prescription for a diarrhea mixture containing three remedies and the excipient.

℞. Cretæ preparatæ..... ℥ii
Tincturæ catechu..... ℥ss
Tincturæ opii ..... ♏lxxx
Aqua cinnamomi ad..... f℥viii
M. Sig.—Two teaspoonfuls every four hours.

Name the official preparations of belladonna and the dose of those used internally.

Extractum belladonnæ foliorum, dose 0.010 Gm. ($\frac{1}{5}$ grain); tinctura belladonnæ foliorum, dose 0.5 Cc. (8 minims); fluid-extractum belladonnæ radicis, dose 0.05 Cc. (1 minim); emplastrum belladonnæ; unguentum belladonnæ.

Write a prescription containing oil of sandal wood and at least one other constituent for chronic cystitis.

JAN. 1, 1903. FOR WILLIAM SMITH.
℞. Olei santali..... f℥i
Salol ..... ℥i
Ft. in Capsules no. xii.
Sig—One after meals. WM. JONES, M. D.

Define narcotics, anesthetics and sedatives, and give an example of each.

Narcotics are agents which lessen pain and produce sleep or stupor; example, opium. Anesthetics are agents which temporarily destroy sensation; they are both general and local; example, ether as a general anesthetic and chloride of ethyl as a local anesthetic. Sedatives are agents which exert a soothing influence on the system by lessening functional activity, depressing motility and diminishing pain; example, the bromides.

Treat a case of opium poisoning; also give the therapeutic uses of opium.

The stomach should be emptied by the stomach-pump or a stimulating emetic, like sulphate of zinc or mustard. Previous to this, however, if the opium is in the stomach, solution of permanganate of potash should be administered freely; as a chemical antidote strong coffee should be given, and the patient should be aroused by flagellation, douching, or forced walking. Atropine and strychnine should be given hypodermically. The temperature should be maintained by the external application of heat. In therapeutics opium is used internally to produce sleep, to relieve pain, to lessen nervous excitement, to promote diaphoresis, to check hemorrhage, and to support the system. Externally it is used as a sedative.

Name five emetics and give the dose of each.

Alum, dose 1 to 4 drams; mustard, dose 1 to 4 drams; ipecac, dose of the fluid extract 15 minims; apomorphine, dose $^1/_{10}$ grain; sulphate of zinc, dose 15 grains.

What are the advantages and disadvantages in the use of choloroform as an anesthetic and what are the signs indicative of danger in the patient?

Inhalations of chloroform produce sensations which are rather agreeable than otherwise, while the first stage of ether anesthesia is decidedly unpleasant. Chloroform produces anesthesia more quickly than ether, and in certain cases this is an advantage. It is, however, much more dangerous than ether. Its dangerous symptoms are: (1) respiration becomes stertorous or shallow; (2) sudden dilatation of the pupils; (3) signs of cardiac failure. Chloroform produces much less subsequent vomiting.

Define briefly but clearly serum therapy.

Serum therapy properly means the prophylactic and curative treatment of certain acute infectious diseases by the subcutaneous injection of a blood serum containing an anti-

toxin specific to the particular disease. As generally used, however, this term includes the treatment of the same disorders by the toxins produced by attenuated cultures of their respective microbes; but these toxins, though sometimes grown on blood serum, may be cultivated on other media, and are never administered in a serum, as the antitoxins invariably are. The antitoxins at present employed in serum therapy are those of diphtheria, tetanus, tuberculosis, erysipelas, pneumonia, cholera, syphilis, plague, and typhoid fever, but only the first three have come into anything like general use. (Potter.)

What official preparations are derived from the willow?

Salicinum or salicin, a glucoside, is obtained from several species of the willow. Salicylic acid and the various salicylates might be prepared from salicin by synthetic processes but practically this is never done.

What active principles are found in digitalis? What are the official preparations of petroleum?

Digitalin, digitoxin, digitalein, digitonin, and digitin. Petrolatum is a mixture of the hydrocarbons obtained from petroleum. The official preparations are petrolatum, petrolatum album, and petrolatum liquidum.

Give the physiologic action and therapy of saline purgatives.

This group includes the neutral salts of metals of the alkaline or alkaline earths. They stimulate the intestinal glands to increased secretion, and by their low diffusibility impede re-absorption, causing an accumulation of fluid in the intestinal tract. This, partly from the effect of gravity and partly by gentle stimulation of peristalsis excited by distension, reaches the rectum and produces a copious evacuation. Magnesium sulphate and sodium sulphate are the typical salines. They should be given in plenty of water and during active

movement (as in walking) in order to produce their best effects.

Name three drugs used in the treatment of intermittent fever. State how each controls this disease.

Quinine exerts a specific influence in all malarial infections by reason of its power to prevent the development of the plasmodium to which malaria is due. A 10-grain dose of the sulphate should be given in the sweating stage, and again five hours before the expected time of the next paroxysm. In the intervals arsenic is of more value; its therapeutic action is due to the fact that it is a valuable anti-periodic, as well as tonic and alterative. Mercury is also of value for its hematinic and alterative properties.

Describe the treatment of intestinal indigestion.

Under this term a variety of conditions have been described dependent upon various causes, but it is usually restricted to acute or chronic intestinal catarrh. When this is dependent upon causes residing in the stomach the existing gastritis must be first treated. A course of calomel and soda is of value; this may be followed by the administration of pancreatin, which will aid digestion. Proper measures of diet and exercise are important. Charcoal in 10-20-grain doses is useful.

Name four drugs incompatible with tannic acid. Name two incompatible with hyoscyamus.

Tartar emetic, lead acetate, silver nitrate and hydrochloric acid are incompatible. The hydroxide of potassium and tannin with hyoscyamus.

What doses of antitoxin are used for a child five years old ill with diphtheria? What would be the prophylactic dose for the same child?

1500 units. 500 units.

Correct the following prescription:

℞. Atropiae Sulphati ..... grs. iss
Potas. Iodidi ..... ½ oz.
Infusae Digitalis ..... ½ fl. oz.
Elix. Simpl. q. s. ad ..... 2 fl. oz.
M. S.—Teaspoonful in water four times a day.

Potassium iodide is best given alone. The dose of atropine is much too great. It should be about $^1/_{100}$ grain to each dram. *Atropiæ sulphati* should read *Atropinæ sulphatis. Infusæ* should read *Infusi.*

What parts of gossypium are used in medicine?

The bark of the root is official as gossypii cortex, and the hairs of the seed as gossypium purificatum.

What is the important alkaloid of erythroxylon and what is its principal therapeutic use?

Its alkaloid, cocaine, is allied to caffeine, but is more powerful, and its proportion in the leaves of the plant varies greatly in the different samples which occur in commerce. Its chief use is that of a local anesthetic.

Name the official preparation of bismuth and give the dose of each.

Bismuth citrate, 0.125 Gm. (2 grains); bismuth and ammonium citrate, 0.125 Gm. (2 grains); bismuth subcarbonate, 0.500 Gm. (7½ grains); bismuth subgallate, 0.250 Gm. (4 grains); bismuth subnitrate, 0.500 Gm. (7½ grains); bismuth subsalicylate, 0.250 Gm. (4 grains).

What is the physiologic action of iris?

Iris when fresh is actively purgative, emetic and diuretic, producing severe nausea and prostration.

What is the dose of (a) potassium iodide, (b) ammonium iodide, (c) sodium iodide?

(a) 0.500 Gm. (7½ grains); (b) 0.250 Gm. (4 grains); (c) 0.500 Gm. (7½ grains).

From what is koumiss made and what are its therapeutic uses?

Koumiss is an effervescing fermented liquor originally prepared by the Tartars from mares' milk, but now imitated with cows' milk by adding sugar of milk, fermenting in an open tank, skimming off the casein and butter, then bottling during active fermentation. Koumiss is an invaluable article of diet in many wasting diseases, especially tuberculosis. It is of great benefit in dyspepsia, the diarrheas of children, convalescence from acute maladies, chronic affections of the kidneys, chronic bronchitis and other cachexiæ.

What is the proportion of mercury in hydrargyrum cum creta? What is the dose?

38% mercury. Dose, 0.250 Gm. (4 grains).

Compare the therapeutic uses of pepsin and pancreatin. How are these remedies prepared?

Pepsin is the digestive principle of gastric juice. Pancreatin is a mixture of the enzymes naturally existing in the pancreas of warm-blooded animals. Pepsin is usually obtained from a solution prepared by digesting the mucus scraped from the rennet-bags of sheep or the stomach of the pig in acidulated water for several days. It is then precipitated by sodium chloride, lead acetate or alcohol. Pancreatin is usually obtained from the fresh pancreas of the hog. Pepsin is employed in cases of gastric indigestion, while pancreatin is indicated in intestinal indigestion.

Describe the therapeutic action of spigelia. What are its therapeutic uses?

Spigelia, pink root, is anthelmintic against the round-worm and is usually administered with senna. In large doses it is an uncertain cathartic, and may produce serious symptoms, including vertigo, dimness of vision, dilated pupils, and convulsions.

What are the therapeutic uses of cannabis and what is the dose of the tincture of cannibas indica?

It is used as a sedative and soporific as a substitute for opium in such conditions as chronic bronchitis, phthisis, in the dyspnea of asthma, and in the restlessness of chronic nephritis. As an analgesic it is useful in neuralgia and migraine. It is also employed in mania, delirium tremens, and in some forms of dysmenorrhea and menorrhagia. The dose of the tincture is 0.6 Cc. (10 minims).

What is the composition of hydrargyri iodidum rubrum?

It is a red crystalline powder prepared by the double decomposition of potassium iodide, 5 parts, and mercuric chloride, 4 parts.

Where is the cinchona tree indigenous? What part of the tree is used in medicine?

It is a native of the eastern slope of the Andes. The bark.

Name three drugs used to retard the heart's action and state the dose of some preparation of each.

Aconite, dose of the tincture, 0.6 Cc. (10 minims); antimony, dose of tartar emetic 0.005 Gm. ($^1/_{10}$ grain); veratrum, dose of the tincture 1 Cc. (15 minims).

Describe the symptoms of hydrargyrism.

The first symptoms of chronic mercurial poisoning are fetid breath, swollen and spongy gums having a bluish line along their margin, stomatitis, sore and loosened teeth, salivation. Anorexia, diarrhea and fever follow, also ulceration, and in some cases even gangrene of the lips and tongue. There is destruction of tissue and various nervous disturbances. The patient becomes emaciated, suffers from headache, insomnia, neuralgia and tremor, a vesicular or pustular eruption appears, and finally there follow coma and convulsions.

Give the common name and state the physiologic effects of mentha piperita.

Peppermint. It is an aromatic stimulant, also carminative

and anti-spasmodic. It is used in the form of menthol, as an antiseptic and local anesthetic. Peppermint is employed internally for the relief of nausea and colic and as a carminative. It is an agreeable corrigent for combination with purgatives to prevent griping.

Of what is iodoform a preparation and what is the dose for internal administration?

Iodoform contains from 94 to 97 per cent. of iodine. Dose, 0.250 Gm. (4 grains).

What are the sources of salicylic acid?

Salicylic acid is an organic acid existing naturally in combination in various plants, but generally prepared synthetically from carbolic acid.

Give the source and describe the uses of lanolin.

Lanolin is the purified fat of the wool of sheep mixed with not more than 30 per cent. of water. It is useful in chronic skin diseases where there is infiltration and where a penetrative action is required for medicaments locally applied.

How do oleates and ointments differ?

Oleates are liquid solutions of metallic salts, or alkaloids in oleic acid intended for external administration. Ointments are soft, fatty mixtures of medicinal agents with a basis of lard, petrolatum, etc. They are intended for application to the skin by inunction, and have a melting point which is below the ordinary temperature of the human body.

What are the therapeutic uses of acetanilide administered internally? Has it any uses when locally applied? If so, what are they?

It is used internally as an antipyretic and an analgesic and antispasmodic. It is extensively employed in surgical practice as a dry dressing for wounds, etc.

Describe linum and give its medical preparations and uses.

Flaxseed is the seed of *linum usitatissimum.* It contains 15 per cent. of mucilage in the epithelium, also 30 to 40 per cent. of fixed oil in the embryo. Linseed oil is official. Linseed tea is in common use, but is not official. Carron oil, a favorite application for burns, consists of equal parts of linseed oil and lime-water. Linseed is demulcent, emollient, expectorant and diuretic. The oil is laxative in doses of 1 ounce. The ground seed is used in making the linseed poultice.

What are the symptoms of iodism? How may it be prevented while the use of the iodide is continued?

The symptoms of iodism are anemia, emaciation and mental depression. There is frontal headache, ptyalism, a saline taste in the mouth, dysphagia, temporary impotence, and an eruption of acne on the face and limbs. The iodide of potash may be prescribed in combination with tincture of cinchona or with Fowler's solution, which prevents the iodic eruption to some extent. If the iodides are given freely diluted in water the toxic effects are less likely to be produced.

Give the common name of hydrastis and describe its therapeutic uses.

The common name is goldenseal. It is used chiefly as a stomachic tonic and antiperiodic, a mild laxative and an antiseptic. It is of value in catarrhal inflammation of the gastro-intestinal and genito-urinary tract and as a local alterative and antiseptic application.

Write the following prescription by the metric system:

Potassii bicarb	3½ dr.
Acidi acetici	7 fl. dr.
Aquae	3 fl. oz.

Potassii bicarb	13.5
Acidi acetici	25
Aquae	90

What are the possible dangers from the use of salol in large doses?

Salol breaks up in the body into salicylic acid and carbolic acid. It is apt to produce the symptoms of carbolic acid poisoning.

Give the medical name and the official preparation of lignum vitae.

Guaiacum. The official preparations are the tincture of guaiac and the ammoniated tincture.

What are the therapeutic uses of manganese?

The salts of manganese, especially the permanganate of potash, are used in anemia, in irregularities of menstruation, as an antidote against opium or morphine in the stomach and locally, as an antiseptic and oxidizing agent. The dioxide is a good remedy in amenorrhea, gastrodynia and pyrosis, and in the form of an ointment for many skin diseases.

How is the peroxide of hydrogen prepared? What are its therapeutic uses?

By passing CO_2 through water containing BaO_2 in suspension, or by action of an acid on BaO_2. The U. S. P. solution contains, when freshly prepared, 3 per cent. of the pure dioxide, corresponding to about 10 volumes of available oxygen. This preparation is a non-toxic antiseptic. It is employed as a gargle or spray in quinsy, croup, diphtheria, scarlet fever, ozena, and for the purpose of cleansing wounds. It may possess some value as an intestinal antiseptic on account of the fact that it is a valuable oxidizing agent.

What are the therapeutic uses of uva ursae? What part of this plant is used in medicine?

Bearberry is an astringent tonic, and is feebly diuretic. The leaves are employed.

What is the common name of oleum morrhuae? On what physiologic effect does its therapeutic use depend?

Cod-liver oil. The action of cod-liver oil is like that of

any other fat except that it is more easily assimilated than any member of the class. Its beneficial effects, therefore, are derived solely from its food value.

What is the composition of linimentum calcis? For what is it principally used?

Carron oil consists of equal parts of lime-water and linseed oil, and is employed chiefly in burns.

What action on the heart has valerian in full doses? State the therapeutic uses of valerian.

In full doses it increases the action of the heart and raises the temperature. The oil in large doses lowers the blood pressure and slows the pulse. Valerian is used in hysteria, for the flatulence of infants and nervous subjects, also for coughs of nervous type, in whooping cough, diabetes insipidus and in delirium with vital depression.

Where is jalap indigenous? What part of it is used in medicine?

Jalap is a Mexican plant. The root is used.

Mention the salts of silver used in medicine and give the dose of each.

Silver nitrate, dose 0.010 Gm. (⅙ grain). Silver cyanide; this is not used in medicine except in the preparation of hydrocyanic acid. Silver oxide, dose 0.065 Gm. (1 grain).

Describe the therapeutic uses of (a) water and (b) mineral water.

Cold water or ice has many external applications of value in the treatment of disease. As a wet pack it is used in tonsillitis and diphtheria. The cold baths and the cold wet pack are the best methods of obtaining an antipyretic effect in fevers. Cold or ice water is applied to the head in acute cerebral congestion. Locally in orchitis, the uterus in postpartum hemorrhage. Hot water externally is most effective in reducing local congestion and setting up resolution of

local inflammation. The hot wet pack is highly esteemed in inflammations of the chest. The vaginal hot-water douche is serviceable in catarrhal conditions of the vaginal and cervical mucous membrane and congestive, swollen or neuralgic conditions of the ovaries, tubes and adjacent tissues. Vapor and Turkish baths are used in chronic kidney disease and as diaphoretics generally wherever a diuretic effect is desired. Internally, water is of value as a diuretic, and if hot as a diaphoretic. Mineral waters are esteemed most highly when they are of the class possessing aperient and purgative properties. Depending upon the composition of these waters, they may be of value in chronic rheumatism, diabetes, obesity, syphilis, metallic poisoning, constipation, etc.

Where is the cinnamon tree indigenous? Mention the active principle of cinnamon and give its dose.

Ceylon. The active principle is a volatile oil, the dose of which is 0.05 Cc. (1 minim).

What therapeutic uses has chloroform other than an anesthetic?

It is used in intestinal colic and serous diarrhea, as a carminative and as a sedative in cases of obstinate cough.

What is the dose of tincture of belladonna and what indications show that its physiologic effect has been obtained?

Dose, 0.5 Cc. (8 minims). Medicinal doses quicken the pulse and large doses stimulate respiration. Dryness of the mucous membrane and skin and dilatation of the pupil will indicate the physiologic effect has been reached.

For what purposes and effects is strychnia frequently used in formulae for cathartics?

Strychnia stimulates the muscular coat of the intestine, increasing peristalsis, and thus acts as a purgative, but it restrains the frequent discharges due to atony of the bowels.

What effect has pilocarpus on (a) the heart, (b) the skin, (c) the salivary glands?

(a) Pilocarpus acts as a cardiac depressant by stimulation of the vagus ends; (b) it causes prompt and profuse perspiration, and (c) salivation.

What is the source from which eserine is obtained? How and for what purpose is eserine principally used?

Eserine is one of the alkaloids of physostigma. It is used locally in solution of 2 grains to the ounce in the eye to contract the pupil and reduce intra-ocular tension. Internally it is efficient in constipation due to torpor of the bowel, in which condition it is usually combined with belladonna and nux vomica.

Describe the therapeutic uses and the dangers of chloral hydrate. How does a toxic dose of chloral hydrate affect body temperature?

Chloral is chiefly used to promote sleep and to check spasms. It must be administered with care on account of the danger of the patient becoming addicted to the chloral habit. It is a distinctly dangerous drug, as it lowers the blood pressure and body temperature. Cardiac and respiratory weakness are contra-indications to its use. Toxic doses lower body temperature.

What is the common name of guaiacum? What are the therapeutic uses of guaiacum?

Its common name is *lignum vitæ*. Guaiacum is diaphoretic, expectorant and alterative, also laxative and purgative, according to the dose administered.

What are the therapeutic uses of limonis succus?

Lemon juice is used as a refrigerant and diuretic mixture in fever. For acidity of the stomach and as a common remedy in obesity. Locally it is used as an antipyretic, antipruritic, and as a gargle. It is also used for flavoring purposes.

Define anthelmintic and name the remedies of this class.

Anthelmintics are agents which destroy or expel worms inhabiting the intestinal canal. They are classed according to the worm against which they are each most efficient. For thread worms the principal remedies are quassia, alum, sodium chloride, lime-water, and the vegetable astringents. For round worm, santonin, spigelia, chenopodium. For tape worm, filix mas, kamala, kousso, pepo, and granatum. The principal vermifuges are the purgatives, castor oil, jalap, and scammony.

What are the therapeutic uses of resorcin?

Resorcin is employed as an antipyretic and antiseptic. A 3 per cent. solution gives good results in ulcer of the stomach, cancer and other morbid conditions. It is also used locally as a remedy in skin diseases.

Name the official preparation and state the therapeutic uses of santalum album.

Oil of santal is official. It is extensively used in chronic bronchitis and catarrhal conditions of the genito-urinary tract.

How is collodium made? What are the preparations of collodium?

Collodium is made by dissolving 4 parts of pyroxylin in 75 parts of ether and 25 parts of alcohol. Preparations are flexible collodium, styptic collodium and cantharidal collodium. Collodium is used as a protective covering for superficial burns, ulcers, wounds and slight cuts. Styptic collodium has many uses as a hemostatic and protective, while the cantharidal form is a convenient epispastic.

Give the common name and the therapeutic uses of hematoxylon.

Log-wood. Log-wood is mildly astringent, its properties depending upon the tannin contained in it. It is not irritating, and is useful in diarrhea and hemorrhages in young

children. It has been employed as a hemostatic in bleeding of the lungs and hemorrhages from the uterus and intestines, also as an astringent injection.

On what physiologic action does the therapeutic use of elaterin depend?

Elaterin is the most powerful of the hydragogue cathartics, causing profuse watery stools, and when given in large doses great prostration and gastro-intestinal irritation, nausea and vomiting.

Name three drugs incompatible with belladonna and two incompatible with pilocarpine.

Tannin and the hydroxides of potassium and sodium are incompatible with belladonna, and are also incompatible with pilocarpine, as are the salts of the metals generally.

Give the usual dose of creosote and tell how it is best administered.

It is prescribed in doses of 0.2 Cc. (3 minims), well diluted in wine or whiskey.

Name four official pills and give the principal ingredients of each.

Pills with aloes contain purified aloes and powdered soap; pills of asafetida contain asafetida and powdered soap; compound pills of iron contain myrrh, carbonate of sodium, sulphate of iron and syrup; compound rhubarb pills contain rhubarb, aloes, myrrh and oil of peppermint.

Define tinctures, extracts and ointments and tell as a rule how many drops of a tincture are in a fluid dram.

Tinctures are alcoholic solutions of medicinal substances, and with the exception of tincture of iodine are made from non-volatile bodies. Extracts are solid or semi-solid preparations obtained by evaporating solutions of vegetable principles. Ointments are soft, fatty mixtures of drugs with a basis of lard, petroleum or fixed oils. The number of drops

to a fluid dram of tinctures varies widely; 110 may be considered an average.

Write a complete prescription containing at least three drugs for acute bronchitis in an adult. Use no abbreviations.

JAN. 1, 1903. FOR MRS. WATSON.

℞. Tincturæ opii camphorata..... f℥v
Tincturæ nucis vomicæ..... f℥ii
Misturæ glycyrrhizae compositæ..... f℥iv
M. S.—Teaspoonful every four hours. JOHN JONES, M. D.

In the treatment of syphilitic node or gumma state which should be used, a mercurial or an iodide, and give the reason thereof.

In the treatment of the tertiary lesions of syphilis the iodides and mercury, the so-called mixed treatment, is often employed, the object being to get the greatest possible alterative effect. The appearance of a gumma, especially of the nervous system, demands energetic drug treatment. Iodides should be given in the largest possible doses, and mercury should be administered by inunction.

Give the reason which would determine the employment of a vegetable or a mineral astringent in acute inflammatory conditions.

Vegetable astringents check secretion and hemorrhages and cut short local inflammation. They are practically non-toxic.

Differentiate the conditions in which opium and hyoscine should be used to promote sleep.

Hyoscine is useful as a hypnotic in children, and in general in conditions in which opium is contra-indicated. Children are particularly susceptible to opium, and an opium habitue would require a different hynotic.

State when calomel or podophyllum should be given and give the reason for the selection.

Calomel is unirritating, and has also a diuretic effect.

Podophyllum is more irritating and causes more griping, and is to be selected in cases of habitual constipation.

Name the coal-tar products used to reduce temperature.

Their name is legion. Those in general use are antipyrine, phenacetine, acetanilide.

Describe the alkaloid, strychnia, and give a test for determining its presence.

Strychnia is an alkaloid derived from the seed of strychnos nux-vomica, a tree of the natural order Loganiacea, growing in India and China. Strychnia and its salts dissolve without color in concentrated sulphuric acid, but on adding to the solution lead peroxide a beautiful blue color results, passing into violet, then red, and finally yellow.

What are the derivatives of cinchona and their doses?

Cinchona bark contains many natural alkaloids, of which 3 are official, quinine, cinchonine and cinchonidine. The sulphates of these alkaloids may be administered in doses of 0.250 Gm. (4 grains).

Describe four diuretics and give the dose of each.

Potassium citrate occurs in transparent crystals, is odorless, of cooling saline taste and a neutral reaction, dose 1 Gm. (15 grains). Sparteine sulphate, the alkaloid of scoparius, occurs in white prismatic crystals of slightly saline and bitter taste, dose 0.010 Gm. (⅙ grain). Digitalis (elsewhere described), dose of the infusion, 8 Cc. (2 fluidrachms). Calomel, the mild chloride of mercury, is efficient as a diuretic in 0.010 Gm. (⅙ grain) doses every hour.

How does a lethal dose of gelsemium affect the system?

In toxic doses it produces vertigo, diplopia, drooped eyelids, dilated pupils, labored respiration, slow and feeble heart, dropped jaw, staggering gait, extreme muscle weakness, almost complete anesthesia, and death by asphyxia.

Name three indications for the use of opium.

To relieve pain, to produce sleep, to check excessive secretion, as in dysentery.

How does opium act when used as in the last question?

The principal action of opium is on the nervous system, first affecting the cerebral convolutions, which are briefly stimulated and soon depressed; next the perceptive and sensory centers in the higher brain are blunted and the conductivity of the afferent nerves is impaired. The hypnotic action of opium is believed to be due to the lessened activity produced by the drug on the nerve cells and the consequently lessened demand for blood. Its constipating action is produced by stimulation of the inhibitory nerves of the intestine through the splanchnic.

What are the therapeutic uses of the preparations of bismuth?

Locally the insoluble bismuth salts are used in acne rosacea, stomatitis, coryza, gonorrhea and leucorrhea. The subnitrate is regarded as of great value in diarrhea and dysentery, in disordered digestion, vomiting, gastralgia, and gastric ulcer. The bismuth nitrate is soluble and toxic, and is not generally used. The subcarbonate and the subgallate are used in the same class of cases as the subnitrate.

How would you distinguish quinine from the other cinchona alkaloids?

The slight solubility of the sulphate of quinine in water distinguishes this alkaloid from other cinchona alkaloids.

Give the adult dose of phosphorus, solution of arsenous acid, and tincture of aconite.

0.0005 Gm. ($\frac{1}{128}$ grain); 0.2 Cc. (3 minims); 0.6 Cc. (10 minims).

What condition of the eye contra-indicates the use of mydriatics?

All diseases increasing intra-ocular tension.

Describe the physiologic action of arsenic and name three indications for its use.

In therapeutic dose, with the exception of a slight increase in the pulse, arsenic exerts very little influence on the circulation. In toxic dose it causes the fall of blood-pressure. In medicinal dose it is a cerebro-spinal stimulant, but in toxic doses it paralyzes the spinal cord, especially the sensory side. Small doses increase the appetite and stimulate digestion. Toxic doses produce violent gastro-intestinal inflammation. In small doses it diminishes and in large doses increases tissue waste. In concentrated form it is a powerful irritant and escharotic. It is indicated in anemia, malaria and diabetes.

For what medicinal purposes is senna used?

It is used as a laxative in habitual constipation, and in larger doses as a cathartic.

Write a prescription for an ointment containing a rubefacient and at least one other constituent.

JAN. 1, 1903. FOR JOHN SMITH.

℞. Unguenti hydrargyri nitratis..... ℥iv
Sulphuris..... ℥ii
Creosoti..... gtt. x
Adipis..... f℥i
Fr. unguentum..... f℥i
S. Rub in well. JAMES JONES, M. D.

What is the usual physiologic action of an astringent administered internally?

Astringents are agents which produce contraction of muscle fiber and condensation of other tissues. They lessen secretions from mucous membranes.

What are the medical uses of ammonia?

Ammonia is employed in medicine when a quickly-acting heart and respiratory stimulant is required. It is also used as an antacid and a counter-irritant.

What are the therapeutic uses of lime (calcium)?

Lime in its unslaked form acts upon the skin as an irri-

tant and caustic; if inhaled or swallowed it may produce dangerous inflammation, followed by ulceration. In weak solution it has a sedative and an astringent effect, both locally and internally, and acts as an absorbent and antacid.

For what pathologic conditions may capsicum be used?

It is an excellent stomachic tonic in atonic dyspepsia and in that of chronic alcoholism with tremor and insomnia. In acute dipsomania large doses are effective in producing sleep and promoting appetite. Locally, capsicum plaster is a mild counter-irritant.

What is the ordinary relative strength of a tincture to a fluid extract of the same drug?

With fluid extracts a cubic centimeter represents the medicinal powers of 1 gramme of the drug. Tinctures are divided into two classes. A uniform strength of 10 per cent. has been adopted by the new pharmacopœia for the tinctures of potent drugs. Other tinctures have a strength of 20 per cent.

Name three agents which are used to promote menstruation.

Potassium permanganate, purgatives, as castor oil, and ergot.

How do the preparations of gentian affect the human system and in what conditions are they indicated?

Gentian is used exclusively as a bitter tonic. In atonic dyspepsia it increases the appetite and stimulates digestion.

The dose of medicine given by the mouth being 1 grain, what would be the equivalent dose for hypodermic use and what for administration by the rectum?

For hypodermic injection the dose should be $\frac{2}{3}$ or $\frac{3}{4}$ of that used by the mouth. By the rectum $\frac{5}{4}$ of the same.

How should a case of poisoning with chloral hydrate be treated?

The patient should be aroused by friction, douches, etc.,

but must not be made to walk, as in opium poisoning, on account of heart failure. Cardiac and respiratory stimulants should be given freely, as ammonia, atropine and strychnine. Artificial respiration should be resorted to early, before the development of asphyxia.

In what conditions may cathartics be useful in the treatment of diarrhea or dysentery?

Cathartics are useful in the treatment of diarrhea and dysentery, especially early in the course of this condition, in the case of diarrhea for the purpose of removing offending material, as indigestible food, discharges, bacteria, etc.

Define a laxative, a saline purgative, a drastic purgative, a hydragogue purgative and a cholagogue purgative, with an example of each.

Laxatives are drugs which excite moderate peristalsis and produce soft stools without irritation, as sulphur. Saline purgatives include the neutral salts of metals, of the alkalies or alkaline earths; they stimulate the intestinal glands to increased secretions and produce a copious evacuation, as Epsom salts. A drastic purgative produces violent peristalsis and watery stools, with much griping pain and tenesmus; in large doses irritant poisoning results, as jalap. Hydragogue purgatives are those which remove a large quantity of water from the vessels, as elaterium. Cholagogue purgatives stimulate the discharge of bile and produce free purgation, as podophyllin.

Would you administer charcoal internally, and if so in what dose and for what purpose?

It may be given with advantage in chronic gastric catarrh, cancer, intestinal dyspepsia and diarrhea when flatulence is a prominent symptom. Dose is 1 Gm. (15 grains).

What are the physiologic effects of gelsemium?

Medicinal doses do not affect the circulation. Toxic doses depress the heart. It is a marked depressant to the spinal

cord, and in toxic doses produces paralysis. The drug kills by paralyzing the respiratory center. Locally the drug causes dilatation of the pupil, probably from paralysis of the oculo-motor nerve.

Describe the therapeutic uses of jalap and state how it differs in effect from aloes.

In moderate dose jalap acts as a hydragogue cathartic, producing copious watery discharges. It is best given in the form of compound jalap powder in conditions of general dropsy, and should never be employed in simple constipation. Aloes is a cholagogue cathartic, stimulating the discharge of bile.

Name two remedies which are commonly used to promote intestinal peristalsis.

Belladonna and nux vomica.

What are the therapeutic uses of guaiac?

Used locally and internally in acute bronchitis; often prescribed in chronic rheumatism, gout, sciatica and lumbago.

Name the official bromides.

The bromides of potassium, sodium, lithium, ammonium, strontium and zinc.

Describe the therapeutic uses of ox-gall.

It is a tonic, antiseptic and purgative, stimulating the absorptive powers of the mucous membrane. It is frequently used as a laxative in constipation.

Where does buckthorn grow? Give the official preparation and dose.

In Europe. Fluidextract of frangula. Dose 1 Cc. (15 minims).

What are the therapeutic uses of gelsemium?

It is indicated in all conditions of exalted nerve function, and contra-indicated whenever the heart is weak. It is espe-

cially useful in cerebro-spinal meningitis, mania, persistent insomnia, neuralgia, dysmenorrhea, incontinence of urine, irritation of the bladder, spasmodic coughs and remittent or typho-malarial fevers.

What is the purgative dose of acetate of potassium?

Two to four drachms.

What is the common name and therapeutic use of plumbi acetatis?

Sugar of lead. It is a component of the mixture of lead water and laudanum, which is employed in bruises and inflammatory swellings where the skin is not broken. It is used in solution as a lotion in skin diseases and pruritus, and is employed as an astringent in diarrhea.

How do official waters, e. g. aqua camphorae, differ from solutions, e. g. liquor calcis?

Waters are aqueous solutions of volatile substances; liquors are all aqueous solutions of non-volatile substances.

How do potassium acetate and potassium bitartrate compare as diuretics and purgatives?

The acetate is the more certain diuretic; the bitartrate is the more active cathartic.

Give the common name and the official preparations of prunus Virginiana.

Wild cherry. The official preparations are the fluid extract, infusion and syrup.

On what chemical change in the intestinal tract does the purgative action of castor oil depend?

The oil is decomposed by the pancreatic juice, setting free ricinoleic acid, which produces purgation by a mildly irritant action on the bowels, stimulating the glands and muscular coat, but not the liver.

What are the therapeutic uses of acetic acid?

Used internally as a mild refrigerant and antiscorbutic,

and as an antidote in poisoning by alkalies, such as ammonia. Locally it is used to check hemorrhages and as an escharotic.

What is the proportion of mercury in blue pill? What is the dose of blue pill?

It contains 33 per cent. of mercury. Dose 1 to 20 grains.

What effect has benzoin on the urine? Name the preparations of benzoin.

It renders the urine acid and increases its quantity. The preparations of benzoin are adeps benzoinatus, tinctura benzoini, tinct. benzoini composita, acidum benzoicum, ammonii benzoas, lithii benzoas, sodii benzoas.

What are the alkaloids of pilocarpus and how do they compare in physiologic effect?

The alkalies of pilocarpus are pilocarpine, jaborine, antagonistic to pilocarpine in action; pilocarpidine, analogous to pilocarpine, and jaboridine, which is analogous to jaborine.

What is the source of camphor and what is the dose of spiritus camphorae?

Camphor is a stearopten obtained from the cinnamomum camphora, a tree of the natural order *Lauraceæ* (indigenous to China and Japan), purified by sublimation. Dose of the spirit 1 Cc. (15 minims).

Give the common name and the therapeutic uses of potassium bitartrate.

Cream of tartar. It is an agreeable laxative, and also is used as a diuretic in infusion of juniper in general cardiac dropsy.

Give the source and preparations of gum arabic.

Acacia, gum arabic, is a gummy exudation of Acacia senegal, a small tree native in Africa. Its preparations are the syrups and mucilage. It enters also into the composition of official troches, etc.

Mention the therapeutic uses of nitric acid.

It is locally a powerful escharotic, and internally in dilute form in bilious affections. It lessens phosphatic deposits and acts as an astringent to the system, diminishing expectoration in bronchorrhea and phthisis.

Give the physiological action and the therapeutic uses of sarsaparilla.

It is doubtful if it possesses any physiologic action. Some, however, claim it to be diurectic, diaphoretic, tonic and alterative. Its chief value is as an excipient for administering potassium iodide and mercuric chloride in syphilis.

Describe and give the indications for the uses of cardiac sedatives, with an example.

Cardiac sedatives are drugs which are used to decrease the activity of the circulation. The indications for their use are increased arterial excitement, sthenic fevers and severe local inflammation. Aconite is an example of such a drug. It reduces very markedly the rate of the pulse and the arterial pressure.

Describe the physiologic action of antipyrine in medicinal doses on the circulation and temperature.

After the ingestion of a full medicinal dose there is a stimulant stage, in which the heart's activity is increased; this is soon followed by profuse sweating, coolness of the surface, slowed pulse, considerable depression, and if fever be present by lowered temperature. In health it has very slight antipyretic effect. It raises the arterial tension and blood pressure.

How do digitalis and belladonna act in increasing blood pressure?

Digitalis increases blood pressure by its powerful stimulating effect on the heart by contraction of the arterioles, resulting indirectly from stimulation of the vasomotor center, and directly from the action of the drug on the vessel wall.

The increased blood-pressure produced by belladonna is due to stimulation of the vasomotor centers and the heart itself.

Name a vasomotor stimulant, a vasomotor depressant and describe the physiologic action of each.

Belladonna is a vasomotor stimulant; it quickens the pulse and raises arterial pressure. The increased blood-pressure is due to stimulation of the vasomotor center and the heart itself. Toxic doses paralyze the heart; large doses stimulate the respiratory center; toxic doses paralyze it; large doses stimulate the brain and spinal cord and act as a depressant to the motor and sensory nerves; it lessens nearly all of the secretions except that of the kidney; it dilates the pupil by paralyzing the peripheral ends of the oculo-motor nerves and by stimulating the ends of the sympathetic. Veratrum viride is a vasomotor depressant; it lessens in a marked degree the force and rate of the cardiac pulsation; the lowered arterial tension results from depression of the vasomotor center and of the heart itself; the slowing of the pulse from stimulation of the inhibitory nerves of the heart and from weakening of the cardiac muscles. Large doses depress the respiratory center, the spinal cord and peripheral nerves and muscles.

Give the theory of the alkaline treatment of rheumatism.

The alkaline treatment of rheumatism by the administration of potassium acetate, citrate, etc., was in general use before the introduction of the salicylates. Wood states that the alkalies do good in rheumatism by lowering arterial action, by favoring oxidation and elimination of partially effete products, and by neutralizing excessive acidity.

What is incompatibility in medicine, and what are the different kinds of incompatibles? Give an example of each.

Incompatibility in medicine signifies that a combination is

not suitable for administration. Incompatibility may be chemical, pharmaceutical and therapeutic, according as the prescribed combination results in chemical decomposition, physical disassociation or antagonistic action. An example of chemical incompatibility is seen in the prescribing of quinine sulphate with potassium acetate, resulting in a voluminous precipitate of quinine acetate. An instance of pharmaceutical incompatibility is the addition of an acid to a quinine and liquorice mixture, resulting in precipitation of the glycyrrhizin, relied on to cover the taste of the quinine. Therapeutic incompatibility arises when two agents mixed together oppose each other in their action, for instance belladonna and physostigma.

Describe the physiologic action of salicylic acid.

Salicylic acid is a powerful antipyretic and antiseptic. In small doses it stimulates the stomach, heart and respiration, but moderate quantities derange the stomach, causing nausea and vomiting, while large doses depress the heart's action and the respiration, lower the arterial tension, relax the vessels and produce free perspiration.

Name the therapeutic uses of apomorphia and state how codeia differs in its physiologic action from morphia.

Apomorphia is a valuable emetic and a useful expectorant in the dry stage of acute bronchitis, and in chronic bronchitis when the expectoration is viscid and scanty. While codeia possesses but feeble hypnotic powers, it exerts a sedative influence similar to morphine; it is at times much better borne by patients than morphine, but is regarded as less reliable.

Enumerate the symptoms arising from a toxic dose of digitalis.

Digitalis poisoning is characterized by obstinate vomiting, diarrhea, headache, severe pain in the back and limbs and a very slow, full pulse, which, when the patient sits up, may become rapid and feeble. Later, even in recumbency, the pulse becomes rapid, thready and irregular, the surface cold,

the urine suppressed and the mind stuporous. Intelligence, however, is not lost until shortly before death. Occasionally convulsions develop during the last stage.

What are the therapeutic uses of tartar emetic?

It is employed as an emetic, diaphoretic, sedative, expectorant, cardiac depressant and counter-irritant.

Describe cantharis and name three official preparations.

Cantharis is the dried body of the beetle, Cantharis vesicatoria, found chiefly in the south of Europe. The active principle is cantharidin. Ceratum cantharidis, collodium cantharidatum, tinctura cantharidis.

By what rule would you determine the dose of any medicine for a child?

Young's rule will be found the most convenient. Add 12 to the age and divide by the age, to get the denominator of a fraction, the numerator of which is 1; thus, for a child 2 years old, 2 plus 12 divided by 2 equals 7, and the dose is 1-7 of that for an adult.

Name ten official preparations of mercury. Name four alkaloids of opium.

Hydrargyrum cum creta, massa hydrargyri, unguentum hydrarygri, emplastrum hydrargyri, hydrargyri chloridum mite, hydrargyrum ammoniatum, unguentum hydrargyri ammoniati, hydrargyri oxidum flavum, unguentum hydrargyri oxidi flavi, hydrargyri oxidum rubrum. Four alkaloids of opium are morphine, codeine, thebaine and narcotine.

Give the source and dose of picrotoxin, creosote and pix liquida.

Picrotoxin is a neutral principle derived from cocculus indicus, dose 1-100 to 1-20 grain. Creosote is a product obtained from distillation of wood-tar, dose 0.2 Cc. (3 minims). Pix liquida, tar, is an oleoresin obtained from the destructive distillation of certain species of Pinus; the dose is 0.500 Gm. (7½ grains).

What are the principal therapeutic uses of the preparations of mercury?

The plaster of mercury is used as an absorbent and counter-irritant over chronic inflammatory swelling, glandular enlargements, syphilitic nodes, etc. Mercurial ointment and the oleate of mercury are used for the same purposes as the plaster; they are also extensively employed in the treatment of syphilis by inunction. Blue mass is used as a cholagogue, laxative and diuretic. Ammoniated mercury is used externally as a stimulant or parasiticide. The chloride of mercury is an antiseptic, anti-parasitic, anti-syphilitic absorbent, and tonic. The mild chloride, calomel, is used internally as an anti-syphilitic, as a laxative, as a gastric sedative, a cholagogue and a diuretic, and externally as a stimulant and desiccant. Mercury and chalk is used in the same class of cases as calomel. The yellow iodide is frequently used as a substitute for the chloride, as is the red iodide. The nitrate is used externally as a powerful caustic. The oxide is used externally for its stimulant and alterative effect. The yellow sulphate, turpeth mineral, is sometimes employed as a stimulating emetic for children, but it is distinctly poisonous.

State the contra-indications to the use of quinine.

It is contra-indicated in acute inflammatory affections of the brain, eyes and ears.

In what form would you prescribe eucalyptus and in what doses? Whence is eucalyptus obtained.

Eucalyptus is derived from the leaves of the tree Eucalyptus globulus, a native of Australia. It may be prescribed in doses of 2 Cc. (30 minims) of the fluid extract or in doses of 0.5 Cc. (8 minims) of the oil in elastic capsules or emulsion.

In what strength would you use solutions of nitrate of silver, borax, permanganate of potash, bichloride of mercury and creolin for injection into the bladder?

Silver nitrate, 1 grain in 4 ounces of water; borax, 10 grains

to the ounce; permanganate of potassium, 20 grains to the pint; bichloride of mercury, 1 to 3000; creolin, ½ to 1 per-cent.

Name six drugs containing large quantities of tannic acid.

Galla, catechu, hamamelis, kino, granatum, hematoxylon.

Name four drugs incompatible with iodide of potassium, two with atropine and one with antipyrine.

Potassium iodide decomposes most of the metallic salts. The following four drugs are examples of this incompatibility: Sulphate of quinine, sulphate of iron, acetate of lead, oxide of zinc. Physostigmine and aconite are incompatible with atropine. Tannic acid is incompatible with antipyrine.

Give the physiologic action of ergot and mention its therapeutic uses.

Ergot is a motor excitant and a vascular contractor. It is also hemostatic and anhydrotic, emmenagogue and oxytocic. It increases the functional activity of the spinal cord, it stimulates the vasomotor center, raises the blood-pressure, produces contraction of unstriped muscle fiber, reduces the caliber of the arterioles, depresses the motor ganglia of the heart and causes a slower and weaker pulsation.

Ergot is used to promote uterine contractions in labor, in amenorrhea due to plethora and in the atonic form of spermatorrhea. It is useful in catarrhal inflammations of the mucous membranes generally. It is an excellent remedy in chronic diarrhea and dysentery, in hemorrhages of arterial type, in headache and migraine of congestive form, in myelitis and tabes and chronic nervous diseases. It is also used locally in hemorrhages.

Name four drugs used in the treatment of bronchorrhea and explain their action.

Eucalyptus for its expectorant effect. Lead acetate for its astringent effect to restrict secretions. Quinine and arsenic as valuable tonics and restoratives.

What is the physiologic action of rhubarb in dose of 1 to 5 grains? In dose of 30 to 60 grains?

In small doses its action is that of a gastric tonic and an intestinal astringent. In larger doses its cathartic action prevails, producing in 6 to 8 hours copious yellow stools with some griping and considerable hepatic stimulation.

For what purposes is diaphoresis produced? Name three diaphoretics.

Diaphoretics are employed in medicine to fulfil the following indications: (1) to arrest forming diseases of not very severe type, as in general cold and suppressed menstruation; (2) to favor absorption, as in dropsy; (3) to aid in the subsidence of diseases which naturally pass off in a sweat, as malaria; (4) to eliminate noxious materials from the blood. Three excellent diaphoretics are pilocarpus, spirit of nitrous ether and Dover's powder.

What is the source and what are the therapeutic uses of picrotoxin?

Picrotoxin is a poisonous neutral principle obtained from the seeds of cocculus indicus, used in the night sweats of phthisis and in the form of an ointment as an anti-parasitic.

Give the chemical name and the dose of (a) Epsom salts, (b) Rochelle salts, (c) Glauber's salts.

(a) Magnesium sulphate, dose 16 Gm. (240 grains); (b) potassium and sodium tartrate, dose 8 Gm. (120 grains); (c) sodium sulphate, dose .16 Gm. (240 grains).

Describe hypodermoclysis and state the circumstances under which it is practiced as a therapeutic measure.

Hypodermoclysis is the introduction into the subcutaneous tissue of fluids in large quantity. It is indicated to replace the fluid lost through excessive purging or hemorrhage. It may also be used to wash from the body certain impurities circulating in the blood and lymph; in other instances it may be used to supply the body with liquid when the stomach will

not permit drinks to be swallowed, as in gastric ulcer or abdominal operations. Normal saline solution is used for such injections. The sterilized liquid is placed in a proper vessel which is absolutely aseptic, and to which air gains access only by means of a glass tube filled with sterilized cotton; from the lower part of the vessel a rubber tube leads, to which is attached a canula carefully sterilized. The skin over the place where the liquid is to enter is to be rendered sterile. The trocar is then inserted into the subcutaneous tissue of the abdomen or thigh and the solution allowed to flow at the rate of 1 dram to each pound of body weight in 15 minutes. The pressure is obtained by raising the container a few feet.

Define galactagogue and sialagogue and give an example of each.

A galactagogue is an agent which increases the secretion of milk, example pilocarpus. A sialagogue increases the secretion and flow of saliva and buccal mucus, example mercury.

By what process and from what source is sugar of milk principally obtained?

It is a crystalline sugar obtained from the whey of cows' milk by evaporation and recrystallization.

State the source and give the uses of saccharin.

It is derived from coal tar. It is about 500 times sweeter than sugar and is used as a substitute for sugar in the food of diabetics and subjects of liver disease and corpulence.

Describe the preparation of lime water. Give the official name and the adult dose.

Liquor calcis may be given to an adult in average doses of 16 Cc. (4 fluidrachms). It may be prepared by pouring 2 quarts of hot water over fresh unslaked lime the size of a walnut; stir till slaked, let it stand until clear and bottle.

Give the source, the physiologic action and the therapeutic uses of oleum ricini.

Castor oil is a fixed oil expressed from the seeds of ricinus communis. It acts as a mild, but rather slow purgative, producing without irritation copious semi-liquid stools. It does not increase the flow of bile nor to a great extent the secretions of the intestinal canal, but excites catharsis by stimulating the muscular coat of the bowel. It is useful in acute inflammatory affection of the bowel and as a laxative in pregnancy, anal fissure and painful hemorrhoids.

What are the medicinal uses of potassium chlorate?

It is an excellent local application in inflammatory conditions of the mouth and throat, being valuable in the various forms of stomatitis, in acute pharyngitis, in diphtheria and scarlet fever.

How should poisoning by coal gas be treated?

Antidotes, chlorine water as a spray, inhaled. Antagonists, oxygen by inhalation 4 or 5 quarts. Ammonia vapor inhaled. Galvanism, by interrupted current to extremities. Artificial respiration, to be maintained steadily for hours. Rhythmic traction of the tongue. Fresh air in plenty; open all doors and windows. Coffee, black, a pint as enema. Venesection may be of service. Douche, alternately cold and warm, to head and chest. Horizontal position, clothing removed. Alcohol moderately by mouth or rectum. Catheter may be required in prolonged cases. Subsequently a warm bed, heat applied to the body and limbs, open windows, perfect quiet, Condy's fluid about the room, stimulants sparingly, cold acid drinks freely.

Write a prescription for a cough mixture containing muriate of ammonia and an opiate, giving adult dose.

JAN. 1, 1903. FOR JOSEPH WILSON.

℞. Ammonii chloridi..... ℥v
Tr. opii camph..... f℥v
Syr. pruni virg..... f℥iv
M. S.—f℥i every four hours.

JOSEPH JONES, M. D.

What are the therapeutic uses of podophyllin?

It is an excellent laxative in constipation associated with hepatic congestion. It tends to produce griping and is usually given with small doses of belladonna or hyoscyamus.

What is the dose of Fowler's solution and what precautions should be observed in its administration?

The dose is 0.2 Cc. (3 minims). Potter advises that full doses of the solution should be taken at first, and always immediately after food; the dose should then be gradually reduced. Susceptible persons often tolerate it better if a few drops of laudanum are administered with each dose. Swelling beneath the eyes is an indication of the physiologic limit for the employment of the drug.

From what part of the colchicum plant is the active principle obtained?

From the corm and seed.

What injurious effect is liable to follow the prolonged internal use of the preparations of silver?

Argyria. The first sign of this condition is a slate-colored line along the margin of the gum with some inflammatory swelling. Subsequently grayish patches appear on various parts of the skin and mucous membrane and gradually extend over the whole body. As a rule, argyria does not produce serious effects on the health of the subject. The pigmentation is due to a deposit of silver in the connective tissues. In the skin it is found in the corium. The discolorization is permanent.

Name a vesicant derived from (a) the animal kingdom, (b) the vegetable kingdom, (c) the mineral kingdom.

(a) Cantharides, (b) mustard, (c) iodine.

Write a prescription for diarrhea containing an alkali and an astringent suitable for a child of ten years.

JAN. 1, 1903. WALTER.

℞. Sodii bicarbonatis..... ʒii
Bismuthis subcarbonatis..... ʒii
Tragacanthæ..... ʒi
Spts. chloroformi..... fʒi
Aquae cinnamomi..... fʒiv
M. S.—Teaspoonful every four hours.

JOSEPH JONES, M. D.

What is the vulgar name for veratrum viride? What is its active principle and the dose of the principle?

American hellebore. It contains several active principles, of which the most important is jervine. The dose of the tincture is 1 Cc. (15 minims).

Name three drugs which are administered internally to arrest bleeding.

Ergot, gallic acid and hematoxylon.

What are the therapeutic uses of magnesia?

It is used as an antacid and laxative in acidity, sick headache, colic, etc., and as an antidote in poisoning by acids, arsenic, phosphorus and the mercuric and copper salts.

Mention the medical uses of the oil of turpentine.

The oil of turpentine is employed externally as a rubefacient and counter-irritant in many conditions causing pain and inflammation. The liniment is in constant use for sprain, neuralgia and other slight local affections. Internally it is best employed in ulceration and hemorrhage of the intestines, and in passive hemorrhage from other organs. It is also used as an anthelmintic against tape-worm, and is of value in flatulent colic. It is employed in chronic bronchitis and chronic inflammations of the mucous membranes generally.

For what are the preparations of juniper used in medicines?

Juniper is a stomachic tonic, diaphoretic, diuretic and

aphrodisiac. The oil acts therapeutically like the oil of turpentine, and may be used in chronic cystitis, etc., but is contra-indicated where acute inflammations of the kidney exist.

How should a case of poisoning with atropine be treated?

Tannic acid should be given freely and the stomach emptied by an emetic or the stomach-pump. Collapse must be met by the use of heart stimulants, such as ammonia, alcohol and nitroglycerin.

What is the vulgar name of physostigma?

Calabar bean.

What are the therapeutic uses of the preparations of zinc?

The acetate is used as an astringent application in conjunctivitis and subacute gonorrhea. The precipitated zinc carbonate is used as a sedative astringent in acute inflammatory affections of the skin, such as erythema and eczema. The chloride is used as an astringent antiseptic and caustic. It is also used in chronic inflammation of the mucous membranes. The oxide is employed in the form of an ointment or powder externally as a mild astringent and sedative in burns, acute ulcers, etc. Internally it is of doubtful value as an anti-spasmodic and anti-hydrotic. The phosphide of zinc is employed in the same class of cases in which phosphorus is indicated. The sulphate of zinc is employed locally as an astringent, and internally is used in chronic dysentery and diarrhea, as well as an emetic in large doses in narcotic poisoning.

Name three official preparations of camphor.

Aqua camphoræ, linimentum camphoræ and spiritus camphoræ.

Write a prescription containing some preparation of iron in a delectable form.

JAN. 1, 1903. FOR WM. JONES.

℞. Tincturæ ferri chloridi..... f℥ ii
Acidi phosphorici diluti..... f℥ iii
Spiritus limonis..... f℥ i
Syrupi..... f℥ iiss
Aquam ad..... f℥ vi
M. S.—Tablespoonful after meals.

JOHN SMITH, M. D.

What preparations of copper are used in medicine and for what purposes?

The only official salt of copper is the sulphate; it is useful in phosphorus poisoning both as an emetic and a chemical antidote. The application of the solid crystal is often useful for its astringent and stimulating qualities. It is also useful in gonorrhea in the subacute stage. Internally it is sometimes employed in chronic diarrhea.

What are the therapeutic uses of borax?

Borax is sodium borate, which is a powerful antiseptic and disinfectant. It has been used internally in amenorrhea, dysmenorrhea and puerperal convulsions and epilepsy. In the form of a wash it is of value as an anti-pruritic.

With what remedies should spasmodic croup be treated? Name three suitable ones.

With emetics, as ipecac, and with anti-spasmodics, such as the bromides. Lobelia is a useful remedy.

apomorphine and colchicine (abbott)

Describe the medicinal uses of hydrocyanic acid.

Hydrocyanic acid is used solely to allay irritation of the peripheral nerves. Thus it is employed internally for the cough of phthisis and chronic bronchitis, for gastralgia in obstinate vomiting, and externally to subdue the itching in pruritis, eczema and urticaria.

Mention the conditions which affect the dosage of medicines.

The age of the patient, the personal idiosyncrasy, the condition of the heart, kidneys, nervous and respiratory system.

What class of acids would you use to acidify alkaline urine?

Benzoic acid and its derivatives, as benzoate of sodium and ammonium.

What is the dose of phenacetine as an antipyretic?

Dose 0.500 Gm. (7½ grains) every 4 to 6 hours.

What is the composition of the so-called green soap?

Green soap is prepared from potassa and linseed oil.

Where does arnica grow most abundantly? What part of the plant is used in medicine?

In the mountains of northern Europe and Siberia. Both the flowers and the roots are official.

What is glycerin and what are its therapeutic uses?

Glycerin is obtained by the decomposition of vegetable or animal fats or fixed oils. It is a triatomic alcohol, existing in fats and fixed oils in combination with the fatty acids. Externally it is used in various forms as an emollient. In the various acute inflammations of the fauces, it makes an excellent vehicle for carrying other drugs. Being hygroscopic, it not only depletes the turgid vessels, but it spreads the medicant over the entire surface. It is especially useful in tampons in such conditions as uterine congestion. It may be employed in suppository in obstinate constipation. It is sometimes used as a substitute for sugar in diabetes.

How many grains of the hydrochloride of cocaine are contained in one ounce of a ten per cent. solution?

Forty-eight grains.

What is the dose of the fluid extract of senna?

Dose, 2 Cc. (30 minims).

What injury may result from large doses or long continued use of potassium chlorate?

The chlorate is distinctly irritant to the kidneys. An inflammation of these organs may follow its use.

Give the habitat of squills and state which of its preparations are used in medicine.

It is native to southern Europe. The preparations are vinegar of squills, fluid extract, syrup, compound syrup and tincture.

Describe the therapeutic uses of olive oil and state where it is principally produced.

It is produced principally in southern Europe, California and Australia. Externally used it is a good protective from the air, and if rubbed into the skin is absorbed by the lymphatics and is directly nutritive. Internally it is a food and a mild laxative, and in quantity protects the mucous membranes against the action of poisonous substances.

How should phosphorus poisoning be treated?

Immediate full dose of sulphate of copper, which is an emetic as well as a chemical antidote. Potassium permanganate and French oil of turpentine are also of value.

What is the dose of oleum erigerontis?

Dose 1 Cc. (15 minims).

Write the following prescription in the metric system:

℞. Ammonii bromidi ..... 2 drams
Sp. ammoniæ aromat ..... 1 dram
Aquæ ..... 4 ounces
Misce.

℞. Ammonii bromidi 8
Sp. ammoniæ aromat. 4
Aquæ. 120
Misce.

What is the dose of oleum sabinae?

Dose 0.05 Cc. (1 minim).

What medicine would you give to promote bone growth?

One of the preparations of lime, as lime water, or the carbonate or phosphate.

What is the alkaloid of pomegranate and for what is it used?

Pellatierine; it is a teniafuge.

By what other name is saltpetre known?

Potassium nitrate and nitre.

In what dose may sulphonal be administered to an adult to produce a soporific effect?

It may be given in average dose of 1 Gm. (15 grains), best in hot milk about 2 hours before retiring.

To what chemical change does sulphur ointment owe its efficiency as a parasiticide?

Sulphur ointment contains an alkaline ingredient and develops sulphides which are powerful anti-parasitics.

What are the uses of lactic acid in medical practice and what pathologic conditions may its administration produce?

It is employed as a mild caustic, a digestant and intestinal antiseptic. It is a valuable local remedy in laryngeal tuberculosis, and internally in cholera, typhoid fever, simple diarrhea and the diarrhea of infants. It is supposed to cause acute rheumatism when in excess and free in the blood.

Write the following prescription in the metric system:

℞. Morphinæ sulphatis..... grains 6
Sodii boratis..... drams 4
Aquæ camphoræ..... fl. ounces 6

℞. Morphinæ sulphatis..... 4
Sodii boratis..... 16
Aquæ camphoræ..... 180

What is the effect of full doses of opium on respiration

and to what extent may this effect be safely carried in treatment?

In full dose there is irregular and slow respiration. It should not be used when there is profuse expectoration, as the lowering of excitability of the respiratory center which it produces would be dangerous in such a case. Morphine is combined with atropine to overcome the effect of the former on the circulation. It should be avoided in all organic diseases of the lungs associated with weak respiration.

Where is colocynth obtained and for what is it used?

Colocynth is the fruit of citrullus colocynthis deprived of its rind. The plant is a native of Spain and Asiatic Turkey. It is classed among the tonic, astringent and resin-bearing purgatives. In moderate doses it increases peristalsis and the intestinal glandular secretion; watery evacuations with griping pain.

What is the comparative action of strychnine and alcohol on the arterioles?

Strychnine raises the arterial pressure by stimulating the vasomotor center in the medulla. Alcohol inhibits the vasomotor system, causing dilatation of all the vessels of the body, especially those of the periphery. The blood pressure is raised, however, owing to the great increase of cardiac action, which overcomes the results of the arteriole dilatation.

How may carbolic acid poisoning be produced and how treated?

Carbolic acid poisoning may be induced by the local use, especially of weak solutions, of the acid, as well as by the internal ingestion of carbolic acid or its derivatives. The treatment of the poisoning consists of the administration of the antidote, which is a soluble sulphate, as sulphate of sodium; this unites with the acid, forming an insoluble sulphocarbolate. Evacuation of the stomach, the application of external heat and stimulants and the use of mucilaginous drinks are indicated.

Would you write for potassium chlorate and tannin in the same prescription? Give reason for your answer.

No. There would be danger of explosion.

Mention the therapeutic uses of gamboge.

Gamboge is an irritant purgative, decidedly diaphoretic; its catharsis is accompanied by vomiting and colic. It has no cholagogue action. Its use, for the most part, is limited to the compound cathartic pill, of which it is a constituent.

Where is kousso obtained? What preparation is used and for what purpose?

Kousso is a native of Abyssinia; it is used in the form of the fluid extract as an anthelmintic against tape-worm.

What remedies should be used for hemorrhages from mucous surfaces?

The astringents and vaso-contractors; the extract of suprarenal gland is probably of greatest value; ergot, gallic acid and opium are employed internally.

On what theory can the use of salol in diarrheal diseases be advocated?

In the intestine it is separated into carbolic and salicylic acids and acts as an antiseptic. It is free from irritating properties.

For what is copaiba used in medical practice?

Copaiba is used in subacute or chronic inflammations of the genito-urinary tract.

Name a drug commonly used which affects the color of the stools without altering the constituency, and explain the cause.

The organic salts of iron blacken the feces by conversion into the sulphide.

Describe the three stages of chloroform narcosis.

1st stage: This stage is very short and the symptoms are very similar to those of alcoholic intoxication. Consciousness

is not lost but the sensibility is generally dulled. Pupils of eyes dilated.

2d stage: This is the stage of anesthesia, consciousness and sensibility are abolished, the muscles are relaxed and the patient is quiet. The pulse is generally normal in frequency, but somewhat weakened. Pupils of eyes contracted.

3d stage: This stage is one of profound narcosis with stertorous breathing, intense muscular relaxation, abolition of the ordinary reflexes and fall of bodily temperature. Pulse is weak and rapid. Pupils of eyes dilated.

Describe the three stages of anesthesia under ether.

1st stage: Burning in the fauces, feeling of strangulation, sense of exhilaration, lightness in the head with a buzzing or roaring in the ears. These symptoms are soon followed by a semi-unconsciousness with visions and illusions. Pupils of eyes dilated.

2d stage: This stage begins with a complete loss of consciousness. Muscular rigidity soon passes off and the patient is quiet. Respiration is slow and regular. Pupils of eyes contracted.

3d stage: Same as the third stage under chloroform narcosis.

Give the contra-indications to the use of anesthetics.

Organic brain disease, including tumors, atheromatous conditions of the blood vessels, organic affections of the heart, lungs and kidneys (Wood). Some authorities add diabetes mellitus, chronic alcoholism and enlarged tonsils.

Why is the use of ether as an anesthetic contra-indicated in diseases of the lungs and kidneys?

Because it is eliminated by the lungs and kidneys, and on account of its irritating qualities it would aggravate the diseased condition.

What is meant by cataphoric application of a remedy?

By cataphoric application of a remedy is meant the infiltrating of the tissue with some drug by electrical osmosis.

Give the indications for the use in producing sleep of (a) morphine, (b) chloral, (c) potassium bromide.

(a) Morphine is used when sleeplessness is due to pain. (b) Chloral is indicated when sleeplessness is due to mental overwork and where a more powerful hypnotic than potassium bromide is required. If the heart or stomach are in bad condition it should not be given. (c) Potassium bromide is given when insomnia is caused by cerebral excitement, nervous excitement (especially when connected with the genital function) and motor activity. According to Wood it is contra-indicated by an excessive irritability of the gastro-intestinal mucous membrane and great exhaustion.

(a) What systemic conditions contra-indicate the use of nitrous oxide gas? (b) State why.

(a) Atheromatous vessels, fatty heart and pulmonary emphysema. (Burchard). (b) Nitrous oxide gas increases blood pressure and in atheromatous degeneration of the arteries this may result in rupture of these vessels and if in the brain, apoplexy or early death may ensue.

In fatty heart the muscles are weakened, and on account of the increased resistance in the blood-vessels there may be sudden dilatation of this organ.

In pulmonary emphysema the danger is in the engorgement of the blood vessels of the lungs which causes an increased resistance to the right heart, which may result in the sudden dilatation of this organ, or there may be pulmonary edema or hemorrhage.

(a) What are topical remedies? (b) Mention two classes. (c) Give two examples of each.

(a) Topical remedies are those which are applied locally. (b) Plasters and liniments. (c) Belladonna plaster and capsicum plaster—turpentine liniment and chloroform liniment.

Give the signs of danger in chloroform anesthesia and tell what should be done.

Lividity of the face, irregular or stertorous breathing

or feebleness of the pulse. Withdraw the anesthetic, lower the head, use artificial respiration and give a hypodermic injection of strychnine, digitalis, or atropine.

When is chloroform preferred to ether as an anesthetic?

In acute inflammation of the bronchi or lungs, aneurism, atheroma and nephritis.

Name the accidents that may happen during the administration of ether, and give the treatment in each case.

In the early part of the administration of ether we may have failure of respiration, which is due to reflex spasm of the laryngeal muscles excited by the ether. By giving more air with the ether we can correct this trouble.

Embarrassed respiration may be due to the accumulation of mucus in the upper air passages. In this condition we simply turn the head to one side.

Respiratory failure may be caused by the action of the ether on the respiratory centre. In this case we withdraw the ether; push the jaw forward by pressing on its angles, draw the tongue forward by means of a tenaculum or forceps and make rhythmic traction of the tongue. Pour ether on the abdomen or chest in order to stimulate inspiration by reflex action, give strychnine and atropine hypodermically. Practice artificial respiration.

Name the most common after-effects of the administration of ether.

Nausea and vomiting.

Under what conditions is ether contra-indicated as an anesthetic?

In acute inflammatory infections of the respiratory tract, advanced arteriosclerosis, severe nephritis, especially when associated with cardiovascular lesions and anemia when the hemoglobin is less than 30%. Diabetes mellitus, especially when well established and associated with acetonuria (Stevens).

PRACTICE OF MEDICINE.

Give the prophylactic treatment of gout.

As nearly as possible a vegetable diet should be adhered to, as animal food gives rise to uric acid. Water should be partaken of plentifully. Alcoholic and malt liquors, especially the rich, sweet wines, such as port, sherry, champagne, should be particularly prohibited. Systematic bathing, regular exercise in the open air, avoidance of exposure to cold and dampness are important.

At what age is spasmodic croup most common? Give the symptoms and treatment of spasmodic croup.

The disease is most common in children before the age of puberty. The attack begins suddenly, most often at night. The first indication is usually a hoarse metallic cough, followed by dyspnea. In severe cases the dyspnea is so extreme that cyanosis of the face and extremities occurs. There is some elevation of temperature. The cough is unproductive at first, but at the close of the attack free expectoration may occur. The child should at once be immersed in a warm bath, and an emetic promptly given. Inhalations of steam are also useful. Between the attacks the child should have tonic treatment.

Give the etiology, duration and prognosis of pertussis.

It is an infectious disease of early childhood, and common between the second and seventh year. The disease usually lasts from four to six weeks. The prognosis, as a rule, is favorable, the danger being due to complications.

Describe the treatment of biliary lithiasis.

The prophylaxis consists in appropriate diet, exercise and general favorable hygiene. In women tight lacing should be avoided. Warm baths, regular exercise in the fresh air, etc., should be recommended. The patient should avoid indulgence in sweet and starchy foods. Constipation should be corrected. Massage has been strongly advised. For the treatment of the attack hot fomentations should be applied over the liver. For the pain hypodermic injections of morphine give relief. If the condition is not relieved by medical means, if the jaundice persist, and especially if symptoms of Charcot's fever appear, surgical interference should be resorted to.

Give the etiology and treatment of St. Vitus' dance.

Chorea is a disease of childhood, although it may occur at any age. Females are most often attacked, and the disease is more common in the temperate climate. It is most prevalent in the spring months. Acute rheumatic fever has been noted as an exciting cause in a large number of cases. Fright, shock and worry are predisposing causes. It may be due to reflex causes, such as intestinal worms, eye-strain, nasal disease and sexual disorders. The treatment consists in long hours of rest, especially in bed. If the child be attending school it had better discontinue and remain at home. The diet should be simple, meats and highly-seasoned foods should be excluded. Arsenic, antipyrine, bromide of zinc and quinine are the most useful drugs.

Give the etiology, symptoms and treatment of cirrhosis of the liver.

The disease occurs most often in the male sex, and is very frequently due to alcohol. In the newborn the affection is due to hereditary syphilis. The next most important causes are acquired syphilis, malaria and other infectious diseases, such as cholera, enteric fever and scarlet fever. Gout and rickets also give rise to it. The disease may begin without

prodromes, except in the case of topers who present a long history of gastro-intestinal catarrh. Early in the course of the affection there may be some slight enlargement of the liver. In the fully established disease the organ is diminished in size. Of decided diagnostic import is an early atrophic change in the right lobe of the liver, which in some cases can scarcely be felt in the abdomen. Jaundice is absent as a rule. The most characteristic symptoms relate to the disturbance of the circulation in the portal vein, or to the diminished function in the atrophied cells of the liver, or they depend upon a combination of these two conditions. One of the most prominent signs is ascites. Even before this the effect of congestion of the mucous membranes of the stomach and bowels may be noted by hematemesis and enterorrhagia, which occur in the course of this affection. Hemorrhoids occur. The spleen is enlarged. The cutaneous veins of the abdomen are often greatly enlarged. The urine is diminished in amount and is of low specific gravity, frequently reddish in color. The temperature is normal or subnormal. The general nutrition suffers greatly, and the patient loses flesh. The treatment consists in abstaining from alcohol. Potassium iodide and mercury are of use in the syphilitic form. The bowels should be carefully regulated, and when ascites becomes prominent, paracentesis abdominis becomes necessary.

Give the etiology of tetanus.

The disease occurs in either sex and at any age. It may result from a wound in any part of the body, and sometimes without apparent trauma. It occurs most often from wounds that are exposed to dirt and filth. The exciting cause is the bacillus of tetanus described by Kitasato.

Give the treatment of sciatica.

Rest by means of splinting the limb is important. Attention must be directed to the cause of the disease. If of rheumatic origin the salicylates are of value. Phenacetine, antipyrine and other members of the coal-tar group are of value;

in severe cases, however, morphine is necessary. Surgical measures should only be resorted to after all forms of medical relief have failed.

State the varieties, causes and prognosis of angina pectoris.

True angina pectoris and pseudo angina pectoris. Occlusion of the coronary arteries and sclerosis are important factors. The true form occurs after middle life, and in the male sex; the pseudo form occurs most frequently in young women, in connection with hysteria and neurasthenia. The prognosis in the true form is very unfavorable; in the pseudo form it is favorable.

How should insolation (sunstroke) be treated?

The treatment of thermic fever consists in the application of cold to the surface of the body, preferably in the form of an ice bath or ice rubbing. The cold pack is sometimes substituted. The bath is commonly continued until the temperature reaches the normal point. Ice water enemata may also be employed. Measures should also be taken to guard the heart. For this purpose strychnine, digitalis and alcohol are useful.

Give the treatment and prognosis of erysipelas.

Cold water should be liberally administered to the patient, and cold sponging, especially if the temperature is high, is of distinct advantage. Ice cloths are also the best treatment for the eruption. They should be frequently renewed. An ointment of ichthyol and lanolin is also used for this purpose. The administration of tincture of the chloride of iron in full doses is the general method of treating erysipelas. When the nervous symptoms become prominent, or if in the aged or cachectic, bold stimulation is necessary; alcohol is best for this purpose. If the pain be severe morphine should be resorted to. Anti-streptococcic serum may be beneficial, and should always be resorted to in malignant cases.

In simple, uncomplicated cases occurring in those in previous good health the prognosis is favorable. The prognosis should be regarded as serious when erysipelas occurs as a complication of any other malady, or when it results from surgical accidents or occurs in the puerperal state. It is always serious in alcoholics and cachectics.

State the etiology and prophylaxis of biliary calculi.

In a majority of cases they are found in persons of thirty and over, and they occur more frequently in the female than in the male sex. Catarrh of the bile-ducts and gall-bladder may lead to stagnation of bile and to an increase in the amount of cholesterin. Farinaceous foods may give rise to the formation of gall-stones; in diseases in which nitrogenous food is largely partaken of, as in diabetes, gall-stones are rarely found. They are formed most frequently in the gall-bladder. They may occur in the larger gall-ducts, and, rarely, even in the smaller biliary passages of the liver. The prophylaxis consists in appropriate diet, exercise and general favorable hygiene. In women tight lacing should be avoided. Warm baths, regular exercise in the fresh air, etc., should be recommended. The patient should avoid indulgence in sweets and starchy foods. Constipation should be corrected. This may best be done by the use of waters, such as Carlsbad. Massage has been strongly advised.

What is chronic hydrocephalus?

As a rule the child's head begins to increase in size soon after birth, or it may even be greatly enlarged at birth. There is irritability and restlessness, and much impairment of the general nutrition; the child does not grow as is usual with normal children, even though the appetite be good. Mental development is tardy, and as a rule the child does not learn to walk. Ocular phenomena are present, such as strabismus, and occasionally optic atrophy. Within a few years vomiting, coma and convulsions appear. Death usually takes place from exhaustion.

Give the etiology and treatment of anthrax.

This is a widespread disease in animals, occurring all over the world. The affection is conveyed to man as the result of the handling of wool or hides, rarely by direct inoculation from the bites of insects that have fed on animals that have died of the disease. It is a very rare affection in man. Certain occupations predispose to it, such as those of stablemen, tanners, butchers, shepherds and wool-sorters. The exciting cause is the bacillus of anthrax. It is important that the pustules should be treated surgically, the site of inoculation being destroyed by bichloride of mercury, carbolic acid or the actual cautery. Constitutional treatment consists in the use of quinine, iron, strychnine and alcohol.

Give the treatment of catarrhal pneumonitis.

When the temperature becomes high, cyanosis shows itself and somnolence is threatened, and a warm bath with cold effusion to the head is useful. Alcohol is valuable as a circulatory stimulant. Inhalations of steam are of value. In strong children in whom there is great secretion in the bronchial tubes which is brought up with difficulty, emetics may be used from time to time, but these should not be continued throughout the course of the disease. It is dangerous to administer narcotics to young children. Stimulating expectorants, such as the salts of ammonia, are often useful. Minute doses of strychnine and inhalations of oxygen are of benefit. A mild purge at the onset frequently gives great relief. The diet should be a light and nutritious one.

What is the prognosis as to the cure of epilepsy? Give the treatment of epilepsy.

True epilepsy is an incurable affection. Much may be done to diminish the number and severity of the attacks, but a true cure is rarely met with. In the treatment it is important to relieve the cause if possible. It is best to endeavor to treat the epileptic in a colony, in which he may have an out-door occupation. The bowels should be regulated, the diet should

consist of meat sparingly, fruit, cereals and vegetables. The best results have been obtained from the use of the bromides.

What cutaneous diseases may occur as complications of saccharine diabetes?

Boils, carbuncles, erythema, eczema, especially of the genitals, purpura, cellulitis and gangrene.

What is hemophilia? How should it be treated?

This is a disease characterized by a tendency to hemorrhage, which is often uncontrollable, and it is due to a deficiency in the coagulability of the blood. The coagulation is retarded, and frequently in this condition the blood does not coagulate in less than from thirty to fifty minutes. The prophylaxis is important; wounds and operations should be avoided in a person suspected to be a bleeder. When the bleeding is from a free surface and easy of access, compression and rest should be tried. Ice, locally, is of value. Calcium chloride and perchloride of iron are recommended by many. Gelatine, collodion and extract of the suprarenal capsule may be found useful when applied to the bleeding surface. Freshly drawn blood from a healthy person may be employed as an application.

Describe the treatment of purulent pleurisy.

The aspirator should be used, and drainage should be as free as possible. If the pus does not flow through the needle a surgical operation is necessary.

Describe the treatment and prophylaxis of nephrolithiasis.

The treatment consists in relieving the pain during an attack of renal colic, which is best accomplished by a hypodermic of morphine or by the inhalation of chloroform. Hot baths and hot fomentations to the loins are useful. Fluids should be freely partaken of. For uric acid calculi, piperazin, urotropin, and the salts of lithia are of value. The waters of various mineral springs are valuable, such as Carls-

bad, Ems, Kissingen. Surgical interference is sometimes necessary.

How should cholera morbus be treated?

Absolute rest in bed is necessary. Food should be given sparingly, and it had better be withheld for some time if vomiting be frequent. Sterilized milk and animal broths may be administered sparingly. Local sinapisms and hot turpentine stupes are of benefit to allay vomiting. At the onset of the disease it is good practice to give a purge. The remedy for the condition is opium in some form. Later in the course of the affection bismuth and antiseptics which act on the intestinal tract are of value.

What is the treatment of spasmodic stricture of the esophagus?

Dilatation with the esophageal bougie is of value. Remedies to act upon the nervous system and tonics are of use. The general hygiene of the patient should be carefully looked after.

Give the treatment of hematemesis.

Absolute rest in bed. Food and drink should be stopped. For the thirst small pellets of ice may be taken in the mouth. Opium and ergot hypodermically are the best remedies.

Describe the treatment of rachitis.

The child should have the best of food, and if the mother cannot nurse it a wet-nurse should be procured. Abundance of fresh air and sunshine are essential. Daily warm bathing is necessary. The child should not be encouraged to walk. The remedies that have proven most effective are phosphorus, cod-liver oil and the syrup of the iodide of iron.

Give the treatment of ulcer of the stomach.

Rest in bed is most important, even in the mildest cases. Food should be withheld from the stomach for some time, rectal alimentation being resorted to. Milk is the best food, and

may be given either hot or cold. External applications over the stomach, such as hot poultices frequently renewed, are of value. Among the most useful of the many drugs that have been recommended is bismuth; this remedy should be employed in large doses. Salol, oxide of silver, carbonate of soda, carbolic acid and cocaine are also highly recommended. If there be great pain opium, and sometimes cannabis indica are useful.

Give the symptoms of (a) acute lead poisoning, (b) chronic lead poisoning.

In acute lead poisoning the symptoms may come on in a few weeks. Rapid and marked anemia is usually the earliest symptom. Constipation, which is followed by excessive diarrhea, vomiting, abdominal tenderness and distension are present. The abdomen, as a rule, is hard and distended. There is colic of the severest type over the entire abdomen. The paroxysms are of gradual onset and increase in severity. The pain is relieved by deep pressure. The temperature, as a rule, is subnormal. The symptoms of chronic lead poisoning are due to the prolonged absorption of lead in small quantities. The anemia may be profound, showing a marked decrease in the red blood-cells, with a corresponding decrease in the hemoglobin. There is wasting of the muscles and a peculiar yellow complexion, which, however, is not due to the deposit of bile pigment. Along the border of the gums, usually most marked under the incisor teeth, is a bluish-black line. Tremors occur from time to time. There is a metallic taste in the mouth, coated tongue, fetid breath, marked dyspepsia and obstinate constipation. Lead colic is particularly marked. The pain, as a rule, is more severe in the afternoon and at night. Occasionally paroxysmal pains occur in the joints without swelling, redness or fever. An important symptom is lead paralysis. This most frequently occurs as wrist-drop, the extensors being particularly affected. Occasionally cerebral symptoms develop, this condition being known as lead encephalopathy.

Give the treatment of suppurative hepatitis.

The treatment consists in the early evacuation of the abscess in suitable cases. Purging with calomel or salts is recommended. Opium is best to relieve pain. When the septic phenomena are marked, free stimulation should be resorted to, whiskey and strychnine giving good results. Quinine is often of use. For the anemia, iron and arsenic should be administered. The diet should be light and nutritious.

What is uremia and how should it be treated?

Uremia is a clinical condition due to acute or chronic disease of the kidney or of its conducting apparatus. Depending upon whether the symptoms arise rapidly or suddenly or whether they are more insidious, the condition is known as acute or chronic uremia. In young subjects with slow pulse and high arterial tension bleeding is indicated, and should be followed by hypodermoclysis of a normal salt solution. Intravenous injections of a normal salt solution are often indicated. Purging by croton oil and broken doses of calomel is useful. For the convulsions, chloral and morphine hypodermically are the most reliable agents. Sweating should be induced by a hot pack or by some similar method. The administration of pilocarpine is accompanied with danger on account of its depressing effect upon the heart.

How should acute nephritis accompanying or following scarlet fever be treated?

Absolute rest in bed is important. It is well to put the patient on an absolute milk diet. Some of the alkaline mineral waters, such as Seltzer and Vichy, may be mixed with the milk. Daily sponging with warm water and gentle friction of the skin are of use. Calomel in fractional doses is useful, which may be followed by a saline, even if there be no tendency to constipation. Some of the diuretics may be used, such as citrate of potash or benzoate of soda. Iron in some form is useful, and Basham's mixture is often administered.

How should edema of the glottis be treated?

The treatment is that of dropsy occurring in other parts of the body. Surgical treatment, such as scarification, intubation, tracheotomy, etc., is often necessary.

Name one important complication and one important sequel of typhoid fever.

An important complication of typhoid fever is hemorrhage from the bowels. An important sequel is phlebitis, which most frequently occurs in the left leg.

What is dysphagia, and with what pathological condition is it associated?

Dysphagia is difficulty or pain in swallowing. It may be due to causes in the mouth and fauces, such as glossitis, cancer of the tongue, to various forms of stomatitis, tonsillitis and pharyngitis. Some of the exanthemata, such as scarlet fever and variola, give rise to lesions of the throat, diphtheria, spasm or paralysis of the pharynx, disease of the larynx, disease of the esophagus, such as stricture, cancer, etc. Finally, from pressure from the outside, such as from an enlarged thyroid gland, thoracic aneurysm, mediastinal tumor, etc., and from pleural and pericardial effusion.

How would aneurysm of the abdominal aorta affect the dorsalis pedis artery pulse as compared with the radial pulse?

The pulse of the dorsalis pedis artery compared with the radial pulse would be small and delayed.

What conditions predispose to cerebral hemorrhage?

Heredity is important; many individuals inherit the apoplectic constitution. It is a disease of middle life, and more common in the male sex. Diseases of the blood vessels are important factors. It may follow the infectious fevers and diseases producing disturbances of the blood. Embolism is an important factor. Hypertrophy of the heart, exertion or excitement frequently cause rupture of the diseased blood vessels.

What are the causes of endocarditis?

The greatest number of cases are the result of rheumatic fever. Chorea is also a cause. The acute exanthemata also give rise to it, also pneumonia, erysipelas, sepsis, puerperal diseases, and sometimes gonorrhea. Tuberculosis, gout, renal disease and diabetes are etiological factors. Trauma has also been given as a cause. It occurs in fetal life. It may sometimes be secondary, from extension of the disease from the myocardium or aorta.

Differentiate between cerebral vomiting and gastric vomiting.

Cerebral vomiting occurs without nausea, often with a clean tongue, and is not related to the taking of food. In gastric vomiting there is the history of some gastro-intestinal affection. The tongue is coated, and there is always considerable nausea and much retching.

Give the characteristic differences between diabetes insipidus and diabetes mellitus.

In diabetes insipidus the urine is of low specific gravity, never over 1010; there is no sugar present, no itching of the skin and genitalia, no hunger, no tendency to the formation of carbuncles or boils. In diabetes mellitus the urine is of high specific gravity, 1030 and over, sugar is present in the urine, there is itching of the skin, great hunger, tendency to formation of boils, loss of weight, and frequently an etherial odor of the breath.

Give the cause of vertigo.

Vertigo occurs in the course of neurasthenia and lithemia, from gastric disorders, from arteriosclerosis, valvular disease of the heart and aneurysm, from Ménière's disease, from reflex causes, such as disease of the eye, nose and larynx. It also occurs in many nervous diseases, such as epilepsy, etc.

Describe pyuria and state its import.

Pyuria is pus in the urine, and is an important symptom

in many diseases of the urinary tract, from the kidney to the end of the urethra. It is present in urethritis, cystitis, ureteritis, pyelitis and pyelonephritis. Pus may be caused by rupture of an abscess in the urinary tract (especially the bladder); this may occur in salpingitis, abscess of the ovary, extra-uterine pregnancy, cysts of various kinds, psoas and other forms of abscess, etc.

Describe leukemia and mention the pathological changes occuring in this disease.

Leukemia is a disease in which the white blood corpuscles are greatly increased in number; the percentage of the various forms also differ greatly from the normal. It is characterized anatomically by changes in the spleen, lymphatic glands or bone marrow, singly or combined. In the splenomedullary form the spleen is greatly enlarged, and it may weigh ten pounds or more. The capsule is thickened, and the surface of the organ somewhat irregular. On section it is quite firm. The color of the pulp is reddish-brown. Infarcts are common. The gross appearance of the blood is altered, occasionally being milky in character, the specific gravity is decreased, the alkalinity is somewhat diminished, and coagulation is slightly retarded. The leukocytes show a great increase in number, from 250,000-500,000 or more per cmm. In the lymphatic variety groups of lymph glands are enlarged, owing to hyperplasia of the lymphoid cells, and the spleen is slightly increased in size. The gross appearance of the blood may show very slight change or resemble the variety just described. The leukocytes are also greatly increased in number, but not to the extent that they are in the splenomedullary form. Examination of the stained films shows an enormous increase in the lymphocytes.

Give the symptoms indicative of impacted gallstone.

When the gallstone has become impacted there is an arrest of the pain. Jaundice is marked, the urine shows bile pigments, and the stools are clay-colored. There is hepatic inter-

mittent fever, sometimes called Charcot's fever. This consists of high temperature, chills and sweating. While this fever is paroxysmal, it does not show the regularity of a malarial attack.

Give the treatment of yellow fever.

Disinfection of the person and all effects. Strict quarantine. A mild cathartic may be given at the onset with advantage. Vomiting and gastric irritability may be treated by the administration of carbolic acid, cocaine or broken doses of calomel. The fever should be treated by cold applications to the head and cold sponging. For the pain opium in some form is useful. Strychnine is valuable as a cardiac tonic. For the hemorrhage, opium, ergot and suprarenal extract may be administered.

Outline appropriate treatment for Asiatic cholera.

Complete isolation of the sick and thorough disinfection of all discharges and all articles of clothing are absolutely necessary. Efficient quarantine must be established. All milk and water should be boiled, and no raw fruit or vegetable should be eaten. In the stage of premonitory diarrhea it is considered good practice to administer a prompt laxative. If there be great pain opium may be given hypodermically. Salol and guaiacol carbonate may be given from time to time as intestinal antiseptics. In the stage of serous diarrhea the patient should be wrapped in flannels and external heat applied to the body. If there be cramp, friction of the muscles is useful. Fluids should only be allowed in very small quantities. Enteroclysis should be used in this stage. When collapse sets in, hypodermoclysis of a normal salt solution should be given. Strychnine may be given by the skin, but it must be remembered that as absorption is slow, accumulation may occur.

What are the causes and treatment of palpitation of the heart?

This may be due to reflex causes, such as disease of the

stomach, disease of the genito-urinary apparatus, and sexual excesses. Toxic causes may give rise to it, such as the abuse of alcohol, tobacco, tea and coffee. Gout and anemia are productive features, and the condition occurs in inanition and marasmus. Finally, it is due to disease of the heart itself, such as organic disease, and it is an important symptom of exophthalmic goitre. The treatment consists in removing the cause, if possible, and is then symptomatic. Rest in the recumbent posture and an icebag over the heart are useful.

What are the causes and symptoms of dilatation of the stomach?

The dilatation may be acute or chronic. It may be due to obstruction of the pyloric end of the stomach, such as congenital stenosis, the cicatrices resulting from gastric ulcer, and from tumors, the most common being malignant. Motor insufficiency of the stomach may give rise to dilatation; this may result from overeating or drinking, and frequently occurs in beer drinkers. The symptoms are general feebleness, anemia, emaciation, thirst, scanty urine, sallow and hollowed face, flabby coated tongue, pyrosis, chilliness, cyanosis, subnormal temperature and nervous symptoms. Pain and vomiting are always present. The outline of the stomach may be demonstrated by means of the X-ray.

What is scurvy, how should it be prevented and treated?

Scurvy is an affection characterized by anemia, by swollen, tender and bleeding gums, by manifestations of purpura and by great prostration due to improper food. The prevention of the condition is accomplished by the use of anti-scorbutic food. In the treatment, antiseptic mouth washes are of use. Fresh vegetables should be administered. Lemon-juice is very valuable, as are also bitter tonics.

Give in detail the treatment of diphtheria.

The prophylaxis is highly important, the disease being very contagious and easily transmitted. The patient should be strictly isolated. Efficient disinfection is also necessary.

The food must be nutritious and easily digested. If the patient cannot swallow, rectal alimentation must be resorted to. Alcohol is necessary, and must be given freely, even in mild cases. The membrane must not be removed. Antiseptic and soothing applications are employed; inhalations of quicklime and steam in all cases in which there is danger of invasion of the larynx are useful. Hydrogen dioxide in solution is serviceable as a mouth wash. Internally, the tincture of chloride of iron may be given in medium doses. Calomel or corrosive sublimate in appropriate doses are useful. The antitoxin treatment, however, is the most important. The dose in individual cases varies; 3,000 antitoxin units may be given at a dose, but this may be increased in severe cases and repeated. In laryngeal cases intubation and tracheotomy may have to be resorted to.

What is the prognosis of suppurative nephritis secondary to cystitis? Outline the treatment of the condition.

The prognosis is unfavorable, and the treatment is surgical.

Give the etiology of tubercular peritonitis and the treatment.

The disease appears at all ages, but it is most common in childhood. Males are more frequently attacked than females, and it is more often met with in the negro than in the white race. It is also found associated with intestinal or mesenteric tuberculosis. The condition may be primary in the peritoneum, and may be confined solely to this membrane. A common mode of infection is through the intestines; this may also occur through the lymphatics or by extension from the pleura or the pericardium. It is often of the miliary variety, but also of the chronic ulcerative and chronic fibroid forms. The modern treatment of this condition is surgical, the best results having been obtained by opening the abdomen and producing adhesions.

Outline a plan of treatment of typhus fever.

The prophylaxis is of the greatest importance. An abund-

ant supply of good food, fresh air and free ventilation are important. Stimulation is necessary on account of the severe prostration. If hyperpyrexia occur the cold bath should be resorted to. Strychnine may be necessary as a respiratory and cardiac stimulant. Complications are treated as they arise. The constipation must be relieved by enemata, and in convalescence tonics should be administered.

Give the treatment of pyelitis.

The patient must be kept in bed and protected against cold. A bland diet should be given and the alkaline mineral waters freely used. Application of heat to the renal region should be resorted to. Warm baths are grateful to the patient. Opium in some form to relieve the pain is necessary. In chronic pyelitis astringents are indicated, such as acetate of lead. Salol and methylene blue are sometimes found of benefit. Surgical interference is necessary if hydronephrosis or pyelonephrosis is present.

Mention the most reliable remedy for pulmonary hemorrhage.

Rest in bed, abstaining from food and drink, an ice-bag applied to the chest, and opium and ergot.

What remedies should be used in hemorrhage from mucous surfaces?

Opium, ergot and suprarenal capsule.

What are the complications and sequelae of whooping cough?

Hemorrhages occur, such as petechiæ, about the face and neck; epistaxis and hemoptysis may occur; broncho-pneumonia is a complication which adds greatly to the gravity of the case. Pulmonary tuberculosis is comparatively frequent in a considerable proportion of the cases, especially in adolescents.

Describe the treatment of paralysis agitans.

The treatment is purely symptomatic. Occasionally hyos-

cyamine or hyoscine control the tremor. The general hygiene of the patient is to be looked after; tonics, such as arsenic and strychnia, are of use.

What are the causes of peritonitis?

The most frequent mode of infection is through the intestines and from the female generative organs. Various forms of ulcer may produce peritonitis, such as the typhoid or tubercular ulcer. Malignant disease of the intestine may give rise to it. It also arises from forms of intestinal obstruction, such as volvulus and stricture. The gall-bladder and liver may be the sources of infection, and particularly abscesses, and syphilitic disease may give rise to it. Obstruction of the biliary passages by gall-stones may produce it. The affection may arise from the spleen, through an infected embolus. It may occur from infective disease of the kidney, from disease of the bladder wall, from the prostate and from the urethra. Peritonitis occasionally occurs in the course of some of the acute infectious diseases, such as erysipelas, acute rheumatic fever and septicemia.

Name the places where yellow fever is endemic.

The disease is endemic in the West Indies, parts of the Mediterranean coast, South America and Africa.

What treatment would you recommend for diphtheritic paralysis? What is the prognosis?

Rest, tonics, strychnia, and, later, electricity are useful. The prognosis in all forms of diphtheritic paralysis is favorable as a rule, except in paralysis of the heart.

What are the causes and treatment of acute myelitis?

Exposure to variations of temperature, especially to cold, is important. Thus certain occupations predispose, such as engineers, cabmen, drivers, etc. Gout, rheumatism and certain metallic poisons, such as lead, mercury and arsenic, have been recognized as etiologic factors. Alcohol may also be a cause. Syphilis usually gives rise to the chronic form. Occasionally

acute myelitis may be secondary, resulting from extension, as in abscess, caries or cancer of the spine. Traumatism is perhaps the most common cause. The puerperal period and the existence of septic conditions have also been noted as causes of the disease. In the treatment, counter-irritation by blisters or the application of cold are of use in the acute stage, but they are contra-indicated after this stage. Precaution should be taken not to interfere with the nutrition of the skin on account of the great liability to trophic changes. Absolute rest is important. Great care must be taken of the bladder. The catheter should be carefully sterilized. Electricity is beneficial late in the course of the disease, and at this time massage is also valuable. A warm climate favors improvement. Hydrotherapy has been highly recommended. General tonics are of use; the bowels may be moved by enemata. In syphilitic cases anti-syphilitic treatment is indicated.

What are the complications and sequelae of scarlet fever?

Diphtheria and nephritis are the most important complications, and occur in nearly all severe cases. Endocarditis occurs; less commonly pericarditis. Meningitis, peritonitis, pleurisy, with and without effusion, also occur. Among the most common sequels are enlarged lymphatic glands, chronic joint affection, the hemorrhagic diathesis, monoplegia, hemiplegia, peripheral neuritis, hysteria and anemia.

On what symptoms would you base a diagnosis of typhoid fever?

Upon the slow onset, with a gradual rise in temperature, nose-bleed, headache, diarrhea, the occurrence on or about the seventh day of the typical eruption, enlargement of the spleen, dilated pupils, the Widal reaction, and the dicrotic pulse.

How should scarlatina be treated?

Strict isolation is important. The scales during the period of desquamation should be carefully collected and burned. The diet should be nutritious and easily assimilated. Pure

drinking water or the alkaline mineral waters may be freely administered. Milk is a necessary article of diet. There is no specific treatment. A mild laxative should be given at the onset. Tepid sponging, at least twice daily, is necessary in severe cases. Warm bathing is usually very grateful to the patient. During the period of eruption an animal fat, used as an inunction to the skin, prevents itching and hastens desquamation. A mild diuretic may be used, and it is important to keep the kidneys active. Complications must be treated upon general principles.

What should be done for a patient during the passage of a biliary calculus?

Hot fomentations should be applied over the lower part of the liver. If the pain is severe, whiffs of chloroform may be inhaled. However, in the majority of the cases relief of the pain only follows the hypodermic use of morphine. If the condition is not relieved by medical means surgical interference must be resorted to.

How should small-pox be treated?

Vaccination should be practiced as a prophylaxis. Complete isolation and disinfection are absolutely necessary. There is no specific treatment. Food is not well borne at first, and there may be much vomiting and diarrhea. Usually acid drinks or small particles of ice are grateful to the patient. From the onset of the disease detergent washes containing antiseptic solutions should be used for the mouth. The room should be darkened; the solar light being rigidly excluded. This prevents pitting. Warm baths two or three times daily are of decided benefit to the patient. During the time of secondary fever bold stimulation is necessary. At the onset a laxative is useful. Pain should be overcome by small doses of opium, but great care must be exercised with this drug, as it tends to lock up the secretions. Restlessness and insomnia should be treated by trional and sulphonal. In convalescence tonics are useful.

What is the treatment for angina pectoris?

For the attack, hypodermics of morphia are necessary. Inhalations of amyl nitrite or nitroglycerin in full doses may prove beneficial. In the interval between the attacks the patient must lead a quiet life. The functions of the body should be well looked after, and the administration of the nitrite of sodium with strychnine is of use.

What should be done to give relief in intestinal obstruction?

The treatment is largely surgical. Opium should be given to relieve the pain. If vomiting be persistent the stomach tube may be used. Purgatives should be avoided. Hot turpentine stupes may be applied to the abdomen. Rectal feeding may be resorted to, but surgical interference sooner or later becomes imperative. Atropine in large doses hypodermically has been advised.

What causes cerebro-spinal meningitis, and how should it be treated?

The exciting cause is the diplococcus intracellularis meningitidis, described by Weichselbaum in 1887. The treatment is purely symptomatic. Cold applications to the head and to the spinal cord are useful. On the other hand, heat to the head and spine may be preferred by some patients. A laxative dose of calomel early in the course of the disease and mercury throughout the entire affection has many advocates. Opium perhaps offers the best mode of treatment, and there is a remarkable tolerance for this drug even in the very young. If vomiting be a prominent symptom morphine should be given hypodermically. Chloral, the bromides and cannabis indica have been used, but in effect cannot be compared with the systematic use of opium. Alcohol is necessary when depression shows itself and asthenia is marked.

Describe the treatment of pericarditis.

In the first stage ice-bags applied over the precordium are

of use in relieving pain and quieting the cardiac action. Small blisters at some distance from the precordium are of benefit, especially when there is an effusion. If pain be severe opium in some form is necessary. In very large effusion paracentesis is necessary, especially so if the effusion be purulent, in which condition surgical interference is imperative. Gentle purges from time to time are useful. A mild, non-stimulating diet is indicated.

How should apoplexy due to cerebral hemorrhage be treated?

The patient must be placed in bed with the head elevated. If arterial tension be high venesection should be performed immediately. Ice-bags are applied to the head. Croton oil or calomel is of great value in inducing free purgation. If the patient be unconscious for a considerable length of time the bladder must be evacuated with a catheter.

What is the treatment of diarrhea occurring in typhoid fever?

Large doses of bismuth, salol and some of the intestinal antiseptics are of value in this condition. Opium must be administered with great caution.

Give the treatment of whooping-cough.

Food should be abundant and nutritious, and if the child vomits during a paroxysm nourishment should be immediately readministered. Antipyrine in doses proportionate to the age of the patient has some influence on the paroxysms. Bromoform is of use, but is very likely to give rise to nausea. Good hygiene is essential in the treatment of the case.

What measures should be adopted in the treatment of pulmonary edema?

The treatment is largely that of the primary disease which causes the edema. There should be active purging, especially if cyanosis be absent. Hypodermics of atropia in large doses frequently repeated have been found of use in some cases.

How should endocarditis be treated?

The treatment consists in absolute rest in the recumbent posture. Digitalis should only be given for definite and fixed indications, and is not required unless the pulse becomes quick and small or irregular, or the signs of failing compensation occur. Strychnia is of benefit in this condition. If anemia persists, iron with quinine and arsenic will be found valuable.

What measures should be employed to rid the system of tape-worm.

The most reliable anthelmintics are the male fern, the pomegranate root, bark and its alkaloid pelletierin, kousso, pumpkin seed, turpentine and chloroform. Thymol is also highly recommended by some authorities. Before the administration of any of these drugs the patient should be put upon a milk diet for at least twenty-four hours. It is then desirable the night before the vermifuge is administered to give a brisk cathartic, preferably calomel. Early the following morning the anthelmintic is administered, and a few hours afterward another purgative.

What are the ordinary age limits of typhoid fever, and what conditions are essential to its production?

The age at which enteric fever most frequently occurs is from 15 to 30. The predisposing causes are temperate climate, autumn months, unfavorable hygienic surroundings, such as infected drinking water, food, sewage and poor drainage. The exciting cause is the bacillus of Eberth or the bacillus typhosus.

How does the cause of typhoid fever principally gain entrance to the human body? Outline the prophylaxis.

Most frequently through the digestive tract in the form of infected drinking water or milk. The prophylaxis consists in the absolute destruction of the discharges and disinfection of the soiled linen. The drinking water should be boiled, and suspected milk should also be boiled.

Describe the treatment of cancer of the stomach.

The most important point in the treatment relates to the early diagnosis, with the hope of operative interference. Medical methods are only palliative. They consist in alleviation of the dyspeptic conditions and the pain. To accomplish these ends systematic lavage and the use of opium are the most satisfactory agents. Strength may be maintained by rectal alimentation.

Give the period of incubation and the treatment of mumps.

The period of incubation is about two weeks. It may be as long as three weeks. In the treatment the patient should be isolated, and a mild laxative given at the onset. Rest in bed is important. Attention should be given to the alleviation of pain.

Describe herpes zoster and its treatment.

One or more groups of small vesicles seated upon a plane base and attended by neuralgic, burning pain, occurring along the course of one or more branches of a nerve, is known as herpes zoster. The process is acute and self-limited. Mild cases rarely require any constitutional treatment. In the more severe cases remedies which invigorate the nervous system are of value. Zinc phosphide every three or four hours seems to be of service, and in some cases quinine and strychnine are useful, also arsenic. If the pain be very severe opium in some form is useful. Antipyrine, phenacetine and salicylate of sodium have been highly recommended. A dusting powder consisting of oxide of zinc, boric acid and talc should be applied over the vesicles. This may be changed daily or every few days.

Give the symptoms and treatment of exophthalmic goitre.

The four cardinal symptoms of exophthalmic goitre are enlargement of the thyroid gland, protrusion of the eyeball,

tachycardia and tremor. Hydrotherapy is often valuable; rest in bed and ice-bags applied to the precordium give much relief to the patient. Digitalis, aconite, veratrum viride, tincture of strophanthus and potassium bromide have been employed in this disease. Thyroid extract has also been lately recommended. Removal of the thyroid gland has been practiced with but little benefit.

Name five diseases caused by a known germ.

Tuberculosis, enteric fever, cholera, plague and diphtheria.

Describe the treatment of neurasthenia.

The study of the individual case is important. The rest cure is applicable in many cases, while in others a change of climate is of great benefit. Hydrotherapy, electricity, massage and hypnotism have all been of value in the treatment. The diet must be easy of digestion. In the cerebral variety the bromides are valuable. In the gastric variety arsenic in the form of Fowler's solution is of service. Syrup of the hypophosphites and valerian, caffeine, hyoscine and phenacetine are of benefit in suitable cases. Opium and other hypnotics must be used with great caution. Iron and cod-liver oil are useful. Systematic exercise is of great benefit.

Give the morbid anatomy and physical signs of acute endocarditis.

The lesions are usually situated in the left side of the heart. The endocardium lining the valves is most frequently affected. The lesions are small vegetations varying in size from one to four millimeters in diameter. Usually micro-organisms are associated with simple endocarditis. Microscopically the first change noted in the endocardium is the granular degeneration of the epithelial cells. In the sub-endothelial tissues blood-vessel changes that accompany inflammation are noted. Coagulation necrosis and the proliferation of the fixed cells are found. The inflammatory exudate, the sub-endothelial tissues and the fibrin upon the free surface cause the bulging

or warty excrescences. Upon this projection, fibrin from the blood stream is also deposited. Intermingled with the exudate the various micro-organisms may be present. Early on inspection no change is usually noted, and the important physical signs can only be discovered upon auscultation. As the mitral valve is most frequently involved, a systolic murmur, which has its maximum intensity at or near the apex, and is transmitted to the left axilla, and often to the angle of the scapula, shows that mitral regurgitation has taken place. The murmur is at first soft and blowing in character. When other valves are implicated murmurs related to them occur.

Mention the causes and symptoms of gastralgia.

The condition consists in severe boring, rumbling, painful contraction in the epigastric region extending from the xiphoid cartilage and radiating to the back, accompanied by syncope and signs of collapse. The condition may appear suddenly without apparent cause, or may be due to slight pressure in the epigastrium. It may be accompanied by the sensation of the globus hystericus, bulimia, frequent micturition and vomiting. It disappears after having lasted a few moments. The attacks occur with marked irregularity, occasionally several taking place in one day, upon alternate days, or not recurring for months. It is a neurosis of the stomach.

Describe the treatment of leukemia.

Rest in bed is desirable, and a nutritious diet should be given. Arsenic should be administered early, and the dose increased to the point of tolerance. This drug seems to have a marked beneficial effect. Ergot has been recommended; bone marrow and iron are also found to be useful, especially when arsenic is not well borne. Oxygen inhalations may be beneficial.

Describe the symptoms and treatment of multiple sclerosis.

The first symptoms may appear after some mental or phys-

ical strain, the patient behaving as if affected by hysteria. There may be temporary aphonia, from which there may be speedy recovery, or numbness may occur in some part of the body. These symptoms may disappear for a time and reappear with increased severity. Charcot has given the following description: The patient develops spastic paraplegia with exaggerated reflexes, with ankle clonus and limited movements. An irregular jerky tension tremor occurs, nystagmus being a prominent symptom. Diplopia and paralysis of the ocular muscles are common. Scanning speech is prominent. There are parasthesia, tinnitus aurium and vertigo. The mental faculties are blunted, and in some few cases apoplectiform and epileptiform convulsions occur. Trophic changes arise late in the disease, the sphincters, however, remaining normal. The treatment is the same as in other forms of sclerosis. The salts of gold, silver and arsenic have been recommended.

Describe the eruptions in the eruptive fevers. State where they first appear and the time of their appearance.

In scarlet fever the eruption occurs at the end of the first day or beginning of the second day. It consists of pin-head points appearing first upon the neck and chest and spreading rapidly all over the body, except certain parts of the face, the mouth and chin. These red points, which are close together, soon coalesce, giving a diffuse pinkish or reddish appearance to the entire skin, which presents a boiled lobster color. Some slight edema may also be noted. Throughout the entire eruption raised papules are found. The eruption lasts about four or five days, and disappears by desquamation.

The eruption in measles occurs upon the fourth day. It appears first upon the face and neck, and spreads rapidly over the entire body. The eruption consists of rose-red or brownish maculo-papular points raised above the skin, with intervening healthy skin, often arranged in a crescentic shape, especially upon the forehead and wrists. The eruption remains at its height for about four days.

The eruption in rubella appears upon the first day, and occurs irregularly over the face, neck, chest, body and limbs, varying in individual cases and in different epidemics. The multiform eruption may resemble erythema, urticaria, and in some cases that of true measles or scarlet fever. It may be confluent or diffuse, lasting from two to four days.

The eruption in small-pox occurs upon the third day. The temperature falls as the eruption occurs. The eruption may be discrete or confluent. At first the rash is about the size of a pin-head, and soon becomes hard, feeling like a shot under the skin. The macular eruption is rapidly converted into a papule of a reddish color. There may be itching and burning attending these early eruptive symptoms. In from twenty-four to forty-eight hours the rash has invaded the entire body, the earlier papules soon become vesicular, this change taking place about the sixth or seventh day from the onset of the attack. In a day or so the fluid becomes turbid and purulent, the top being held down (primary umbilication). In from twenty-four to forty-eight hours this umbilication has disappeared, the top now being conic in shape. About this time an intense red inflammatory areola is noticed about the base of the pock, and the eruption is now exceedingly painful. On or about the ninth day from the beginning of the disease suppuration begins in the pock, lasting about three days, when the apex of the cone drops in, due to the absorption of the contents of the pock (secondary umbilication). When absorption has been completed a crust forms that may remain for some days, these crusts falling off on or about the sixteenth day from the beginning of the disease, leaving depressed striated scars.

The eruption in varicella occurs upon the first day, and marks the beginning of the disease. The exanthem shows itself as a small reddish point or papule, which in a very few hours becomes a vesicle. It is slightly elevated above the skin rather than having the appearance of being under the skin; the vesicles are thin and transparent, and from one-

eighth to one-quarter of an inch in diameter. There is usually no areola. In the course of a few hours the vesicle becomes milky and begins to shrivel, with depression at the top from absorption of its contents. This results as a yellowish-brown crust that in about ten days from the beginning of the attack, and even before this, separates, leaving a more or less well-defined scar, which in some cases, especially upon the face, remains permanently. The pocks may appear upon the face, neck, scalp, wrist and some parts of the body.

Give the symptoms of acute pericarditis.

It is impossible to diagnosticate a true pericarditis by symptoms without a careful physical examination. The disease commonly begins with severe pain in the region of the precordium. The pulse rate increases, and may be from 90 to 160 per minute. In some cases it may be normal, or when effusion occurs the pulsus paradoxus occurs. Fever of some degree is usually present. The most important sign is a friction sound, which varies greatly in intensity. It is limited to the precordial area, and is heard most frequently at the base of the heart. It is increased by pressure with the stethoscope. If an effusion develops the friction sound disappears, and returns again as absorption takes place.

What are the complications and sequelae of cerebro-spinal fever?

The important complications are broncho-pneumonia, bronchitis, croupous pneumonia, endocarditis and pericarditis. The sequels are exceedingly common. They consists in affections of the special senses. There may be loss of sight, permanent deafness, loss of smell, loss of taste, various forms of paralysis and neuralgia.

Describe the eruption of typhus fever.

The characteristic eruption of typhus appears upon the fifth day of the disease, and in its early stages closely resembles measles. Macular spots of irregular size and outline,

and of a dirty pinkish or reddish color, characterize the exanthem. It appears first upon the chest and abdomen, and extends to the extremities, the face being rarely affected. It is particularly copious upon the extremities, where later in the disease it becomes darker or petechial. Another eruption is also characteristic, and consists of marbling or mottling of the skin. This rash lasts throughout the disease, and does not disappear in death.

Describe the treatment of measles.

There is not specific treatment, and in uncomplicated cases medicines are unnecessary. A mild laxative at the onset is useful. The entire treatment should be directed to the prevention of complications, especially broncho-pneumonia. When complications occur they must be treated upon general principles.

Give the physical signs of a cavity of the lung in pulmonary tuberculosis.

If the cavity be large and superficially situated there will be depression upon inspection. Upon palpation, if the cavity be empty, there will be increased vocal fremitus. Upon percussion, if the cavity is empty, a tympanitic note may be elicited. If the cavity communicate with the bronchus a cracked-pot sound may occur. If the cavity be filled dulness will be noted upon percussion. On auscultation, if the cavity be empty, increased vocal resonance and cavernous breathing will be heard. If fluid be present in the cavity bubbling rales are heard. Around the cavity a friction sound is frequently noted.

Give the etiology and treatment of hemothorax.

Hemothorax may result from traumatism, caused by fracture of a rib or wounding of a lung. It may also result from rupture of an aneurysm, from malignant disease of the lung, and in the hemorrhagic diathesis. If the hemothorax be moderate in size it should not be interfered with, as subsequent

absorption and clotting will take place. Rest and the free administration of opium are necessary. Avoid stimulation, for it will interfere with the formation of a clot.

Describe the characteristics and significance of the several kinds of arterial pulse.

The normal radial pulse is characterized by regularity, fair volume, and, in the healthy adult, is from 70 to 80 per minute in the erect posture. The pulse of aortic regurgitation is known as the water-hammer or Corrigan pulse. It makes itself known by an apparent fulness, which, however, soon passes, and it recedes from the finger, hence it is also known as the receding pulse. The pulse of mitral stenosis is a small, irregular, rapid pulse. The dicrotic pulse conveys to the finger a double beat.

Diagnosticate diabetes mellitus.

The diagnosis of diabetes mellitus consists in the continuous presence of glucose in the urine. The amount of urine passed by the patient may be from 3 to 5 quarts in the 24 hours; its specific gravity is high, 1030 or over. The color is usually straw-colored, and the urine is clear. The patient has great thirst, large appetite, as a rule loses weight, and an etherial odor may often be detected in the breath; there is pruritus, especially of the genitals, and boils and carbuncles are apt to form.

Differentiate gastric cancer from gastric ulcer.

Gastric cancer occurs after the age of 40, most frequently in the male sex; gastric ulcer is a disease most frequently occurring in young females in whom chlorosis is often present. Gastric cancer is characterized by loss of weight, marked cachexia, and often by the presence of a tumor in the region of the pylorus. There is pain which, as a rule, is dull in character and not particularly aggravated by food. Vomiting occurs after a longer period, 24 hours or more, of food which is but partially digested. The Oppler-Boas bacillus may be

present in the vomited material, and there may also be tinges of blood. In ulcer there is pain and marked tenderness in the region of the ensiform cartilage. This pain is greatly aggravated by the taking of food; vomiting occurs soon after a meal; there is frequently hematemesis. In the examination of the gastric contents it will be found that in cancer there is an absence of free HCl and the presence of lactic acid, while in ulcer there is an excess of free HCl.

Differentiate scarlatina, measles and roseola.

In scarlatina the eruption appears late on the first day or early on the second day of the disease, while in measles it appears on the fourth day, and in roseola the eruption is the first symptom of the disease. The onset in scarlet fever is abrupt, with a chill or convulsion, high temperature, rapid pulse, 140-160 per minute or more, sore throat, etc. In measles the onset is characterized by marked catarrhal symptoms, such as sneezing, coughing, lachrymation, etc.; the temperature moderate, there is slight sore throat and mild gastric disturbance.

How would you diagnose pneumonia?

The direct diagnosis of pneumonia depends upon the sudden onset with chill, temperature which, as a rule, is high, severe pain in the side, cough, at first with scanty expectoration, later the expectoration becoming very tenacious and containing blood (rusty sputum), and upon the physical signs. These consist of the crepitant rale in the first stage, dulness on percussion in the second stage with bronchial breathing, and the occurrence of the crepitus redux in the third stage.

Differentiate peritonitis and enteritis.

In peritonitis there are present marked abdominal pain, tenderness on pressure, abdominal distension, after which effusion is apt to occur, vomiting, which becomes persistent, fever and perhaps the occurrence of collapse; marked constipation is an important symptom. In enteritis there is diar-

rhea, there is rarely marked distension, no abdominal rigidity; as a rule, there is the history of some dietary error.

Differentiate organic and functional heart murmur.

Organic murmurs may be systolic, presystolic or diastolic in time. There is evidence of cardiac hypertrophy, dilatation, or both. The murmur is conducted in certain definite directions (except the presystolic murmur). A thrill is sometimes present. A functional murmur is always systolic in time; it is heard at the base, particularly at the left base (whereas the organic murmur is heard at the punctum maximum), it is not transmitted, there is no evidence of hypertrophy or dilatation, and it is present in anemic conditions.

Describe three pathological pulmonary sounds heard on auscultation, and give their significance in diagnosis.

The friction sound which may be heard in inspiration, expiration or both, which indicates a fibrinous pleurisy. A crepitant rale, which usually indicates fluid in the vesicular structure of the lung. Amphoric breathing, showing a cavity.

Differentiate aortic stenosis and aortic insufficiency.

In aortic stenosis the murmur is systolic in time, transmitted to the arteries of the neck; a systolic thrill is also often present, there is some evidence of hypertrophy of the left ventricle, the pulse is full and, as a rule, not rapid. In aortic regurgitation the murmur is diastolic in time, heard at the left base, conducted down the sternum. The water-hammer or Corrigan pulse is present. There is marked evidence of hypertrophy of the left ventricle. Occasionally the "Flint murmur" may be heard.

Differentiate typhoid fever and remittent fever.

In typhoid fever prodromes are present, such as loss of appetite, headache, diarrhea, evening fever, becoming more marked each succeeding night. On or about the 7th day the characteristic eruption appears, the typical tongue makes its appearance, the spleen is enlarged, and the dicrotic pulse is

found during the second week. The Widal and diazo reactions are present. Remittent fever may be present in many of these cases; there is, however, no Widal or diazo reaction, no dicrotic pulse, and the presence in the blood of the plasmodium malariæ will in all cases lead to a correct diagnosis.

Describe four peculiar appearances of the tongue and give their significance in diagnosis.

A flabby, indented, swollen tongue, covered with a yellowish fur shows catarrhal gastritis. This tongue is also seen in smokers and drinkers, and occurs often in moderate fevers. A tongue which is red at the edges and tips and is coated posteriorly occurs in enteric fever. The "strawberry" or cat tongue, in which the papillæ are elevated and a slight grayish fur is seen, occurs in scarlet fever. Furrings which are small and limited indicate irritation from a rough tooth or inflammation of a tonsil.

Differentiate acute rheumatism and periostitis.

Acute rheumatism is characterized by redness, swelling and pain in the joints, by fever of a moderate range, by acid sweats and a constant tendency to inflammation of the serous membranes of the heart. Periostitis, as a rule, follows an injury; the pain is more localized and does not refer to the joints; there are no acid sweats, and pus formation may occur, which is exceedingly rare in acute rheumatism.

Differentiate neuritis from myalgia.

In neuritis the pain is, as a rule, along the nerve trunks; trophic changes may occur. In myalgia pain is over the muscles; there is no constitutional disturbance; fever is entirely absent; pressure upon the affected area in myalgia gives relief; in neuralgia the pain is aggravated by pressure.

Describe the symptoms of yellow fever.

For convenience of description the disease is divided into three stages: The stage of onset, which generally lasts three

days; the period of calm, which lasts from 12 to 24 hours; and the period of collapse, the duration of which is indefinite. In the first stage there is headache, pain in the bones, nausea and vomiting, moderate fever, the pulse may be 80 to 100 in a minute, and becomes progressively slower as the disease advances, the urine is albuminous; there may be even in this stage slight jaundice. These symptoms disappear more or less abruptly and give place to the stage of calm, in which all the previous symptoms disappear; and recovery from this stage may be uninterrupted. If this favorable event should not occur, the third stage is ushered in, with the appearance of marked jaundice, from which the disease receives its name. There may be hemorrhage from any of the internal organs, most frequently, however, from the stomach, the characteristic black vomit. The symptoms of the first stage are added to this.

Give the diagnosis of gastric ulcer.

The disease is most frequent in young anemic females. There is pain and tenderness on pressure in the region of the ensiform cartilage; there is hematemesis and obstinate constipation. Examination of the gastric contents shows an excess of HCl.

Give the symptoms resulting from paralysis of the phrenic nerve.

This is a paralysis of the diaphragm, if the condition is bilateral; no movement is noted on the abdomen and epigastrium; the hypochondrium is drawn in; marked dyspnea occurs upon the slightest exertion. There may be enlargement of the chest.

What is the significance of the patellar reflex as a sign of disease?

Absence of the knee-jerk is caused by a lesion affecting any region of the reflex arc; it is, therefore, lost in disease affecting either motor or sensory fibers or both, as in neuritis, in disease of the posterior roots or columns, as in Friedreich's ataxia. It may be absent in apoplexy, epilepsy, injury to the

cord and in meningitis; it is sometimes absent in diabetes, diphtheria and chorea. It is exaggerated in hemiplegia following apoplexy, in the cerebral palsies of children, in general paralysis of the insane, also in hysteria, neurasthenia and strychnine poisoning.

Differentiate epilepsy from hysteria.

Epilepsy is often preceded by an aura, followed by complete loss of consciousness. There are at first tonic, followed by clonic, convulsions; during the attack the pupils are dilated; the patients often bite their tongue. In hysteria there is never complete loss of consciousness; there is no regularity with regard to the convulsion; it is most common in females between the ages of 15 and 25; the pupils are irregular, hysterogenic zones are present, the patient never falls so that she may be injured.

Differentiate neuritis and rheumatism.

In neuritis the pain is commonly along the nerve trunks; trophic changes occur; there may be foot-drop or wrist-drop; fever is slight. In rheumatism there is redness, swelling and pain in the joints, acid sweats, frequent implication of the membranes of the heart, marked deposits of urates in the urine.

Differentiate acute phthisis and capillary bronchitis.

There is a form of acute pulmonary phthisis which is known as the broncho-pneumonic form, which can with the greatest difficulty only be differentiated from so-called capillary bronchitis. The main points of difference would consist in the progressive emaciation, a family history of tuberculosis, the finding of tubercle bacilli in the sputum, and the appearance of the physical signs in the lungs.

What are the clinical manifestations of biliary calculi?

As long as the calculi remain quiescent in the gall-bladder no symptoms arise. It is only upon the passage of the gall-stones into the duct that the symptoms of hepatic colic arise,

which consist in great pain in the region of the liver, radiating toward the umbilicus and right shoulder-blade, nausea and vomiting and, after the passage of stones, jaundice, clay-colored stools and the appearance of biliary pigments in the urine.

Differentiate empyema from pulmonary abscess.

In pulmonary abscess there is a fever of a septic type, the physical signs of a cavity are commonly present, frequently expectoration of foul-smelling pus, which under the microscope shows elastic fibers. In such cases leukocytosis is present. In empyema there are the usual signs of pleural effusion, the temperature may range from 102° to 105°, displacement of the heart and the adjacent organs is common, local edema and redness of the skin are often present.

Describe the diagnostic characteristics of the eruption of typhoid fever, smallpox and chicken-pox.

The eruption of typhoid fever appears about the seventh day, consisting of slightly elevated, rose-colored spots, which disappear on pressure and appear again after the pressure is removed; they occur in crops, having a duration of from two to three days; they appear commonly on the abdomen, chest, between the shoulder-blades, extremely rarely upon the face. The eruption of smallpox appears on the third day in the form of a macula, passing through the successive stages of vesicle, pustule, crust and scar. The pustule is umbilicated and has an inflammatory areola; the eruption appears all over the body, especially on the exposed parts. The eruption of chicken-pox appears on the first day; it appears as a small reddish papule, which in a very few hours becomes a vesicle; the vesicle is thin and transparent.

Differentiate diphtheria from follicular tonsillitis.

In diphtheria the exudate is found upon all parts of the posterior pharynx, uvula and tonsils. Around the exudate there is an inflamed areola. The exudate is removed with great difficulty, leaving a bleeding surface, the false mem-

brane rapidly reforming. Iu follicular tonsillitis the exudate is strictly limited to the crypts of the tonsils; it is wiped away with ease, without leaving a bleeding surface, and it does not reform. The Klebs-Löffler bacillus is found only in the diphtheritic exudate.

Differentiate acute enteritis from acute dysentery.

In dysentery the important symptoms to be considered are tormina, tenesmus and stools composed of mucus and blood. These symptoms in acute enteritis do not occur in anything like the severity and constancy that they do in dysentery.

Differentiate appendicitis from enteric fever.

As a rule, appendicitis begins abruptly, with marked pain in the right iliac fossa over McBurney's point. There is constipation, tenderness, board-like rigidity, all this occurring, as a rule, within a few days. The onset of enteric fever is gradual, with prodromes of diarrhea, headache, characteristic tongue, appearance of the eruption about the seventh day, enlargement of the spleen, dicrotic pulse, Widal reaction.

Differentiate acute pericarditis from acute endocarditis.

In pericarditis there is pain in the pericardium. This, as a rule, is absent in endocarditis. In pericarditis there is a friction sound, which may be either systolic or diastolic, but as a rule, is not related to either. In endocarditis there is a murmur, which is either systolic, diastolic or presystolic; the murmur is transmitted, the friction sound is localized. The murmur is heard at the punctum maximum; the friction sound is heard over the body of the heart and is nearer the ear.

How would you diagnose a case of rickets?

Sometime between the seventh month and second year of life the patient shows irritability, restlessness and some fever toward evening, dentition is delayed and gastro-intestinal disturbances follow; there is profuse sweating. The shape of the head is characteristic; it is rectangular, the face appearing small in proportion to the skull, bone changes are noted, and the rachitic rosary appears.

Differentiate variola and varicella.

In variola the eruption appears on the third day, preceded by marked constitutional symptoms. The eruption goes through the successive stages of macule, papule, vesicle, pustule, which is umbilicated and surrounded by an inflammatory areola, crust and scar. The eruption in varicella appears on the first day and is vesicular almost from the beginning. There are rarely marked constitutional phenomena, and the disease is essentially one of childhood.

Differentiate apoplexy from uremic coma.

This is often very difficult; however, the following points favor apoplexy: Profound coma, the face may be pale and cyanotic or flushed; respiration is stertorous and slow and may be of the Cheyne-Stokes type; hard arteries, with a slow, hard, irregular, full pulse; the pupils are dilated or unequal and do not react to light; conjugate deviation of the head may be present; there is evidence of paralysis; the skin is hot and dry; the coma in uremia may be preceded by, or accompanied with, convulsions; the face may be pale and edematous; the pulse is slow and of high tension, showing either hypertrophy of the heart or sclerosis of the vessels; there may be a urinous odor exhaling from the patient; frequently there is edema of the feet; albumin and casts are found in the urine; albuminuric retinitis may be present.

Differentiate unconsciousness from apoplexy, syncope and alcoholic intoxication.

(Apoplexy see above.) In syncope the face is very pallid, the pulse is very weak, and the pupils are markedly dilated. In alcoholic coma the unconsciousness is rarely complete. The alcoholic odor of the breath is not diagnostic, as apoplexy and uremia may occur in persons that have been drinking. The pulse is at first rapid and full, later becoming small and feeble. The pupils are equal and often dilated. The skin is cool and moist and the temperature subnormal.

Differentiate cardiac hypertrophy from cardiac dilatation.

In cardiac hypertrophy the apex-beat is displaced downward and to the left. The first sound of the heart is strong and booming. The pulse is slow and strong. In cardiac dilatation the apex-beat is displaced to the right. It is diffused and feeble, the first sound being weak. The pulse is often rapid, irregular and weak.

Differentiate Asiatic cholera from cholera morbus.

This often presents great difficulties, especially in times of an epidemic of cholera; however, the finding of the comma bacillus will in all cases clear up the diagnosis. Rice water discharges are much more common in true cholera. In cholera morbus there is usually the history of an indiscretion in diet.

Differentiate heat exhaustion from sunstroke.

In heat exhaustion premonitory symptoms occur, such as dizziness, headache, nausea and vomiting. The respirations are increased in number, and the pulse is very rapid, 130-140 per minute. Unconsciousness is not profound. The temperature may be normal or subnormal, or slight fever may be present. In sunstroke there may or may not be prodromes. The temperature is very high, from 106°-115°, or even higher. Dyspnea is marked, and the skin of the body is red and sometimes even livid. The pupils are contracted and the pulse is very rapid. There is complete unconsciousness in which convulsions may occur. Cheyne-Stokes breathing may be present.

Diagnosticate parenchymatous nephritis.

The face is pale and edematous. The pulse is full and strong, showing some hypertrophy of the heart at first, although this is not nearly as common as in the interstitial variety. The urine is decreased in amount, of high specific gravity, high-colored, and contains large amounts of albumin and casts. Often there is also edema of the lower extremity.

Differentiate aortic and mitral valvular diseases.

In aortic disease the murmur is heard with the greatest in-

tensity at the aortic cartilage (second right costal cartilage); it is either transmitted to the neck, if it be systolic, or it is transmitted down the sternum, if the murmurs be diastolic in time. In aortic valvular disease there is always hypertrophy of the left ventricle. In mitral disease the murmur is heard at the apex. It is transmitted to the axilla and the angle of the scapula if the murmur be systolic in time. The presystolic murmur is not transmitted and is accompanied with a presystolic thrill.

When is perforation in typhoid fever most likely to occur?

Sometime in the course of the third week.

Describe the essentially different sounds given by the thorax on percussion.

Tympany is elicited over the trachea, resonance over the lungs, dulness over the heart.

In what cases would the ophthalmoscope aid in diagnosis?

In disease of the arteries (retinal hemorrhages). In disease of the kidney, in disease of the nervous system, syphilis, tobacco-poisoning, lead-poisoning, tubercular meningitis, diabetes, etc.

Differentiate in a general way between cerebrospinal fever and tubercular meningitis.

The onset of tuberculosis is not so sudden as in cerebrospinal meningitis; the pains, hyperesthesia and retraction are less, and there are no eruptions. Retraction of the abdomen, irregular pulse and Cheyne-Stokes respiration are much more frequent. A pre-existing tuberculous lesion may be found, and the ophthalmoscope may reveal tubercles in the choroid.

What does bronchial breathing indicate?

This is heard normally when listening over the trachea. It is encountered over airless spaces in the lung tissue and over cavities.

In what diseases can we employ the microscope to advantage as an aid in diagnosis?

Principally in diseases of the blood and kidney. It is also necessary in the examination of all secretions and excretions for pathogenic organisms and parasites.

Describe the physical signs of simple ascites and those of ovarian dropsy.

In ascites, if the patient be lying upon the back, the center of the abdomen is flat (provided the amount of fluid is not excessive), the lateral and dependent portions bulge. There will be tympany over the region of the umbilicus and flatness in the flanks. Fluctuation will be obtained. In dropsy due to ovarian disease the accumulation of the fluid is local (in the region of the ovary); it does not change with position of the patient. If the accumulation be great, the differential diagnosis is very difficult; vaginal examination must be made, and sometimes the character of the dropsy can only be determined from the fluid withdrawn.

Differentiate the early eruption of syphilis and measles.

In syphilis there is the history of the chancre, and quite a period (six weeks) before the eruption appears. Coincident with the eruption there is inflammation of the throat (mucous patches). There is rarely any fever. The eruption is copper-colored, and is not particularly prominent on the face. In measles there is marked fever from the onset, with severe catarrhal symptoms. The eruption does not appear before the fourth day, it occurs prominently on the face and rapidly spreads all over the body, the catarrhal symptoms continuing.

What are the methods of physical diagnosis or exploration?

Inspection, palpation, mensuration, percussion, auscultation and succussion.

Describe the symptoms of acute inflammatory articular rheumatism.

The disease, as a rule, begins with pain, swelling and red-

ness of one or more of the large joints. The joints implicated are symmetrical. There is moderate fever, 102°-103°, acid sweats and marked urates in the urine. There is a tendency to implication of the serous membranes of the heart.

Give the etiology and describe the symptoms of idiopathic erysipelas.

It occurs at all seasons of the year and in all climates. It is most liable to occur in debilitated and cachectic persons and in the course of chronic pulmonary tuberculosis. The disease may occur in the puerperal state. The exciting cause is the streptococcus erysipelatis of Fehleisen. The disease begins with a chill or chilliness, and is followed by the development of the eruption. There are gastro-intestinal symptoms or fever. The skin becomes irritated, itchy and swollen. There is heat, tension and burning in the part. The eruption shows decided elevation with a distinct, prominent margin, it is red or puffy in the center and glossy in appearance. Uncomplicated cases last from two to three weeks.

Mention the causes and describe the treatment of primary lobar pneumonia.

The exciting cause is the diplococcus or pneumococcus of Fränkel. Exposure to cold and wet, alcohol, are said to be predisposing causes. The treatment of the disease consists in giving the preliminary purge, preferably calomel. Dover's powder or a hypodermic injection of morphine to relieve the pleural pain, remedies to sustain the heart and respiration, such as alcohol and strychnine, are useful. Ammonium carbonate and ammonium chloride are also of value.

Describe the treatment of hydrothorax.

Purges, diaphoretics and diuretics are of value. If these remedies do not relieve the condition the aspirator must be resorted to.

State your treatment, including diet, of typhoid fever.

If the patient be seen before the tenth day of the disease, a calomel purge should be administered. The systematic cold bath of Brand is a favorite method of treatment. Alcohol and strychnine are valuable adjuncts to sustain the circulation. The diet should be absolutely liquid. Water plentifully, milk, liquid peptonoids are commonly employed. No solid nor semi-solid food should be administered before the evening temperature has been normal for at least one week.

Describe the treatment of diabetes mellitus.

Diet is most important. No starches or sugars should be given. The diet should consist in the fresh green vegetables, meat, fish. No alcoholic or malt liquors should be employed. The generally accepted treatment is by some form of opium, codeine being most often employed.

Give the symptoms and treatment of tetanus.

The prominent symptoms are the occurrence and recurrence, at varying intervals, of tonic spasm of greater or lesser intensity in the voluntary muscles. The spasm is usually first noticed in the neck, which is soon followed by spasm of the muscles of the jaw, with inability to open the mouth. There is pain, which, however, is not severe. Occasionally the body arches backward, a condition known as opisthotonos. There is usually fever of about 101°, but after prolonged spasm hyperpyrexia may occur. The urine is scanty, extremely toxic and often contains albumin. Profuse sweating is a prominent symptom. The treatment consists in the endeavor to administer nutriment, and rectal injections should be resorted to. Chloral is of value because it produces sleep and sometimes relaxes spasm. Antitetanic serum is of value in some cases. The wound should be thoroughly cleansed and treated antiseptically.

What is the most common cause of tabes dorsalis?

Syphilis.

How should acute coryza be treated?

Acute coryza should be treated by cleansing the nose with a mild antiseptic solution; a weak solution of cocaine is also of value. Dover's powder is also recommended internally.

Describe the treatment of pleurisy with effusion.

The common measures administered to absorb fluid, such as purges, diaphoretics and diurectis, should be resorted to. If these fail the aspirator may be used.

What is the period of incubation in variola and vaccinia?

The period of incubation of variola is from ten to thirteen days. The period of incubation in vaccina varies from three to seven days, depending upon whether humanized or bovine virus is used.

What are the symptoms of hepatic abscess? In what climate is hepatic abscess most likely to occur?

The symptoms of hepatic abscess are an enlarged and tender liver, with jaundice, anemia and wasting. The clinical manifestations vary, and large abscesses may be present without marked disturbance. Occasionally fluctuation may be detected in the liver. There may be pain of a throbbing character. Occasionally all the phenomena of sepsis are present, chills, fever and sweating. The disease is most common in hot climates.

How may pleuritis in its early stages be differentiated from intercostal neuralgia?

In pleuritis there is pain, which is especially aggravated by breathing. In intercostal neuralgia the pain is over the exit of the intercostal nerves. It is increased by pressure. In pleuritis the pain is diminished by pressure. The pain is not aggravated in intercostal neuralgia by deep breathing. In pleurisy there is a friction sound, which does not occur in intercostal neuralgia. Frequently intercostal neuralgia is accompanied by the development of herpes zoster.

How many and what are the stages of malarial intermittent fever?

There are three stages: The stage of chill, the stage of fever, and the sweating stage.

Mention the eruptive fevers.

Scarlet fever, measles, German or French measles or rubella, variola, varicella and erysipelas.

Describe the treatment of intermittent fever.

The treatment of intermittent fever consists in the administration of quinine in sufficient doses to destroy the plasmodium of malaria. From 10 to 20 grains a day for an adult is sufficient for this purpose.

Give the etiology and outline the treatment for acute gastritis.

In the majority of instances the condition is due to irritants, either thermic or chemical, that come in contact with the mucous membrane of the stomach, producing an acute inflammation. Food either too hot or too cold, spices, drugs and poisons may have this influence on the mucous membrane. The treatment consists in the administration of a purge, such as calomel or castor oil. The diet should be restricted for a while. In severe cases it is necessary to produce vomiting. Lavage is useful. Drugs are scarcely ever necessary.

Describe the symptoms and treatment of chronic hydrocephalus in children.

The symptoms of congenital hydrocephalus are difficulty in the movements of the child on account of the weight of the head. As a rule there is impairment of intellect. The head is often enormous in size. There may be headache and dimness of vision, and the gait may become irregular. The pulse is usually slow. Medical treatment is of no avail in this condition. Operative methods are advised by some authorities.

Define rubeola and describe its symptoms.

Rubeola is an acute, infectious, contagious disease charac-

terized by marked catarrhal symptoms, especially of the respiratory tract, with a characteristic eruption occurring on the fourth day. The disease may begin with a chill, followed by fever that may reach 103° F. or higher, with marked catarrhal symptoms from the onset. There is injected conjunctiva, lachrymation, photophobia, coryza, and some cough. Rales are heard in the chest. Koplik's sign may appear about this time. On the fourth day the eruption appears, which consists of rose-red or brownish maculo-papular points raised above the skin, with intervening healthy skin, often arranged in crescentic shape. The eruption remains at its height for about four days. The catarrhal symptoms continue. About the eighth day of the disease the eruption begins to fade. A fine desquamation occurs. In the absence of complications the disease lasts about twelve days.

Describe the symptoms and treatment of gangrene of the lung.

Cough accompanied by expectoration, which is abundant, thin and foul-smelling, should call attention to gangrene of the lung. Fever is always present. There is often hemoptysis. Microscopically the sputum contains leukocytes, shreds of lung tissue, especially elastic fibers, fat crystals and bacteria. Upon percussion over the affected area dulness is present. Upon auscultation, bronchial breathing and, if excavation occurs, signs of a cavity are present. The treatment is supportive.

Describe the symptoms of tubercular meningitis.

The course of the disease is usually divided into a prodromal stage, a period of excitement and a period of paralysis. In the prodromal stage the child becomes irritable and restless, there is anorexia, headache, pain in the limbs, accompanied by nausea and obstinate vomiting. The second stage is marked by an aggravation of the symptoms just enumerated, with fever. The headache becomes intense, and is usually general. The hydrocephalic cry is usually present.

Obstinate constipation is characteristic. There is a rapid pulse, which may be from 120 to 160 per minute; the abdomen is prominent; nervous symptoms are present, most frequently delirium. The pupils are contracted, and strabismus may occur. There is marked cutaneous hyperesthesia. Convulsive movements are common. This period lasts for a week or ten days and is followed by the stage of paralysis. The fever becomes higher, often reaching 105° or 106°. Spasmodic contractions, with tremor and twitching of the tendons and muscles, with local paralysis occur. The third nerve is most frequently involved, causing ptosis. The duration of the disease is variable, lasting about three weeks. When the disease occurs in adults it may be prolonged to three or four months. Leukocytosis is present throughout the course of the disease.

What should be done for hemoptysis occurring in the course of phthisis?

Absolute quiet is essential; food and drink should be stopped for a while; ice-bags may be applied over the chest; the administration of opium in some form is generally advised.

Give the symptoms of epidemic influenza.

The disease occurs suddenly, usually with a chill and marked fever, 103°-105°, with catarrhal symptoms, such as sneezing, coughing, etc. There is headache, usually frontal or behind the eyes, or at the root of the nose, pain in the limbs and in the bones. There is marked prostration, out of proportion to all the other phenomena. There is a constant tendency to complications resulting from inflammation of the respiratory or gastro-intestinal mucous membrane. There may be nausea and diarrhea. Uncomplicated cases last from a week to ten days.

What is hemoptysis?

Bleeding from the lungs.

Give the physical signs of pleuritic effusion.

On inspection there may be slight bulging. The apex-beat

of the heart is seen to be displaced. Upon palpation there is decreased vocal fremitus. Upon percussion there is flatness over the affected area. Upon auscultation the breath-sounds are absent, and vocal resonance cannot be obtained over the affected area.

Describe the natural heart sounds.

Two distinct sounds are encountered: The systolic or first sound, and the diastolic or second sound. They are separated from each other by a short pause, a long pause occurring between the second and first sound. The first sound is due to the contraction of the ventricle, the rush of blood and the closure of the auriculo-ventricular valve. It is long, low and booming in character. The second sound is due to the closure of the semilunar valve, and is short and valvular. The first sound is best heard at the apex, the second sound at the base of the heart.

On what day does the rash usually appear in scarlatina?

At the end of the first or beginning of the second day.

What are the symptoms of delirium tremens?

The prodromes consist of nervousness, restlessness and anorexia. As a rule there is insomnia. A tremor occurs which affects the lips, tongue and limbs. Delirium soon develops, which is active and constantly changing. The skin is moist and the expression is anxious. The pupils are dilated. The temperature is subfebrile, the pulse soft and rapid. The tongue is covered with a thick fur, and there is sometimes nausea and vomiting.

What are the clinical features of cerebrospinal fever?

The onset is sudden, beginning with intense headache, stiffness in the muscles of the back of the neck, nausea and vomiting. The attack may begin with a chill. Delirium and stupor commonly occur. There is marked alteration of sensation. The fever varies from 101°-105° or more. Kernig's sign is present. Herpes is very common. Other eruptions also

occur, such as erythema, urticaria and petechiæ. Arthritis may be present. The urine is scanty and may contain albumin.

Diagnose varioloid.

The disease begins with a chill, followed by fever of about 103°. There is nausea and vomiting, pain in the head and back. The eruption occurs earlier than in variola, usually in the course of the second day. It is never so copious. The evolution of the pox is arrested in the vesicular stage. There is no secondary fever, as there is no pus to absorb.

Give the symptoms of acute myelitis.

Paralysis of motion, which comes on rapidly, with complete loss of sensation below the site of the lesion, and paralysis of the sphincters are the important symptoms. Bed-sores usually occur. There is some rise in temperature. Convulsions may occur. Reactions of degeneration are not present. The reflexes are exaggerated when the lesion is above the lumbar region, and ankle clonus may be elicited. Loss of sensation is complete.

What diseases produce conditions of the skin which are of general diagnostic value?

The eruptive diseases, yellow fever, diseases of the liver, purpura, Addison's disease and melanotic cancer.

What would auscultation and percussion reveal in a case of congestion of the lung?

Auscultation would reveal small moist rales, with broncho-vesicular breathing; percussion may reveal impairment of resonance.

What are the physical signs of stenosis of the mitral valve?

A presystolic murmur heard at or near the apex, which is not transmitted, a presystolic thrill and a rapid, irregular, feeble pulse.

Describe the features of a case which would lead you to diagnose acute appendicitis.

Marked tenderness and pain in the right iliac fossa, especially over McBurney's point; rigidity upon the affected side; nausea and vomiting, and marked constipation.

What does the urine reveal as to color, specific gravity, quantity voided, abnormal constituents, etc., in a typical case of diabetes mellitus?

The color is pale yellow with a slight greenish cast; the specific gravity is high, 1030 or over; the quantity voided is usually large, five quarts or more in twenty-four hours; the abnormal constituents consist in the presence of glucose; occasionally there is also albumin.

State the sex and period of life to which chlorosis is confined.

It is common in the female sex, rarely occuring in the male. It is usually at the age of puberty.

What are the grades of temperature which come under observation in the sick?

The temperature of collapse is below 96°; subnormal temperature is from 96°-97.5°; normal temperature is 98.6°; a subfebrile temperature is from 99.5° to 101°; moderate fever from 101° to 103°; high fever from 103° to 105°; hyperpyrexia above 105.5°.

Give the most frequent causes of pericarditis.

The most frequent causes are rheumatic fever, scarlet fever, diphtheria, septicemia and trauma.

Give the symptoms of an ordinary case of scarlet fever.

The disease begins suddenly, with chill or a convulsion. There is nausea and vomiting, high temperature, rapid pulse and marked angina. There is enlargement of the lymphatics at the angle of the jaw. At the end of the first or beginning of the second day an eruption appears all over the body, which

has the color of a boiled lobster. The eruption lasts four to five days and disappears by desquamation. Postscarlatinal nephritis is a frequent complication.

Describe an attack of acute articular rheumatism.

The disease begins suddenly, with fever of about 102°-103°. There is pain, tenderness, swelling and redness in one or more of the large joints. Occasionally prodromes are present. There may be a preceding tonsillitis or pharyngitis. The involvement of the joints is symmetrical. The pulse is accelerated from 100 to 110 per minute, the urine is high-colored, scanty in amount, specific gravity from 1025 to 1040, containing an abundance of phosphates and urates, albumin being rarely present. The saliva is strongly acid. Copious acid sweats occur. Skin eruptions are common, such as urticaria and erythema.

Give the differential diagnosis between cerebrospinal meningitis and typhoid fever.

In the first week of the disease the diagnosis is often difficult. Later in enteric fever the characteristic eruption appears, the spleen enlarges, the pulse becomes dicrotic, the nervous symptoms are not prominent until the beginning or toward the end of the second week, the headache disappears at the end of the first week, the Widal reaction is present. In enteric fever the onset is rarely sudden; there are marked prodromes, such as headache, epistaxis; vomiting is very infrequent; the temperature curve in enteric fever is characteristic, rising step-like in the first week, being subcontinuous in the second, remittent in the third and intermittent in the fourth week. The onset in cerebrospinal fever is sudden, with chill or convulsion; marked rigidity of the muscles of the back of the neck; violent headache and marked vomiting of the cerebral type. Herpes is common. The temperature is not characteristic, and the nervous symptoms are much more prominent than in enteric fever.

What are the physical signs of pulmonary solidification?

Upon palpation there is increased vocal fremitus. Upon

percussion there is dulness, and upon auscultation there is bronchial breathing. There may be rales.

Differentiate catarrhal from croupous pneumonia.

Catarrhal pneumonia is a disease secondary to bronchitis. Croupous pneumonia occurs suddenly, with marked chill, high temperature. In croupous pneumonia there is marked pain in the side, cough, anxious expression of the face, flush upon the cheeks, herpes, rusty sputum, and the disease terminates by crisis, usually upon one of the odd days of the disease, fifth, seventh or ninth day. Broncho-pneumonia occurs most commonly at the extremes of age. The disease is longer in duration, terminating by lysis. Upon physical examination in broncho-pneumonia there are scattered areas through both lungs, over which may be detected subcrepitant rales and dulness. Croupous pneumonia is, as a rule, a unilateral disease affecting the base of the lung. The crepitant rale, which occurs in the first stage, disappears in the second stage and reappears in the third stage as crepitus redux, is characteristic.

Give the general symptoms of cerebral hemorrhage.

The onset is sudden, with loss of consciousness, a rapid development of hemiplegia, conjugate deviation of the head and eyes, usually normal temperature, full, bounding pulse and irregular pupils. There may be Cheyne-Stokes respiration.

What condition of the blood is generally prominent in all forms of rheumatism?

There is marked anemia. The red bloodcells may be reduced one-half or more in number. The hemoglobin may be reduced to fifty per cent., and leukocytosis occurs.

What adventitious sounds are usually discovered by auscultation in catarrhal pneumonia?

Rales, usually of the subcrepitant variety, large mucous rales and broncho-vesicular breathing.

How are the lymphatic glands involved in scarlatina?

The lymphatic glands at the angle of the jaw and of the neck are usually enlarged, sometimes greatly, so that they form what is known as the collar of brawn.

Give the physical signs of the second stage of acute lobar pneumonia.

There is dulness on percussion, bronchial breathing on auscultation.

Give the topographical outlines of the liver as revealed by percussion when the patient is in the recumbent position.

Anteriorly liver dulness begins in the mammillary line at the sixth rib, in the axillary line at the eighth rib, and in the scapular line posteriorly at the tenth rib. It extends from all these points to the lowest border of the costal cartilages.

At what point does auscultation best reveal the sound of the mitral valves and of the aortic valves?

The sound of the mitral valve is best heard at the apex of the heart. The sound of the aortic valve is best heard at the second right costal cartilage near the sternum.

Make a diagnosis of locomotor ataxia.

The disease is commonly divided into three stages: The pre-ataxic, the ataxic and the paralytic stage. The pre-ataxic stage is characterized by lightning pains, most often in the lower extremities, by ocular phenomena such as the Argyll-Robertson pupil, which is a contracted pupil reacting to accommodation but not to light, and by the use of the patellar tendon-reflex. In the second stage the ataxic gait occurs; the patient cannot stand with his feet in juxtaposition with his eyes closed. The symptoms of the pre-ataxic stage continue in this stage. The paralytic stage is characterized at first by loss of control of the sphincters and by paralysis.

Give the symptoms of acute spinal meningitis.

The disease usually begins with chill and a temperature of

the aseptic type. There is severe pain in the back, increased by motion, radiating into the extremities; rigidity of the muscles occurs. Hyperesthesia is general. The reflexes are exaggerated, and ankle clonus is pronounced. There may be retention of urine and feces from paralysis of the sphincters.

What is the period of desquamation in scarlet fever?

The period of desquamation in scarlet fever usually occurs after the appearance of the eruption, or when the eruption has been prominent for about four or five days. It may last from several days to several weeks or more. The desquamation is usually in large scales.

Define lithemia.

A condition due to a disturbance of metabolism, characterized by an excess of uric acid in the blood, and clinically by various digestive, nervous and circulatory phenomena.

What are hemic murmurs as applied to the heart, and what is their cause?

It is commonly believed that hemic murmurs are due to an alteration in the constituents of the blood, such as occurs in chlorosis or in other forms of anemia. These murmurs are systolic in time, soft, and heard at the left base of the heart.

Make a general diagnosis of icterus.

Jaundice is characterized by a yellowish discoloration of the skin and of the conjunctiva. There is itching of the skin, slow pulse, the appearance of bile pigment in the urine and clay-colored stools.

Why is dyspnea caused by disorganization of the mitral valves?

This is due largely to the fact that, when rupture of compensation occurs, the right heart, and hence the pulmonary circuit, is interfered with.

Describe a typical case of laryngismus stridulus.

The disease comes on abruptly, the child being attacked

most often at night with shortness of breath, followed by closure of the glottis, which may remain closed from several seconds to twenty or thirty. During this time cyanosis may be a prominent feature. This is followed by relaxation of the spasm giving rise to high-pitched inspiration. Convulsions may occur, and are apt to be very severe.

Describe a typical case of typhus fever.

The disease begins suddenly, with marked chill and high temperature. There is nausea, vomiting and epigastric pain. The pulse is rapid, hard and not easily compressible. Vertigo and delirium soon set in. The face is reddened, the pupils are contracted and the conjunctiva injected. The tongue is coated. The liver and spleen are painful upon palpation and are somewhat enlarged. Delirium and convulsions are common. Constipation is marked throughout the course of the disease. On or about the fifth day an eruption occurs, which, in its early appearance, closely resembles measles. It occurs all over the body except the face. This eruption afterward becomes petechial. Another eruption is characteristic, which consists of marbling or mottling of the skin. On or about the fourteenth day of the disease crisis occurs.

What is the significance of prolonged expiration?

When inflammatory exudates occur in the bronchial tubes the expiratory murmur equals and occasionally is longer than the inspiratory murmur. When this sign is localized to the apices it is indicative of incipient tubercular disease. It further occurs in bronchial asthma and in chronic pulmonary emphysema.

What age and sex are most subject to chorea?

It is a disease of childhood, most common between the fifth and fifteenth years; much more common in the female than in the male sex.

What is understood by an exanthematous fever?

A fever in which a characteristic eruption occurs.

What parts of the brain are most liable to hemorrhage?

The parts supplied by the middle cerebral artery.

Describe the morbid states associated with asthma.

They are chronic bronchitis and chronic pulmonary emphysema.

What are the general or constitutional symptoms of diphtheria?

The onset of the disease is rapid, the early symptoms being discomfort and weakness, with headache. There is moderate fever. Pain on swallowing is often the first symptom. Upon examination of the throat the characteristic exudate is seen.

What are the physical signs of aortic regurgitation?

Upon inspection the apex of the heart is found displaced downward and to the left. The impulse is seen to be forcible, indicating great hypertrophy of the left ventricle. Palpation confirms this. Upon auscultation a diastolic murmur is noted at the second right costal cartilage, transmitted down the sternum. The Flint murmur may be present. The pulse is characteristic, being known as Corrigan, receding or water-hammer pulse.

On what day does the rash usually appear in measles?

On the fourth day.

What is progressive pernicious anemia?

This is a primary anemia, characterized by a marked decrease in the number of red bloodcells, by fatty degeneration of the heart, liver and kidneys, and by a peculiar lemon-yellow discoloration of the skin.

What is Asiatic cholera?

A specific disease, due to the comma bacillus of Koch, prevailing endemically in some parts of the world, and occasionally becoming epidemic, characterized by vomiting, purging, muscular cramp and high mortality.

Enumerate the points of diagnostic value in a case of chronic interstitial nephritis.

Hypertrophy of the heart and arteriosclerosis, albuminuric retinitis, headache, the passage of large amounts of urine of low specific gravity, 1004 to 1006, traces of albumin and often without albumin, and the presence of tube casts.

Name a medicine which affects the urine as to color and odor.

Turpentine.

What cardiac lesions are likely to accompany or to follow acute articular rheumatism? And how may they be recognized by the aid of the stethoscope?

Pericarditis and endocarditis. In endocarditis a murmur will be developed; in pericarditis a friction sound is heard.

How may rheumatism affect the respiratory organs?

Pleurisy with or without effusion may occur in the course of rheumatic fever.

What is the usual reaction of the urine in (a) chronic cystitis, (b) acute articular rheumatism?

In chronic cystitis the reaction is usually alkaline; in acute articular rheumatism markedly acid.

What is the diagnostic significance of dropsy?

Dropsy is an accumulation of watery fluid in one or more of the serous cavities or in the subcutaneous tissues. It is due to venous obstruction, to a toxemic condition of the blood, to the effects of inflammation upon the neighboring circulation, to vasomotor causes relating to disease of the nervous system, to lymphatic obstruction, and it occurs in a condition known as idiopathic or essential edema.

Define a puerile murmur and give its causes.

This form of breathing is normal in infants and children. It diminishes in intensity up to the age of twelve years. It closely resembles broncho-vesicular breathing. However, the

ratio between the length of inspiration and expiration is always longer. It is occasionally heard in dyspnea, especially from disease of the heart. It also occurs in what is known as compensatory breathing over one lung when there is disease of the opposite lung, or in the portion of one lung when it is affected by disease in another part.

Differentiate between sibilant and sonorous rales.

Sibilant rales are high-pitched, whistling rales, and occur in the smaller bronchial tubes. Sonorous rales are low-pitched, snoring in character, and they occur in the larger bronchial tubes.

Name the leading rational and physical signs of chronic bronchitis.

The important sign of chronic bronchitis is cough, with or without expectoration. After chronic bronchitis has existed for some time, emphysema frequently occurs, and also bronchiectasis. The physical signs which belong to chronic bronchitis are, particularly, rales, which are dry rales if there be no expectoration, and moist rales if expectoration be profuse.

Differentiate between pulmonary edema and pneumonitis.

Pulmonary edema is usually a secondary disease. There is marked dyspnea, urgent and troublesome cough, large numbers of moist rales of all sizes are heard, particularly at the base. In pneumonitis there is the onset, with chill, high temperature, rusty sputum, and the important physical signs, which consists in crepitant rales, followed by bronchial breathing, and the crepitus redux. The termination is by crisis.

In what conditions does bronchial breathing take the place of vesicular breathing?

Bronchial breathing is encountered over airless spaces in the lung tissues and over cavities. Only pulmonary tissues containing air have the property of changing into the vesicular murmur the bronchial sound as it passes through the trachea and bronchi.

What is the character of the fever curve in chronic tuberculosis?

As a rule it is intermittent in character. Occasionally, however, the inverse temperature curve is seen.

What are the physical signs in the first stage of pneumonic fever?

On inspection there is increased breathing; palpation may detect friction fremitus from the associated pleurisy. On percussion there is impairment of resonance, and on auscultation the crepitant rale is found to be present.

Relate the history of a case of progressive muscular atrophy.

The early symptoms are pain in the arm and shoulder, with numbness and a feeling of exhaustion; next atrophy is noticed, as a rule, in one hand. The wasting usually extends and the muscles supplied by the ulnar nerve are, as a rule, most affected. The motion of the fingers becomes impaired, and the wasting gradually passes up from the forearm to the arm and shoulder. Both flexors and extensors are affected. The other hand usually shows the same process within two to ten months. Sometimes the muscles of the shoulder are first affected, next the muscles of the back, hip and thigh are involved. It is rare for the muscles of the legs to be attacked. There is paralysis and fibrillary twitching. The reflexes are lost early. Reactions of degeneration set in later. One or both sides of the face may be affected. The sphincters do not share in this process.

Describe alcoholism and some of its effects.

As a rule, the onset is insidious, the symptoms consisting in fatigue, unwillingness to work and loss of energy. There is malaise, headache, general and mental depression, loss of sleep and tremor of the hands, lips and tongue. The tremor at first may be controlled. As the condition advances these symptoms become more manifest. The skin becomes flabby, the face shows

venous congestion, and acne may show itself about the nose. Symptoms of gastric catarrh are present as a rule. The tongue is flabby and furred, and the tremor is marked when the tongue is protruded. Leukoplakia may occur, especially in males. The breath is fetid, and there is great thirst. Often there is disgust for food, especially in the morning, and this is aggravated by the early morning nausea and vomiting. Insomnia is an early and almost constant symptom, and if the patient sleep at all, he is disturbed by bad dreams. Peripheral neuritis may develop. The will and intellectual faculties are greatly impaired, and there is perversion of the moral tendencies. The resistance of the body becomes lessened, so that drinkers readily succumb to the acute infectious diseases.

What is the diagnostic significance of Cheyne-Stokes respiration?

This form of respiration is very likely to be observed in disease of the brain, from disturbances of the circulation or from toxic conditions.

State where topographically mitral and tricuspid murmurs are most distinctly heard.

The mitral murmur is heard at or near the apex. The tricuspid murmur is heard a little to the right of the ensiform cartilage.

Enumerate the diagnostic sounds in a diseased respiratory apparatus.

There may be moist or dry rales, crepitant rales, friction sounds, bronchial breathing, broncho-vesicular breathing or cavernous breathing.

In what conditions does sub-normal temperature occur?

This occurs in diabetes, myxedema, chronic cardiac, renal and hepatic disease, and in many forms of insanity. It is also common in internal malignant growth. It frequently occurs after the defervescence in some of the specific fevers. It occurs in the stage of collapse in cholera.

How does paralysis of the third nerve affect the eye?

There may be ptosis, slight exopthalmus, external strabismus, diplopia and a dilated pupil which reacts neither to accommodation nor to light.

Give the causes and clinical features of purpura simplex.

This condition occurs in many diseases. It is characterized by the extravasation of blood into the skin, mucous membranes and internal organs, and sometimes by free hemorrhage from mucous membranes. The alterations in the composition of the blood in purpura are usually those of symptomatic anemia from hemorrhage. Purpura simplex is most usually met with in children. It is a mild condition, accompanied with purpuric spots upon the extremities, and sometimes upon the trunk and arms, with impairment of the appetite and diarrhea.

Make a diagnosis of cerebral tumor.

The characteristic symptoms consist in headache, optic atrophy, sensory disturbances, convulsions, vomiting, vertigo and bradycardia. The headache is almost constant, and increases in severity as the disease advances. It may often be diffuse, occupying the entire skull. Double optic neuritis is very frequent. The temperature is usually normal or subnormal. If, however, the tumor be situated in the pons or medulla there may be hyperpyrexia. Occasionally there is dyspnea, and also Cheyne-Stokes respiration. Yawning and hiccough occur.

Describe the skin appearances in (a) rubeola, (b) rubella, (c) scarlatina and (d) vericella.

(a) In rubeola the eruption appears upon the fourth day. It is maculo-papular and coarse. It appears all over the body, and is particularly marked upon the face. It is sometimes arranged in crescentic form. It disappears by fine desquamation. (b) In rubella the eruption occurs upon the first day

irregularly over the face, neck, chest, body and limbs. It is a multiform eruption, and may resemble erythema, urticaria, and in some cases even measles and scarlet fever. It may be confluent or diffuse, and usually lasts from two to four days. Desquamation occurs in fine scales. (c) In scarlatina the eruption appears at the end of the first day or beginning of the second day. It is a bright scarlet eruption, being a true inflammation of the skin. It disappears by desquamation, which is often in large scales, an entire cast of a hand or foot coming away. (d) The eruption in varicella appears upon the first day, the exanthem showing itself as small reddish points or papules, which in a few hours become vesicles. The eruption is slightly elevated above the skin, rather than having the appearance of being under the skin. The vesicles are thin and transparent, and from $\frac{1}{8}$ to $\frac{1}{4}$ of an inch in diameter. The contents are at first clear and transparent. As a rule there is no areola. In the course of a few hours the vesicle becomes milky, and begins to shrivel. The pox may appear upon the face, neck, scalp, and some parts of the trunk.

In what diseases may blood be expectorated?

As a rule it occurs in chronic pulmonary tuberculosis. It sometimes occurs in croupous pneumonia. It may result from cancer of the lungs, from abscess of the lung, from bronchiectasis, ulcerative lesions of the bronchi and frequently in disease of the mitral valve. It may occur from aortic aneurysm. Malignant disease and parasites of the lung also give rise to it. Vicarious hemorrhage. It may occur in the hemorrhagic diathesis, in purpura and trauma of the chest wall.

Give the period of incubation and of eruption of the exanthemata.

The period of incubation in scarlet fever is from four to seven days. The eruption occurs at the end of the first or beginning of the second day. The period of incubation in measles is about ten days. The eruption occurs on the fourth day. The period of incubation of rubella is about eighteen

days. The eruption appears upon the first day. The period of incubation in variola is from ten to thirteen days. The eruption appears upon the third day. The period of incubation of varicella is from ten to fifteen days. The eruption appears upon the first day.

Make a differential diagnosis between renal colic and hepatic colic.

The pain in biliary colic radiates over the upper half of the abdomen toward the right shoulder. There is tenderness over the gall-bladder. The pain in renal colic radiates less over the abdomen, but is marked down the ureter to the testicles and to the head of the penis, often irritating the rectum. There is tenderness over the kidney and in the lumbar region. In biliary colic the vomiting is pronounced and persistent. In renal colic vomiting may be present, but is never persistent. In biliary colic there are no symptoms relating to the bladder or testicle. In renal colic these symptoms are marked. The urine may contain bile in biliary colic. In renal colic the urine may contain blood and mucus. Jaundice is present in bliary colic, and entirely absent in renal colic.

Mention and describe, in regard to the feces, abnormal conditions that are of diagnostic value.

Large quantities of mucus may be present in the evacuations, showing a catarrhal condition of the mucous membrane of the intestine. Fat may occur in the stools, and be due to disease of the pancreas. Blood occurs from hemorrhage in the intestine. Pus may occur from the rupture of an abscess situated anywhere in the intestinal tract. Gall-stones and enteroliths are also diagnostic. Shreds of tissue and fibrinous casts from necrosis occasionally occur. They may be due to carcinoma of the bowel. Fibrinous casts occur particularly in the course of dysentery. Various forms of animal parasites may also be found in the stools.

Give the symptomatology of epilepsy.

As a rule the attack comes on suddenly, the patient falling

to the ground unconscious. This may or may not be preceded by an aura. At first there are tonic spasms, the patient often biting his tongue and bloody foam appearing at the mouth. This is followed by clonic spasm, and this in turn is succeeded by epileptic coma. During the attack the pupils are markedly dilated. After the attack the patient usually falls into a deep, profound sleep lasting for several hours.

Make a diagnosis of infantile spinal paralysis.

The disease begins suddenly, often with convulsions, delirium and fever. The temperature rises suddenly, usually to about 103° F., there is pain in the back and limbs, and sometimes diarrhea. Paralysis, as a rule, occurs suddenly. The paralysis is more extensive early and the muscles of the paralyzed limb soon undergo atrophy. Reactions of degeneration are marked. The legs are most often attacked. Later, as a rule, marked improvement takes place.

How may pleuritic friction sounds be distinguished from rales occurring in the bronchial tubes?

A friction sound is close to the ear; it is distinctly localized, and accompanied by pain on respiration. It may occur in inspiration or in expiration or be heard in both. As a rule there is no pain with rales; they are further from the ear and are more diffused over the chest.

What complication should be guarded against in inflammatory conditions of the ear?

The most important complication relates to an affection of the meninges. This is more apt to result from disease of the middle ear.

Define cyanosis and give its causes.

This is a blue-red condition of the skin, showing itself most prominently upon those parts that are normally bright red, such as the lips, cheeks, mucous membranes and the finger nails. Canosis is due to the accumulation of carbonic acid in the blood and a deficient amount of oxygen, the blood having a venous or hypervenous character.

What aids to diagnosis are utilized in the treatment of persons affected with stomach lesions?

Inflation of the stomach may be practiced so as to determine the size and position of the stomach. The X-ray may be used. A test meal may be given, and the contents of the stomach withdrawn after a certain time. The contents are then tested for free HCl, pepsin, lactic acid, etc.

State possible causes of dropsical conditions of the abdomen and lower extremities.

This is most often due to disease of the heart, kidneys and liver. It occasionally occurs from profound anemia, and may be due to pressure in the abdomen, as from malignant disease or aneurysm.

What causes general anemia? Make a diagnosis of general anemia.

By the term anemia is meant a deficiency of the blood, either in its bulk or in certain of its constituents. It is usually divided into primary and secondary anemia. By the term prmary—also called essential, idiopathic or cryptogenetic—anemia is meant a disturbance of the blood or blood-making organs, so that the anemia seems the distinctive feature of the disease, while other symptoms appear mainly dependent upon this change. Secondary anemia is due to some disease acting upon the blood or blood-making organs, the anemia not being the prime feature, but a symptomatic manifestation. The diagnosis depends upon a change in the blood itself, either in a diminution in the hemoglobin or in the number of blood corpuscles, or a change in both these constituents. There are also constitutional symptoms, such as pallor, shortness of breath, especially upon exertion, digestive disturbances and nervous symptoms.

Mention and differentiate the species of tenia.

In man three species of tapeworm which are fully developed commonly occur. The tenia echinococcus occurs only in its

larval form. The three varieties are tenia solium, tenia saginata and the bothriocephalus latus or tenia latus. The tenia solium is sometimes called the armed tapeworm, as the rostellum is supplied with two rows of hooklets, each row containing from twelve to fourteen hooklets. The head is quadrilateral, being supplied with four suctorial discs. The worm is about four meters long. The segments are from 6-8 mm. in breadth and from 10-12 mm. length. In the tenia saginata the head is surrounded by four suckers, with a rudimentary sucker in the middle. The segments measure from 8-10 mm. in width and are about 18 mm. in length. In the tenia lata the worm varies from 5-16 meters in length. The head is elongated, and supplied with two grooved suckers, one on each side. The breadth (1.8 cm.) of the joints is greater than the length. The mature segments show a rosette arrangement of the uterus which is characteristic.

Describe the Brand method of treatment in typhoid fever.

When the temperature in the axilla reaches 102.6° F. a cold bath is given, and repeated every three hours, the water being at a temperature of about 70° F. The patient should be immersed in the tub, the water covering all but the head; then water of a lower temperature should be poured upon the patient's head or a wet ice pack used. Gentle friction should be applied constantly by the attendants, and the patient should be encouraged to do likewise. The abdomen should not be rubbed. The duration of the bath is 15 minutes. Some alcoholic stimulant should be administered to the patient before and after the bath. When the bath is finished the patient should be lifted back to his bed and covered with woolen blankets. The temperature should be taken one-half hour afterward to note the fall produced by the bath.

Give the symptoms and treatment of myocarditis.

The symptoms may be entirely latent, and the condition in mild grades is not likely to be recognized. In the advanced

stages pain in the precordium, especially upon slight exertion, becomes prominent. It radiates and shoots down the left arm, and tingling may occur in the fingers. Shortness of breath is a prominent symptom. The apex beat is weak and diffused, the pulse is feeble, and often intermittent. Marked arrhythmia occurs. Constipation and gastric disturbances are common. In advanced stages edema of the skin may occur. The treatment consists in careful regulation of the diet, attention to the functions of the body, and the systemic use of such drugs as alcohol, strychnia, iodide of potassium and arsenic.

What is the practical import of hematuria, and how can its source be diagnosed?

Blood in the urine may be from the kidneys, in cancer acute nephritis, after powerful diuretics, etc.; from the bladder, in diphtheritic and acute cystitis, calculi, cancer, congestion, etc.; from the prostate and as a result of mechanical injury. When blood is derived from the bladder the first that is passed will contain a smaller amount of blood than the last. Blood from the bladder may be copious in amount, and this urine in contrast to that containing blood from the kidney, upon standing, will show fibrin. Blood from the kidney is more likely to be intimately mixed with the urine, and if coagula be present they are apt to be washed out. From the urethra only the last drops are likely to be bloody.

Give the etiology of scarlet fever.

Age is an important predisposing cause. It rarely occurs after the tenth year of life. Neither sex nor occupation predispose to it. The disease is more common in cold and temperate regions. Epidemics are more prevalent in the winter. In this disease there is a marked personal predisposition. One attack confers immunity as a rule. The exciting cause is not known.

Give the treatment of tic douloureux.

It is especially important to treat the underlying condition.

If the disease be reflex it is important to give attention to the affection giving rise to it. Hygienic treatment is of importance. Change of scene and residence, with good, nourishing diet, are necessary. Many drugs have been recommended for the treatment of the paroxysm, such as quinine, the coal-tar analygesics, the salicylates, caffeine, aconite, gelsemium and belladonna. Morphine should be avoided if possible, as there is great danger of the patient acquiring the opium habit. Local treatment is sometimes of use, thus hot and cold applications, liniments containing menthol, and occasionally electricity may be tried. In protracted cases surgical interference should be thought of.

Give the symptoms of appendicitis.

The onset is sudden; there is pain in the abdomen, which at first may be general or centered around the umbilicus, and occasionally in the epigastrium and in the left or right iliac fossa. In many cases the pain is confined to the right iliac fossa, and directly in the region of the appendix (McBurney's point). If the pain is general it soon localizes itself to the right iliac fossa, usually within the course of twenty-four hours. It is paroxysmal or intermittent, and colic-like. This pain may be preceded by chilliness. Frequently nausea and vomiting mark the beginning of the attack. Fever rapidly follows the onset of the disease, and is usually moderate, from 100°-103° F. Occasionally it may be absent. The frequency of the pulse generally corresponds to the degree of the fever. Constipation is commonly present. The tongue is coated posteriorly. The facial expression of the patient shows anxiety and suffering. The position of the patient is often characteristic. The right thigh is frequently partially flexed upon the abdomen, while the left leg is extended. Examination of the abdomen shows slight distension. On palpating the abdomen the right rectus muscle will be found rigid. Tenderness is as constant as pain. Pressure upon the opposite side produces pain in the region of the appendix.

In some instances the appendix may be clearly made out, and occasionally a tumor is palpable.

Define aphasia and give its etiology.

Aphasia embraces a variety of defects in the use or the comprehension of language, either spoken or written. In the majority of cases aphasia is one of the symptoms of organic local cerebral disease, occurring in the left hemisphere in the right-handed, and vice versa. It occurs in cerebral hemorrhage, thrombosis, embolism, abscess, tumor, and depressed fracture of the skull. Rarely it has been noted in hysteria and neurasthenia.

Give the diagnosis and treatment of acute follicular tonsillitis.

The diagnosis depends upon great pain in swallowing. This may be preceded by lassitude, malaise, headache, pain in the bones, vomiting, and marked fever. Examination of the throat shows redness and swelling of one or both tonsils, with yellowish-white patches upon them, varying in size from a pin-head to a split pea. These may be stripped off without leaving a bleeding surface, leaving an intact mucous membrane beneath. The breath is usually fetid. The patient should be put to bed and a laxative administered. The coal-tar products, especially phenacetine, in small doses, guardedly given, promptly relieve the pain. Ice bandages and small particles of ice in the mouth are useful. If pain and sleeplessness persists, opium, especially Dover's powder, may be administered.

Give the treatment of intestinal hemorrhage in typhoid fever.

Food and drink should be withdrawn; one or more ice-bags applied to the right iliac fossa, and opium given for effect. The head of the bed may be lowered and the foot of the bed elevated. The opium should be pushed so as to produce mild somnolence. If thirst becomes excessive, small pellets of ice may be placed in the mouth from time to time.

Give the treatment of delirium tremens.

One of the most important features in the treatment is careful feeding. Little food should be given at a time, but it should be frequently administered. If vomiting is persistent, rectal alimentation may be resorted to. If there are signs of heart failure stimulants must be administered. Strychnine hypodermically is of great value. Every effort should be made to induce sleep. The most useful agents are morphine hypodermically, or hyoscine. Chloral is also useful, but it has a depressing effect upon the heart.

Give the treatment and prognosis of progressive pernicious anemia.

Rest in bed is essential, and easily digested, nutritious foods should be given. Arsenic has been found of most value, given in the form of Fowler's solution in ascending doses. If this drug is not well borne iron may be substituted. Bone marrow is also useful. Stimulants, such as strychnine and alcohol, and inhalations of oxygen, are of advantage. The prognosis is always grave. Death results in from a few months to a few years. Apparent recovery followed by relapse is common.

Give the symptoms of acute exudative nephritis.

The disease may begin suddenly or gradually. Edema develops rapidly. The urine becomes scanty and high colored, and uremic symptoms, such as vomiting and convulsions, occur. The edema at first is most marked in the face, particularly about the eyelids. There is dull headache, with pain in the back and loins, dryness of the skin and dyspnea. The temperature is sub-febrile. The urine upon examination shows that it is decreased in amount, the color is dark red and is turbid, blood being present. The specific gravity is from 1020 to 1030, and upon testing the urine large quantities of serum albumin are found. The quantity of urea is usually less than normal. Under the microscope hyaline, granular and epithelial casts are noted, with renal epithelium, red blood cells and granular matter.

Define and describe bronchorrhea.

This is a rare form of bronchitis, characterized by an excessive amount of secretion, which is very foul. It is sometimes called purulent bronchorrhea. The quantity of expectoration varies from one to three pints. The character may be either thin or watery or it may be transparent or ropy. Dyspnea and cough are always present, often being persistent and paroxysmal.

Define hydro-nephrosis. State its causes and describe its treatment.

Obstruction to some part of the ureter, bladder or urethra may give rise to dilatation of the pelvis and tubules of the kidney from accumulation of urine. It may be due to the twisting of the ureter, it may result from congenital narrowing of the ureter or urethra, from pressure. The treatment is largely surgical. Massage may be practiced with favorable results. However, if the condition persists, aspiration and drainage are necessary.

Give the symptoms and treatment of migraine.

The principal symptom is the headache, which shows greater or less periodicity. This symptom is followed by pallor and some vasomotor spasm. As a rule the disease is unilateral, the left side being oftener affected than the right. The pupil upon the affected side is often smaller, and the eye may be retracted. Often there is disturbance of vision, the duration, however, being temporary. Occasionally, tinnitus aurium occurs, which may be associated with vertigo. These symptoms are accompanied in the majority of cases by marked gastric disturbances, such as nausea, with frequent vomiting. The treatment consists in relieving the pain and the prevention of its recurrence. The following drugs have been recommended: Ergot, the coal-tar products, salicylate of sodium, the bromides, caffeine and gelsemium. As a prophylactic, nitroglycerin taken after meals with bismuth and pepsin has been said to be of value. Mild purging with calomel from time to time often prevents attacks.

Mention a disease of the nervous system in which the patella reflex usually disappears; one in which it is usually exaggerated.

In locomotor ataxia the knee-jerk usually disappears; in spastic paraplegia, as a rule, the knee-jerk is exaggerated.

Define myxedema and give its treatment.

This is a disease characterized by a myxomatous change in the subcutaneous tissues due to pathologic lesions in the thyroid gland causing diminished or absent secretion. Thyroid extract should be administered as early as possible, and should be continued until all the symptoms disappear, and then a prophylactic dose must be given regularly. General tonics, such as iron, quinine and strychnia, are of value.

Define simple acute stomatitis; at what age is it most common and what is its treatment?

This is an inflammation of the mucous membrane of the mouth. The disease is most frequent in children, but may also occur in adults. The treatment consists in cleanliness, careful feeding, and the use of a mild alkaline mouth wash. A mild purge is often advantageous.

Give the causes and treatment of bronchial asthma.

The disease is sometimes hereditary. It is more common in males than in females. It may follow an attack of bronchitis, and is commonly associated with chronic bronchitis and emphysema. The inhalation of dust, the pollen of certain plants, fog, fumes, vapors, odors that emanate from certain animals may produce an attack of asthma. Reflex causes, as irritation from nasal polypi, causes relating to the gastro-intestinal tract, skin or genito-urinary center may act in a like manner. For the treatment of the paroxysm narcotics and anti-spasmodics are usually employed. Chloral, whiffs of chloroform or ether, amyl nitrite by inhalation, or morphia and atropia hypodermically are useful drugs. Relief sometimes follows the inhalation of nitre-paper cigarettes,

which also contain lobelia and stramonium. Sinapisms and turpentine stupes to the chest may be of value.

Give the treatment of an acute attack of gout.

A mild laxative at the onset is useful. The affected joint should be kept at rest, and a diet of milk and farinaceous articles, with plenty of water, should be insisted upon. If the pain become severe opium in some form must be administered. For the attack itself colchicum is the remedy. Iodide and bromide of potassium are also useful, as are also the salicylates and the salts of lithia.

State the prognosis in aneurysm of the thoracic aorta.

The prognosis is always grave, death invariably resulting.

Differentiate broncho-pneumonia and incipient phthisis.

This is very frequently difficult, incipient phthisis often occurring as a localized broncho-pneumonia. Broncho-pneumonia follows an acute bronchitis, making itself known by a rise in temperature over 103° F., by an increase in the respiratory and pulse rate, the pulse commonly running from 120-160 per minute, while the respiratory rate may be from 40-80 per minute. Broncho-pneumonia occurs at the extremes of age. The physical signs of well-developed broncho-pneumonia are, upon inspection, an increased respiratory rate; on palpation, increased vocal fremitus in areas over both lungs; upon percussion, localized areas of dulness over both lungs (more marked posteriorly) surrounded by a tympanitic area; on auscultation, broncho-vesicular breathing subcrepitant rales mixed with large and small mucous rales. The physical signs are all more marked posteriorly, and are usually well marked at the bases.

Incipient phthisis has a gradual onset with loss of appetite, gastric disturbance, slight evening rise of temperature (100° or thereabouts), anemia and general malaise. There is, as a rule, slight cough with scanty expectoration (the tubercle bacillus may be found in the expectorated material). Occa-

sionally there is slight hemotysis or the sputum may be blood-tinged; there is a progressive loss of weight. The physical signs relate principally to the apices. There is a slight impairment of resonance at one or both apices on percussion, and upon auscultation there may be heard slight friction sounds, harsh breathing and some fine moist rales.

What are the diagnostic signs of retro-pharyngeal abscess?

This may follow the infectious fevers, such as scarlet fever or diphtheria, usually in young children, ocasionally due to caries of bone. There is pain on swallowing (dysphagia), difficulty in breathing, occasionally hoarseness, cough and stiffness of the neck. Upon examination of the throat by inspection and palpation there is discovered a fluctuating tumor which projects from the posterior wall of the pharynx.

Differentiate tonic and clonic spasms.

A tonic spasm is a continuous spasm; a clonic spasm is an interrupted one with contraction and relaxation.

Describe the symptoms of a case of apoplexy due to cerebral hemorrhage.

Prodromes may precede the attack, such as nausea, vomiting, vertigo. As a rule, the attack comes on suddenly, the patient becoming comatose. The face is flushed or pale. There is stertorous breathing, occasionally of the Cheyne-Stokes type. There is conjugate deviation of the head and eyes; the pupils are irregular, and there is evidence of hemiplegia.

Differentiate acute bronchitis from lobar pneumonia.

In acute bronchitis there is cough, at first without, later with mucopurulent expectoration; subfebrile temperature, and slight pain under the sternum. There are no changes from the normal on percussion, but upon auscultation there are at first dry rales, followed by moist rales. Lobar pneumonia is characterized by sudden onset, with marked chill, high temperature, "stitches in the side," cough, a sputum which

is very tenacious and often rusty; full pulse at first, later becoming rapid. The physical signs are quite characteristic. There is, in the first stage, the crepitant rale, in the second stage dulness on percussion with bronchial breathing and, in the last stage, "crepitus redux."

Differentiate hemoptysis and hematemesis.

Hemoptysis.	*Hematemesis.*
Blood is bright red and frothy; often coughed up.	Blood is dark, clotted and often mixed with food; is vomited. Stools may be tarry.
Alkaline in reaction.	Acid in reaction.
Containing air bubbles.	Air bubbles absent.
Tubercle bacilli may be present in the blood.	No tubercle bacilli in the blood.

Differentiate rheumatism from gout.

Gout occurs suddenly and shows a special preference for the smaller joints, especially the great toe. Rheumatism comes on more gradually and attacks principally the large joints. The appearance of the joint in gout is swollen, glossy, tense and bluish. There is less sweating and less fever than in rheumatism; gastric and nervous symptoms are never prominent. Implication of the membranes of the heart in gout is decidedly less frequent than in rheumatism.

Differentiate intestinal colic, uterine colic and renal colic.

Intestinal Colic.—Diffuse pain, which may be localized, very severe in character; usually of sudden onset, relieved by pressure; lasting, as a rule, a few hours. A free discharge of flatus relieves the attack.

Uterine Colic.—The pain is in the pelvis, there is some history of uterine discharge and disease.

Renal Colic.—The pain starts from the region of the kidney, shooting down the ureter. There is retraction of the testicle; often nausea and sometimes vomiting.

Give the physical signs of the most usual valvular lesion of the heart.

Mitral insufficiency is the most common valvular lesion of the heart. The physical sign is a murmur at the apex, systolic in time and transmitted to the left axilla and the angle of the scapula.

Differentiate pleurisy and pneumonia.

In pleurisy there is a friction sound heard commonly both in inspiration and expiration; fever is slight, there is marked pain in breathing. There may be slight cough. In the first stage of pneumonia there is a pleurisy, especially when the inflammatory exudate reaches the periphery of the lung. There is high fever, which is preceded by a marked chill, cough, rusty sputum and the physical signs (crepitant rale, dulness on percussion, bronchial breathing and crepitus redux).

What conditions might cause alvine discharge containing fat?

In obstructive jaundice fatty stools are sometimes noted; they occur occasionally in overfed infants. Fatty stools are often indicative of disease of the pancreas, such as cancer or pancreatic calculi.

Give the characteristic symptoms of purpura hemorrhagica.

Hemorrhages from the mucous membranes and extravasation in the cutaneous surfaces; great weakness, anemia due to loss of blood. Fever is present, as a rule.

What conditions increase the amount of uric acid voided with the urine?

Increased by diet (fat and sugar), muscular exercise. In the acute fevers (pneumonia and rheumatic fever), in leukemia and in disease of the spleen generally; in diabetes and in lithemia. It is decreased in amount under strict milk diet, in

anemia, chronic lead-poisoning and chronic interstitial nephritis.

Differentiate thrombosis and embolism.

Thrombosis.—Prodromes are common, drowsiness and headache, the onset of the attack is insidious. Hemiplegia gradual in onset. Ocular and other nerve palsies.

Embolism.—Loss of consciousness rapid, hemiplegia and disturbances of the pulse and respiration. Embolism is more frequent in the left side of the brain, hence valvular disease favors embolism.

What diseases are liable to occur in the right inguinal region?

Appendicitis, floating kidney, disease of the liver and of the bladder.

Distinguish between the terms illusion, delusion and hallucination as used in diagnosis.

An illusion is a wrong conception of an object which really exists. A delusion is an absurd and unfounded belief. A hallucination is a sense perception without a physical basis.

Give the physical and rational signs of pericarditis before and after effusion.

There is slight fever, marked pain in the precordial region, dyspnea and irregular, usually quickened, pulse. There is pericardial friction on auscultation. When effusion occurs the friction disappears; there is dulness in the precordial area, the base of dulness being at the apex of the heart, quite the reverse from the usual condition.

Define vocal fremitus and state its significance in pulmonary disease.

Vocal fremitus means the vibrations of the voice which are transmitted to the chest wall. These are conducted from the larynx by the trachea and bronchi to the smaller tubes within the lungs, and thence through the lung tissue to the

surface. Vocal fremitus is increased by consolidated lung tissue; it is increased from an empty pulmonary cavity superficially situated, and is diminished or lost on accumulation of fluid in the pleural cavity.

Differentiate between sunstroke (coup de soleil) and apoplexy.

In sunstroke there is the history of exposure to the sun. The temperature is very high, 105°-115° or over, but no evidence of hemiplegia. In apoplexy there is conjugate deviation of the head and eyes, hemiplegia, irregular pupils, never so high a temperature, and full, bounding pulse.

What casts are frequently found in albuminous urine and what do they denote?

Hyaline, granular, epithelial and blood casts. Hyaline casts probably result from the exudation or secretion of a material from the epithelial cells lining the tubules. They are sometimes found in healthy individuals. Granular casts indicate nephritis. Epithelial casts are always indicative of a renal lesion. Blood casts are found in acute parenchymatous nephritis or in a condition in which the renal tubules become filled with red blood corpuscles.

Of what import is the spleen in the diagnosis of febrile conditions? Give the topography of the spleen.

As a rule, the spleen is enlarged in all febrile conditions. The spleen extends from the ninth rib to the margin of the twelfth rib in the midaxillary line of the left side.

Differentiate the crepitant rales and the subcrepitant rales and give the clinical significance of each.

The crepitant rale is a fine moist rale and is heard only at the end of inspiration. It is found in the vesicular structure of the lung. The subcrepitant rale is also a fine moist rale, somewhat coarser than the crepitant rale, found in the finer bronchi and heard both in inspiration and in expiration. The crepitant rale is heard in croupous pneumonia, broncho-

pneumonia, hemorrhage, pulmonary infarcts, edema of the lung and sometimes in tuberculosis. The subcrepitant rale is heard in congestion and edema of the lungs, in hemorrhage or in any condition in which fluid is present in the finer bronchi; in pulmonary tuberculosis, in the third stage of croupous pneumonia and in broncho-pneumonia.

What are the manifestations of hereditary syphilis?

The child at birth is very feeble, and the eruption may be present; the child snuffles, the mouth is fissured, and the lips are ulcerated. Liver and spleen are enlarged, and bone symptoms are prominent. If the symptoms do not appear at birth, they will appear at or about the third month. There is then nasal catarrh, with a seropurulent discharge. Necrosis of bone is rapid, and the nose undergoes a characteristic deformity. Lesions of the skin also appear. When the teeth appear they are notched (Hutchinson's teeth).

Make a diagnosis of aneurysm of the descending aorta.

There is marked pain, especially in the back, and a large tumor may appear posteriorly in the scapular region. Paraplegia may occur from pressure on the cord, dysphagia from pressure on the esophagus, and pulmonary symptoms from pressure on the left bronchus. There are, besides, all the physical signs of aneurysm in any other locality, such as expansible pulsation, tumor, bruit and thrill.

Make a differential diagnosis of pleuritic and pericardial effusion.

If the pericardial effusion be very great, it may much resemble a left-sided pleural effusion. In pericardial effusion, however, there is pulmonary resonance at the base, Skodaic resonance in the axilla, and the heart is not displaced to the right of the sternum. The dyspnea is greater in pericarditis with effusion, and the paradoxical pulse may be present. An antecedent history of rheumatic fever may help the diagnosis and favor pericarditis.

Describe the treatment of hay fever.

A change of residence before the annual attack is the only prophylaxis; a correction of the neurotic and gouty tendency of the individual should be attempted. A spray to keep the nasal passages clean is important. A weak solution of cocaine for this purpose is valuable. Suprarenal extract appears to give the best results both locally and internally.

Define epidemic parotitis. What complications may arise in the course of this disease?

There is abrupt development of fever and an enlarged parotid gland on one side. Inflammatory edema of the surrounding tissue is common, the ear may be pushed upward. The mouth is displaced and the face disfigured. The fever is usually about 102°. In some cases the opposite gland becomes affected after a few days. Suppuration does not occur. Occasionally other glands, such as the testicles, ovaries and mammary glands, are affected.

Define chlorosis.

Chlorosis is a form of primary anemia, affecting chiefly females at the time of puberty, and characterized by marked diminution of the hemoglobin.

INDEX.

Abdomen, regions of, 39
Abdominal aorta, 32, 71
muscles, 10
viscera, 27
Abortion, 456, 457, 458, 459
Abscess, 326, 370, 387, 389
Absorption, 104
Accomodation, 82, 108
Acetabulum, 14
Acetanilide, 548, 575
Acetic acid, 184, 208, 590
Acetone, test for, 303
Acetous fermentation, 196
Acids, definition of, 203
corrosion by, 181
antidote for, 248
Aconite, 522, 549, 562, 565
Aconitine, dose of, 546
Acromegaly, 366
Adenoma, 387
Adipose tissue, 317
After pains, 474
Agglutinins, 326
Air, analysis of, 260
Albuminoids, 185
Albumin, test for, 188, 192, 233, 246
Albuminuria of pregnancy, 454
Albumose, 303
Alcohol, 183, 269, 545, 608
drinking of, 90, 141, 142, 166, 330, 416, 541, 651, 672
methyl, 288
percentage in wines, 183
Alcoholic fermentation, 235
liquors, 201, 210, 231, 239
Aldehydes, 300
Alimentary canal, 50
Alkali, 204
group, 268
Alkaloids, 182, 271, 290
Allantois, 438
Allotropism, 217
Alloy, 224
Aloes, 554
Altitude, effect of, 169
Alum, 251, 261, 554
Aluminum, 207, 228
Amalgam, 224
Amenorrhea, 512
Amid, 179
Amins, 254
Amnion, 438
Amorphous, definitions of, 175, 265
Ammonia, 204, 281, 286, 299, 549
Ammonium, 279
Ammonium compounds, 178, 231, 262, 549, 554, 572
source of, 178
Amphiarthrosis, 19
Amputations, 364, 390, 425
Amyl nitrite, 528, 540
Amyloid degeneration, 308, 325, 335
Anatomy, 9
Anemia, 308, 311, 315, 335, 512, 520, 678
pernicious, 315, 669, 683
Anesthetics, 197, 221, 385, 535, 609, 610, 611, 612
Aneurysm, 321, 352, 366, 388
Angina pectoris, 616, 633
Angioleucitis, 336
Angiomata, 319, 386
Anhydride, 211
Anilid, 179
Anilin, 299
Ankle joint, 16, 38, 41, 389
Ankylosis of jaw, 340
of joints, 344
varieties of, 402
Anodynes, 521
Anospinal center, 112
Antagonist, 552
Anthelmintics, 581
Anthrax, 618
Antidotes, 254, 552
Antimony, 265, 302
Antipyretics, 564
Antipyrine, 559, 592

Antiseptics, 566
Antitoxin, 145, 571
Antrum maxillae, 430
Aortic aneurysm, 623, 686, 692
insufficiency, 86, 645, 669
stenosis, 645
valve, 102
Aphasia, 125, 682
Aphonia, 125
Apnoea, 92
Apomorphine, 540, 594
Aponeurosis, 14
Apoplexy, 416, 533, 634, 651, 687, 691
Appendicitis, 36, 362, 650, 663, 681
Appendix vermiformis, 22, 46
Arnica, 605
Arsenic, 177, 194, 197, 217, 243, 283, 302, 532, 586
Arterial pulse, 643
Arteries, aorta, 32, 48
axillary, 20
basilar, 44
brachial, 18, 29
carotid, 11, 45
celiac axis, 65
degeneration of, 323, 324, 335
femoral, 23, 27
intercostal, 29
internal carotid, 40
internal iliac, 67
ligation of, 348, 356, 382, 384, 385, 390, 391, 392, 399, 402
meningeal, 38, 354
of bladder, 41
of forearm, 41
of hand, 52
of heart, 30
palmar arch, 36
popliteal, 65
post-tibial, 60
pulmonary, 70
structure of, 105
subclavian, 26
ulnar, 68
Arthritis deformans, 327
Arytenoid cartilages, 67
Asafetida, 540
Ascites, 321, 420, 654
Asphyxia, 74, 121
Asthma, 532, 685
Astigmatism, 131
Atavism, 91
Atheroma, 320
Atmosphere, composition of, 198
Atom, definition of, 189
Atomic theory, 216
weight, 174, 199, 211
Attraction, forces of, 192
Atrophy, 318, 401
Atropine, 261, 527, 538, 603
Auditory apparatus, 17
vertigo, 117
Aural labrynth, 65
Axilla, 32

Bacteria, 308, 335, 336
Baking powder, 282, 294
Ballottement, 446
Balsam of Peru, 529
Barley water, 564
Barometer, 264
Base, definition of, 209
Basic radical, 209
Bassini's operation, 369
Bathing, 155
Baths, 137, 153, 169
Belladonna, 528, 531, 542, 554, 558, 568, 579
Benzene, 270
Benzoin, 591
Bile, 108, 109, 134, 207
duct, occlusion of, 337
test for, 246
Biliary calculi, 238, 614, 617, 625, 632, 648
Bilirubin, 303
Binary compounds, 203
Bismuth, 263, 298, 572, 585
Bladder, 27, 28, 58, 425
injections for, 596
Blisters, 524
Blood, circulation of, 93
coagulation of, 74, 97
composition of, 104
corpuscles, 105, 110, 114, 116, 124
description of, 128
expectoration of, 675
function of, 78, 104
plasma, 333
pressure, 93, 98
quantity of, 76
reaction of, 133
stains, 120
tests for, 246, 302
vessels, 81
Blow-pipe, 201, 271

Blue pill, 591
Blushing, 92
Body, composition of, 94
Bones, clavicle, 28
frontal, 36
humerus, 12
inflammation of, 324
malar, 41
occipital, 16
of foot, 16
of hand, 44
of head, 14
of heel, 30
of pelvis, 31
ossa innominata, 57
parietal, 78
patella, 31
radius, 32
sternum, 58
superior maxilla, 59
Borax, 527, 604
Boric acid, 527
Boroglycerid, 230
Boron, 255
Brachial plexus, 9
Brain, anemia of, 320
convolutions of, 52
corpus callosum, 71
cortex cerebri, 80
fissure of Rolando, 69
Sylvius, 29, 69
fourth ventricle, 41
function of, 73
gray matter of, 134
lobes of, 23, 45
medulla oblongata, 63, 89
membranes of, 25, 120
motor area of, 118
pia mater, 44
pons varolii, 26
tumor, 422
ventricles of, 41, 43
Brand treatment, 679
Breasts, removal of, 343
Bright's disease, see Nephritis
Bromides, 519, 540, 589
Bromine, 216
Bromism, 543
Bryonia, 546
Bubonic plague, 139, 333
Buchu, 557, 559
Buckthorn, 589
Bunions, 364
Bunsen burner, 202
Burns, 342, 389
Bursitis, 364
Butter, 137, 186
Butyric acid, 298

Caffeine, 535, 565
Calabar bean, 531, 542
Calcific metamorphosis, 334
Calcium chloride, 544
Calculi, biliary, 238, 614, 617, 625, 632, 648
urinary, 187, 304
Calculus formation, 225
Calomel, 216
Camphor, 530, 538, 591, 603
Camp hospital, 150
Cannabis Indica, 543, 574
Cantharides, 527, 560, 595
Capillaries, 83
Capillary attraction, 254, 290
Capsicum, 548, 587
Caput succedanum, 463
Carbohydrates, 220, 223, 241, 264
Carbolic acid, 184, 291, 523, 548, 552, 608
Carbo ligni, 534, 588
Carbon, 259
oxides of, 220, 273, 280
Carbuncle, 387
Carcinoma, 310, 313, 314, 367, 427, 428
Cardamon, 537
Cardio-inhibitory centers, 127
Caries, 317
Cartilage, 87, 124
Cascara sagrada, 548, 565
Castration, 396
Casts in urine, 691
Cataphoresis, 610
Cathartics, 532, 588
Cecum, 39
Celiac axis, 65
Cell growth, 121
Cells of body, 114, 124
Cemeteries, 155
Cerebellum, 73
Cerebral hemorrhage, 307, 332
softening, 316
tumor, 674
veins, 61
Cerebro-spinal fever, 314, 661
Cerebrum, removal of, 76
Cerumen, impacted, 408
Cervical caries, 397
vertebrae, 14
Cervix uteri, 70, 492

Cesarian section, 506
Chancre, 430
Chancroid, 426, 430
Chemical action, 196, 213
affinity, 173
Chemistry, 240
Chest in respiration, 116
Cheyne-Stokes respiration, 673
Chicken-pox, see Varicella
Chloral, 229, 238, 521, 580, 587
Chlorides, 196
Chlorinated lime, 219
Chlorine, 178, 206, 224, 248
Chloroform, 183, 229, 248, 256, 274, 569, 579, 609, 611
Chlorosis, 512, 663, 693
Cholagogue, 539
Cholera, Asiatic, 160, 626, 652, 669
morbus, 620, 652
Cholesterin, 114
Chorda tympani, 75
Chorea, 614, 668
Chyle, 74, 103
Chyme, 74
Chromic acid, 551
Chromium, 301
Cicatricial changes, 323
Ciliary processes, 72
Cinchona, 522, 574, 584
Cinnamon, 579
Circumcision, 406
Cirrhosis of liver, 310, 314
Citric acid, 293
Clavicle, 28
Climate, 146, 153
Clubfoot, 403
Coal gas, 600
oil, 289
Cocaine, 524, 550, 605
Codeine, 559
Coffee, 165
Colchicum, 527, 539, 548, 601
Colic, 688
Collodion, 181, 581
Colloid degeneration, 311
Collyrium, 566
Colocynth, 539, 608
Color blindness, 120
sensation, 95
Colostomy, 365
Columnae carneae, 133
Coma, 416
Combustion, 201
Comma bacillus, 309
Complimental air, 126
Compounds, 240
Congestion, 350, 363
Conium, 531, 541
Connective tissue, 9, 113
Constipation, 144
Convallaria majalis, 535
Cooking, effect of, 157
Copaiba, 609
Copper, 177
sulphate, 242, 519, 539, 604
Corpus luteum, 119
Corrosive sublimate, see Mercuric chloride
Coryza, 657
Cough, prescriptions for, 531, 547, 600
Craniotomy, 505
Cream of tartar, 262
Cremation, 167
Creosote, 559, 582
Cretinism, 315
Croton oil, 519, 551
Croup, 604, 613
Crystalline, definition of, 175
lens, 24
Crystals, formation of, 197
Cubebs, 551
Curare, 559
Cyanogen, 227
Cyanosis, 677
Cystocele, 571
Cysts, 308

Death-rate, average, 138
Death, changes in body after, 209
Decay, 266
Defecation, 112
Degeneration, 311
Deglutition, 74
Delirium tremens, 661, 683
Dermoid cysts, 418
Destructive distillation, 195
Diabetes insipidus, 624
mellitus, 619, 624, 643, 656, 663
Diacetic acid, 303
Dialysis, 244
Diaphoretics, 532, 541, 598
Diaphragm, 23, 77, 110
Diarrhea, 568
Diarthrosis, 19
Diet, 73, 98, 121, 133, 144, 163, 237
Digestion, 77, 82, 96, 101, 104, 106, 126
Digestive secretions, 79, 84, 86

Digitalis, 523, 553, 561, 565, 570, 592, 594
Diphtheria, 143, 150, 158, 165, 309, 315, 627, 630, 649, 669
Disinfectants, 155, 157, 159, 215
Dislocations, 389, 396, 427, 429
elbow, 374
forearm, 431
head of femur, 373
hip, 391, 415
inferior maxilla, 394
knee, 419
shoulder, 350, 376, 394, 413
Diuretics, 525, 532, 584
Donovan's solution, 538
Dosage for children, 595
Dover's powders, 555
Dropsy, 670, 678
Ductus communis choledochus, 9
Duodenum, absorption from, 93
Dura mater, 37
Dysentery, 650
Dysphagia, 92, 366, 623
Dyspnoea, 92
Dystocia, 480

Ear, diseases of, 385, 396
Eclampsia, 493, 494
Ectopic pregnancy, 459, 460
Eczema, 315, 333
Edema, 308
Effervescence, 234
Efflorescence, 234
Elastic tissue, 112
Elaterin, 582
Elbow, 27, 47
resection of, 422
Electric battery, 285
light, 256
Electricity, 271
Element, definition of, 206, 240
Embolism, 320, 690
Embryotomy, 505, 506
Embryo, human, 443
Emetics, 532, 569
Emmenagogue, 531
Emulsification, 109, 561
Emulsion, 270
Encephalon, 88
Endemic diseases, 135
Endocarditis, 624, 635, 637, 650
Endocardium, 26
Endometrium, diseases of, 456, 510
Endosmosis, 229
Endothelium, 11
Enteric fever, see Typhoid
Enteritis, 319, 644, 650
Enzymes, 223
Epidemic diseases, 135
Epiglottis, 88
Epilepsy, 618, 648, 676
Episiotomy, 470
Epistaxis, 413
Epithelioma, 308
Epithelium, 65, 73, 122
Epsom salts, 598
Equations, chemical, 196, 199, 204, 210, 213, 217, 218, 223, 226, 227, 229, 242, 244, 250, 251, 256, 258, 263, 266, 267, 269, 274, 279, 285, 286, 287, 289, 296, 297, 298, 300, 302
Erectile tissue, 106
Ergot, 530, 560, 597
Eruptive fevers, 639, 658
Erysipelas, 410, 616, 655
Erythroxylon, 572
Escharotics, 567
Eserine, 580
Esophageal stricture, 386, 620
Esophagus, 42, 46
Ether, 245, 270, 521, 610, 612
Ethers, compound, 208
Eucalyptus, 596
Eustachian tube, 23, 119
Eutocia, 483
Evaporation, 198
Exanthemata, 675
Excipient, 563
Excreta, disposal of, 162
Exophthalmic goitre, 636
Exophthalmos, 396
Eye, 40, 42, 59, 65, 66
enucleation of, 403, 412
movements of, 110
pupil of, 89
refractory media of, 99

Factory hygiene, 139
Fallopian tubes, 36
Faradic current, 258
Fats, 80, 186, 287
Fatty degeneration, 318
infiltration, 318
metamorphosis, 312
Favus, 335
Feces, 89, 147, 676
Fecundation, 437
Fehling's test, 249, 262, 304

Female reproductive organs, 433
Femoral hernia, 46
Fermentation, 277
Fetal heart sounds, 446
Fetus, 444, 445, 474
Fibrinous degeneration, 314
Fibromata, 318
Fibrous tissue, 112, 310
Filth diseases, 140
Filtration, 198
Fire damp, 235
Fissure of Rolando, 69
Sylvius, 29, 69
Fistula, 403
in ano, 351, 352
Flame, chemistry of, 279
Fluid extracts, 587
Fluorine, 230, 301
Fontanels, 445
Foods, 73, 75, 76, 83, 87, 98, 108, 111, 147, 159
Foramen ovale, 71
Foramina of skull, 15
Forceps, use of, 501, 502, 503, 514
Forests, effect of, 148
Formulae, 193, 212
Fowler's solution, 273, 538, 601
Fractures, 347, 393, 395, 409, 421, 425, 428, 429
clavicle, 400
femur, 373, 380, 421
forearm, 363
inferior maxilla, 412
humerus, 350
nasal bones, 355
patella, 379
Pott's, 340
ribs, 415
skull, 343, 347, 349, 378, 409
Fruit acids, 256
Funis, prolapse of, 499
Furuncle, 387

Galactogogue, 599
Galactorrhea, 497
Gall bladder, 41
stones, see Biliary calculi
Gallic acid, 524, 562
Galvanic cell, 213
definition of, 175, 176
Gamboge, 609
Gangrene, 313, 318
Gas, definition of, 200
illuminating, 214
Gaseous elements, 240
Gastralgia, 638
Gastric juice, 120
Gastritis, 658
Gastrocnemius, 12
Gastro-duodenitis, 542
Gastrotomy, 398
Gelsemium, 537, 584, 588, 589
Genitalia, 352
Gentian, 587
Genu valgam, 397
Germicide, 557
Germ theory, 149
Giant cell, 317
Glands, ductless, 115
excretory, 132
of small intestine, 34
Glauber's salt, 598
Glaucoma, 424
Gliomata, 396
Globulins, 210
Glottis, edema of, 623
Glucose, 204, 210
Glucosides, 563
Glycerin, 208, 271, 605
Glycogen, 212
Gold, 527
Gonorrhea in obstetrics, 497
Gossypium, 572
Gout, 320, 321, 613, 686, 688
Gravitation, 211
Groin, 384
Guaiacum, 580, 589
Guarana, 556
Gum arabic, 591
Gun-cotton, 181, 252
Gunshot wounds, 377

Hair follicle, 62
Halogens, 177, 198, 206
Hamamelis, 559
Hammer-toe, 418
Hamstring muscle, 29
Hare-lip, 414
Haversian system, 66
Hay-fever, 693
Hearing, organs of, 99
Heart, arteries of, 30
apex beat of, 111
columnae carneae, 133
description of, 652
dilatation of, 652
fatty changes in, 313
hypertrophy of, 312, 652
palpitation of, 626

Heart, rate of, 91, 109
remedies, 550, 592
revolution of, 80
sounds, 120, 125, 645, 661, 662, 667, 673
valvular diseases of, 312, 328, 652, 689
ventricles of, 11, 16
weak, training for, 141
Heating of houses, 147
Heat production, 114
prostration, 151, 652
Hectic fever, 334
Heel, bones of, 30
Hematemesis, 620, 688
Hematics, 560
Hematocele, 491
Hematosalpinx, 509
Hematoxylon, 581
Hematuria, 680
Hemoglobin, 92, 187, 257
Hemophylia, 619
Hemoptysis, 660, 680
Hemorrhages, 323, 371, 385, 427
cerebral, 623, 665, 669
in obstetrics, 491
pulmonary, 629
Hemostatic, 558
Hemothorax, 642
Hepatitis, 622
Hernia, 352, 353, 369, 375, 376, 386, 388, 398
Herpes progenitalis, 430
zoster, 636
Hiccough, 550
Hip joint, 45
Humerus, 12, 18
Humidity, effect of, 170
Hunger, 77
Hydatid pregnancy, 439
Hydrargyri iodidum rubrum, 574
Hydrargyrism, 574
Hydrarygrum cum creta, 573
Hydrastis, 576
Hydrate, 203
Hydrogen, 201, 205, 206, 280
dioxide, 220, 285, 577
sulphide, 177, 224, 265
Hydrobromic acid, 293
Hydrocarbon, 258
Hydrocele, 388, 407
Hydrocephalus, 498, 617, 658
Hydrochloric acid, 262, 303, 544, 558
Hydrocyanic acid, 284, 295, 299, 604
Hydrogogue, 539
Hydronephrosis, 684
Hydrophobia, 345
Hydrosalpinx, 509
Hydrothorax, 655
Hydride, 278
Hydriodic acid, 293
Hygrometer, 264
Hyoscine, 541, 563, 566
Hyoscyamus, 541, 571
Hyperemesis, 449
Hyperemia, 311, 334
Hypermetropia, 131
Hypertrophy, 427
Hypnotics, 566
Hypochondriac region, 16, 38
Hypodermic medication, 521
Hypodermoclysis, 598
Hypospadias, 397
Hypostatic inflammation, 334
Hysterectomy, 481, 506
Hysteria, 648

Ice, artificial, 151
Ichthyol, 562
Icterus, 321, 667
Ileocecal valve, 40, 88
Illuminating gas, 233
Immigrant inspection, 168
Immunity from disease, 136, 307, 309
Incompatibility, 523, 531, 593
Indian hemp, see Cannabis Indica
Indican, 304
Infant, care of, 475, 477, 478, 500, 515
feeding, 154
Infantile paralysis, 677
Infarct, 320
Infectious diseases, 136
Infiltration, 311
Inflammation, 314, 316, 318, 321, 325, 332, 381, 414, 415, 430
Inflammatory fever, 372
Influenza, 660
Inguinal canal, 26, 30
Insemination, 436
Insolation, 616
Insomnia, 539
Intercostal neuralgia, 657
Intermittent fever, 571, 658
Intervertebral substance, 72
Intestinal bacteria, 97
colic, 688
glands, 34, 113
indigestion, 571
obstruction, 383, 419, 633

Intestinal villi, 113
Intestine, large, use of, 125
Intussusception, 388
Involution, 473
Iodine, 237, 537, 541
Iodism, 576
Iodoform, 216, 560, 575
Ions, 300
Ipicacuanha, 535, 565
Iris (of eye), 515
versicolor, 572
Iron, 276
compounds of, 176, 179, 217, 260, 556
group, 289
reduced, 370
tests for, 178
Ischio-rectal abscess, 339, 377
fossa, 11
Isomerism, 209, 226
Isomorphous, 175, 265

Jaborandi, 523, 547
Jalap, 578, 589
Jaw, excision of, 391
Juniper, 602

Kidney, 11, 33, 37, 82
circulation of, 18
degeneration, 331
Koumis, 573
Kousso, 609
Knee joint, 64, 343

Labor, delayed, 489
diagnosis of, 461
management of, 467, 469, 470, 471, 472, 473, 477, 479, 483, 484, 485, 486, 487, 488, 490, 513, 518
mechanism of, 462, 463, 464, 465, 486, 514, 515
pains, 462
precipitate, 488
preparation for, 460, 468, 471
stages of, 461, 466
Lachrymal duct, 339
gland, 64
Lactic acid, 298, 607
Lactose, 599
Lactucarium, 548
Lanolin, 575
Lardaceous degeneration, 325
Laryngismus stridulus, 667
Larynx, 25
Larynx, stenosis of, 409
ventricles of, 27
Latent heat, 211
Lateral sinus, 51
Laws of combination, 203
Lead, 180, 231, 546
antidote for, 212
poisoning, 621
test for, 222
Leontiasis ossia, 366
Leucomaines, 119
Leukemia, 311, 625, 638
Lignum vitae, 577
Lime, 586
water, 599
Limonis sulcus, 580
Linamentum calcis, 578
Linea alba, 61
Linum, 576
Lipomata, 319
Liquor amnii, 438
Lithium, 191, 261, 519
Litholapaxy, 392
Lithotomy, 419
Litmus, 200, 229
Liver, 9, 36, 73, 87, 132
abscess of, 657
amyloid, 330
atrophy of, 324, 336
cirrhosis of, 614
hemorrhage of, 340
hyperemia of, 326
percussion of, 666
Lobelia, 519
Locomotor ataxia, 319, 666
Lotio hydrargyri flava, 546
nigra, 556
Lunar caustic, 176
Lungs, 37, 64, 132
gangrene of, 659
Lupus, 403
Lymph, 103, 108
Lymphadenitis, 334
Lymphangitis, 336
Lymphatic glands, 10, 69, 71, 325, 331
system, 122
Lymphorrhagia, 323, 325

Magnesia, 602
Malaria, hygiene of, 135
Malleability, 229
Malleolus, external, 35
Mammary abscess, 496
glands, 59, 451

Manganese, 577
Manure, disposition of, 156
Marsh's test, 194
Mastication, 32
Mastitis, 496
Materia medica, definition of, 536
Maxillary sinus, 48
Measles, see Rubeola
Meat inspection, 170
Meconium, 446
Mediastinum, 69, 72
Medulla oblongata, 63, 89
Meibomian glands, 18
Melanosarcoma, 309
Membrana tympani, 344
Membranes, mucous, serous and synovial, 116
Meniere's disease, 117
Meningitis, 309, 633, 653, 659, 664, 666
Menopanse, 512
Menstruation, 434, 435
Mentha piperita, 574
Mercury, 193, 266, 595, 596
  chlorides of, 216, 245, 286, 291, 520, 532, 546
  iodides of, 293
Metabolism, 75
Metals, 211
Methane, 182
Metric system, 239, 265, 297
Micturition, 85
Migraine, 684
Milium, 406
Milk, adulteration of, 157
  composition of, 237
  cow's, 186, 291
  diseases conveyed by, 167
  human, 94, 186, 291
  inspection of, 170
  modified, 136
  souring of, 238
  sterilized, 151, 170, 278
Mineral water, see Water
Miscarriage, 456
Mixture, definition of, 240
Molecule, definition of, 189
Morbus coxae, 345, 399
Morphine, 226, 534
Mortification, 368
Mouth, hygiene of, 158
Mucin, 246
Mucoid degeneration, 311
Mumps, see Parotitis
Muscles, 260
Muscles, abdominal, 10
  affections of, 399
  atrophy of, 672
  biceps, 45
  classes of, 13
  compressor urethrae, 14
  contraction of, 117, 125, 130
  deltoid, 44
  fatigue, 127
  gluteus maximus, 38, 72
  internal oblique, 10
  involuntary, 98
  masseter, 72
  of back, 70
  of calf of leg, 12, 40
  of forearm, 13
  of neck, 51
  of orbit, 14
  of male perineum, 40
  of mastication, 32
  of scapulo-humeral joint, 53
  of tendo achillis, 16
  rectus abdominis, 56
  shoulder and arm, 45
  sphincter ani, 61
  structure, 106
  tibialis anticus, 61, 72
  tissue, 65
  trapezius, 20
  quadriceps, 41, 348
Myalgia, 646
Mydriatics, 557
Myelitis, 630, 662
Myocardial degeneration, 331
Myocarditis, 679
Myomata, 319
Myopia, 124, 162
Myotics, 542
Myxedema, 685

Narcotics, 611
Nasal fossae, 54
Nascent state, 204
Necrosis, 420
Negroes, diseases common with, 168
Nephrectomy, 390, 393
Nephritis, 314, 315, 329, 565, 622, 652, 670, 683
Nephrolithiasis, 619
Nephrorrhaphy, 390
Nephrotomy, 390
Nerves, afferent, 113
  cranial, 23
  efferent, 113
  facial, 47, 92, 356, 401

Nerves, fibre, 37, 87
fifth cranial, 26, 33, 66, 111
fourth cranial, 78
glossopharyngeal, 39, 60
median, 29, 341
motor oculi, 66, 109, 119
of eye, 65
of optic commissure, 20
of palm of hand, 56
olfactory, 59
optic, 14, 75
pharyngeal plexus, 68
phrenic, 68, 647
pneumogastric, 50, 57, 95
radial, 61, 393
sciatic, 21
sclerosis of, 324
sixth, 11, 78
spinal accessory, 413
spinal cord, 58
superior laryngeal, 97
sympathetic, 43, 85
ulnar, 398
Neuralgia of fifth nerve, 400
prescription for, 550
Neurasthenia, 637
Neuritis, 646, 648
Neuromata, 319
Nevus, 423
New-born, hygiene of, 153
Night-sweats, 525
Nipples, care of, 495, 496
Nitrates, 257
Nitric acid, 190, 215, 236, 592
Nitrites, 257
Nitrogen, 272
acids, 263
oxides of, 221, 268, 611
Nitroglycerin, 254, 263, 535, 539
Nomenclature, chemical, 189, 203, 210, 224, 226, 227, 268, 277, 292, 298
Non-metals, 179, 211
Normal salt solution, 394
Nuisances, 154, 166
Nursing women, hygiene of, 158
Nux vomica, 522, 567

Obesity, 100, 133, 337
Oil of turpentine, 602
wintergreen, 528
Ointments, 575
Oleates, 575
Olefiant gas, 195
Oleic acid, 564
Oleomargarin, 137
Oleum erigirontis, 606
morrhuae, 577
ricini, 600
sabinae, 606
theobromatis, 525
tiglii, 519
Olfactory apparatus, 123
Olive oil, 186, 606
Omentum, 21
Opium, 185, 416, 532, 544, 547, 554, 569, 585, 607
Opthalmia, gonorrheal, 320, 497
Organic chemistry, 200
compounds, 176
Osmosis, 83, 274
Ossa innominata, 57
Ostitis deformans, 366
Ovaralgia, 510
Ovarian cyst, 511, 516
dropsy, 654
Ovaries, 52
Ovaritis, 510
Ovule, 437
Ovulation, 437
Ovum, 83, 437, 438
Oxalic acid, 242, 300
Ox-gall, 589
Oxygen, 194, 205, 223, 234, 242, 275, 288, 295
Ozone, 189, 230, 251

Paget's disease, 343
Pain, 100
Pallor, 92
Palmar arch, 36
fascia, 53
Pancreas, 21, 93
Pancreatin, 573
Papillomata, 312
Paracentesis, 386
Paraciticide, 557
Paralysis agitans, 629
Paraphimosis, 349, 397
Paresis, 321
Paris green, 249
Paronychia, 364, 402
Parotid duct, 10
Parotitis, 144, 636, 693
Patellar reflex, 647, 685
Pelvic inflammation, 510
Pelvimetry, 517
Pelvis, bones of, 31
female, 439, 440, 441, 442
male, 439

Pepo, 560
Pepsin, 251, 573
Peptones, 210
Pericardial effusion, 692
Pericarditis, 633, 641, 650, 663, 690
Pericardium, 21
Perineum, 40, 469, 470, 514
Periosteum, 61
Periostitis, 646
Peritonitis, 322, 339, 628, 630, 644
Peritoneum, 25, 62
Perspiration, 94, 118
Pertussis, 144, 613, 629, 634
Petroleum products, 180
Peyer's glands, 69
Pharynx, 30, 39
Phenacetine, 205, 530, 605
Phenol, see Carbolic acid
products of, 272
Phimosis, 368, 397
Phlebitis, 307, 404, 426
Phlegmasia alba dolens, 481
Phosphorus, 144, 181, 182, 206, 212, 221, 253, 284, 520, 538, 547, 606
Photography, 199
Phthisis, see Tuberculosis
Physical action, 213
Physics, 240
Physostigmine, 531, 537, 603
Phytolacca, 526
Pia mater, 44
Picrotoxin, 595, 598
Pilocarpine, 528, 544, 567, 580, 591
Pix liquida, 595
Placenta, 435, 468, 477
previa, 492
Plaster of Paris, 262
Plastic operations, 409
Pleura, 30
Pleurisy, 619, 657, 689
Pleuritic effusion, 692
Pleuritis, 657
Plumbing, 160
Pneumonia, 316, 618, 644, 655, 665, 672, 686, 687, 689
Pneumonitis, 671
Podophyllin, 601
Polarization, 175
Pomegranate, 607
Pons varolii, 26
Popliteal space, 64
Porosity, 254
Porro's operation, 506
Portal circulation, 95
Post-mortems, 86, 337
Postpartum hemorrhage, 482
Potassium, 218, 266
compounds, 179, 191, 243, 252, 299, 524, 535, 572, 590, 591, 600, 606
Poupart's ligament, 22
Precipitate, definition of, 240
Pregnancy, 442, 443, 450
albuminuria in, 454, 455
diagnosis of, 447, 448, 452, 515, 516
hygiene of, 163, 453
multiple, 498, 499, 516
pathology of, 454
presentations in, 452, 453, 463, 464
Premature birth, 474
Prescriptions, 531, 534, 539, 541, 547, 549, 550, 551, 566, 567, 568, 572, 583, 586, 600, 602, 604
metric, 576, 606, 607
Preventible diseases, 139
Productive inflammation, 312
Prostate, 28
Prostatectomy, 375
Prostatitis, 360
Proteids, 185
Protoplasm, 116
Ptomaines, 143, 191
Ptosis, 428
Puberty in female, 439
Puerperal state, 476, 480, 495
convulsions, 494
Pulmonary abscess, 649
edema, 634, 671
solidification, 664
sounds, 645, 671, 673, 677, 690, 691
Pulsatilla, 556
Pulse, 79, 93
Pulvis glycyrrhizae comp., 524, 563
jalapae comp., 529
Purgatives, 570
Purpura hemorrhagica, 689
simplex, 674
Pus, 163, 319, 334
Pustule, malignant, 408
Putrefaction, 261
Pyelitis, 629
Pyemia, 395, 398
Pyroxylin, 181, 252
Pyuria, 624

Qualitative analysis, 209, 240
Quantitative analysis, 209
Quarantine, 148
Quassia, 556
Quickening in pregnancy, 449
Quinine, 596

Rachitis, 620, 650
Radical, 179, 253, 275
Ramus of jaw, 67
Rattlesnake bite, 425
Reagent, 174, 203
Rectal feeding, 102
Rectocele, 511
Rectum, 32, 42, 70
  stricture of, 390
Reflex action, 78, 107, 129
Reflexes, the, 102
Remittent fever, 645
Renal circulation, 95
  colic, 676, 688
Reserve air, 126
Residual air, 126
Resorcin, 581
Respiration, 81, 89, 124, 128, 156
Respiratory sounds, 81, 131
Retina, 107, 116
Retropharyngeal abscess, 687
Rheumatism, 536, 593, 646, 648, 654, 664, 665, 670, 688
Rhubarb, 598
Rigor mortis, 85, 117
Rochelle salt, 598
Roentgen ray, 265
Roseola, 644, 674
Rotheln, 144
Rubella, 644, 674
Rubeola, 138, 642, 644, 654, 658, 674

Saccharin, 599
Sacro-iliac disease, 349, 399
Safety lamps, 250
Sal ammoniac, 178
Salicylic acid, 204, 522, 575, 594
Salivary glands, 17
Salol, 577, 609
Salpingitis, 509
Saltpetre, 607
Salts, definition of, 173, 203
Santalum, 581
Saponification, 109, 287
Sarcoma, 310
Sarsaparilla, 592
Scabies, 552
Scalp wounds, 344
Scammonium, 560
Scarlatina, 162, 316, 631, 644, 663, 666, 667, 674, 680
Scarpa's triangle, 33
School houses, 148
  life, diseases of, 149
  rooms, 157, 161
Sciatica, 615
Sclerosis, multiple, 638
Scoparius, 562
Scrotum, affections of, 383
Scurvy, 627
Sebaceous glands, 89
Secretion, 89
Seidlitz powder, 250
Selenium, 301
Semen, 436
Seminal fluid, 121
Senile changes, 328
Senna, 543, 586, 605
Septicemia, 398
Serpentaria, 564
Serum therapy, 569
Sewage disposal, 164
Sewer gas, 137, 166
Shock, 410, 420
Shoulder joint, 19
Sialagogue, 538, 599
Sigmoid flexure, 4, 6
Sinapis, 525
Sinus, 395
Sinuses of face, 55
Skin, 49, 115, 131, 158
Sleep, 121, 134, 153
Small-pox, see Variola
Smell, sense of, 77, 123
Soap, 270, 300
Sodium compounds, 529, 544, 555, 572
Solar plexus, 15
Solvent, definition of, 554
Sound, sensation of, 115
Sparteine, 529
Spasms, 687
Special senses, 100, 117
Specific gravity, 174, 200, 218, 235, 240
Spectroscope, 175
Speech center, 99
Spermatic cord, 29
Spermatozoa, 436
Sphincter ani, 61
Sphygmograph, 107
Spigelia, 573

Spina bifida, 319
Spinal column, 38, 49
cord, 58, 86, 100, 126, 128
Spleen, 31
in fevers, 691
in leucocythemia, 126
Sprain, 411
Sputum disinfection, 149
Squills, 606
Stammering, 131
Staphisagria, 549
Starch, 180
Static electricity, 176
Stenson's duct, 36, 90
Sterility, 456
Still-birth, 501
Stoichiometrical problems, 205, 236, 239, 287, 290
Stomach, 36
absorption from, 93
cancer of, 636, 643
distension of, 91, 627
foreign body in, 359
ulcer of, 620, 643, 647
Stomatitis, 685
Strabismus, 394
Stramonium, 247
Strophanthus, 536, 553
Strychnine, 258, 278, 534, 564, 579, 584, 608
St. Vitus' dance, see Chorea
Styptic, 558
Subinvolution, 473, 478
Sublimination, 176, 214
Sublingual duct, 10
Submaxillary duct, 10
Sudoriferous glands, 89
Sugar, tests for, 188, 247, 262
classes of, 195, 215
Sulphonal, 607
Sulphur, 194, 214, 234, 255, 282, 528, 536, 555, 607
Sulphuretted hydrogen, 236
Sulphuric acid, 211, 222, 245, 282
Sulphurous acid, 202
Sulphur, oxides of, 194, 269
Sunstroke, 616, 652, 691
Superfetation, 499
Suprarenal capsule, 63
Surgical fever, 347
Symbiosis, 326
Sympathetic nerve, 43
Symphysiotomy, 505
Synarthrosis, 19
Syncope, 121
Synovial bursae, 394
Synthesis, 258
Syphilis, 312, 430, 500, 583, 654, 692
Syphilitic gummata, 324

Tabes dorsalis, 656
Talipes calcaneus, 348
equino-varus, 358, 407
equinus, 359
Tallow, 186
Tampon, 482
Tannic acid, 571, 597
Tape worms, 635, 678
Tar, 551
Tartar emetic, 219, 236, 557, 559, 595
Tartaric acid, 277, 284, 299
Tea drinking, 167
Tears, 92, 133
Teeth, 46, 88, 97, 123, 129
Tendo Achillis, 16
Tendons, 14
Temperature of body, 86, 101, 126, 127, 130, 663, 673
Temporo-maxillary articulation, 47
Testes, 28, 57, 123
Tetanus, 85, 615, 656
Therapeutics, definition of, 536
Thermometers, 228, 232, 264
Thigh amputation, 374
Thirst, 77
Thoracic duct, 30
Thrombosis, 311, 690
Thrombus, 426
Thymol, 551
Thymus, 63
Thyroid, 12, 119
Tic douloureux, 680
Tidal air, 126
Tinctures, 582, 587
Tinnitus aurium, 432
Tobacco, evils of, 151, 162
Tongue, 44, 646
excision of, 339
Tonsillitis, 649, 682
Tonsils, 69
Torticollis, 397
Trachea, 49
foreign body in, 357
Tracheotomy, 68, 346
Trichinosis, 528
Tubal pregnancy, 460
Tubercle bacilli, 315, 328
Tubercles, 310, 332, 335
Tubercula quadrigemina, 18

Tubercular joints, 322, 336
meningitis, 322
ulcer, 323
Tuberculosis, 141, 313, 332, 335, 642, 648, 672, 686
Tully's powder, 555
Tumors, 325, 331, 332, 347, 381, 382, 383, 402, 405, 424
Turpentine, 282, 553, 602
Tympanum, 391
Typhoid, 165, 333
Typhoidal ulcer, 323
Tyrotoxicon, 143

Ulceration, 327, 368
Umbilical cord, 439
hemorrhage, 500
souffle, 451
Underwear, material of, 167
Urates in urine, 278
Urea, 84, 187, 222, 262, 283, 333
Uremia, 416, 533, 622, 651
Ureter, 9, 67
Urethra, 15, 70
Urethritis, 343
Uric acid, 185, 186, 200, 247, 232, 252, 689
Urinary calculi, 187, 304
deposits, 244, 276, 296
Urination, 127
Urine, amount of, 198
composition of, 82, 120, 129, 183, 192, 218
examination of, 238
in health, 117
in nephritis, 297
pigments, 247
pus in, 357
reaction of, 209
specific gravity of, 183, 185, 207, 241, 269, 292
tube casts in, 310
Urinometer, 266
Urticaria, 526
Uterine bruit, 45
colic, 688
fibroid, 516
hydatids, 439
inertia, 489
Uterus, 62, 435, 436, 442, 507
after pregnancy, 91
cancer of, 512
dilatation of, 508
displacement of, 455, 507
fixation of, 509
Uterus, inversion of, 492
ligaments of, 24
rupture of, 490
Uva ursae, 531, 577

Vaccination, 140, 142, 144, 165, 166, 170, 657
Vagina, 19
Vaginismus, 508
Vaginitis, 405
Valence, 253
Valerian, 578
Varicella, 144, 649, 651, 674
Varicocele, 361
Varicose veins, 432
Variola, 138, 632, 651, 657
Varioloid, 662
Varix, 426
Vascular system of new-born, 71
Vaseline, 228
Vasomotor remedies, 593
Veins, cerebral, 61
external jugular, 67
internal jugular, 32
pulmonary, 49
saphenous, 68
subclavian, 13
Vena cava, 40, 47
Venesection, 563
Venous blood current, 112
Ventilation, 152, 153, 161
Veratrum, 530, 543, 602
Version, 504, 505
Vertebrae, 14, 35
Vertigo, 624
Vesicants, 601
Vesiculae seminales, 60
Vienna paste, 556
Vinegar, 181
Vitellus, 438
Vocal cords, 10, 80, 90
Voice, 112
Volvulus, 386
Vomiting, 96, 539, 624
Vulva, 517
Vulvo-vaginal abscess, 351

Water, 200
contamination of, 161, 168
decomposition of, 192, 234
detection of impurities in, 164, 247, 273, 301
diseases conveyed by, 164
hard and soft, 169

Water, mineral, 190, 228, 250, 283, 296
natural, 230
of crystallization, 174
uses of, 545, 578
Webbed fingers, 422
Wet pack, 159
Willow, preparations from, 570
Willes, circle of, 42
Wine, adulteration of, 140
Wolffian bodies, 94
Wormian bones, 62
Wounds, classification of, 384
infection of, 395
Wrist, amputation, 368
joint, 31
Wry-neck, 365

Yellow-fever, 167, 626, 630, 646

Zinc, preparations of, 603
salts of, 179, 207, 252
Zingiber, 558