

**A guide to the examinations at the Royal College of Surgeons of England  
for the diplomas of member and fellow / [Frederick James Gant].**

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GANT'S  
GUIDE TO THE EXAMINATIONS  
BY THE  
CONJOINT BOARD

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SEVENTH EDITION

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WILLMOTT EVANS

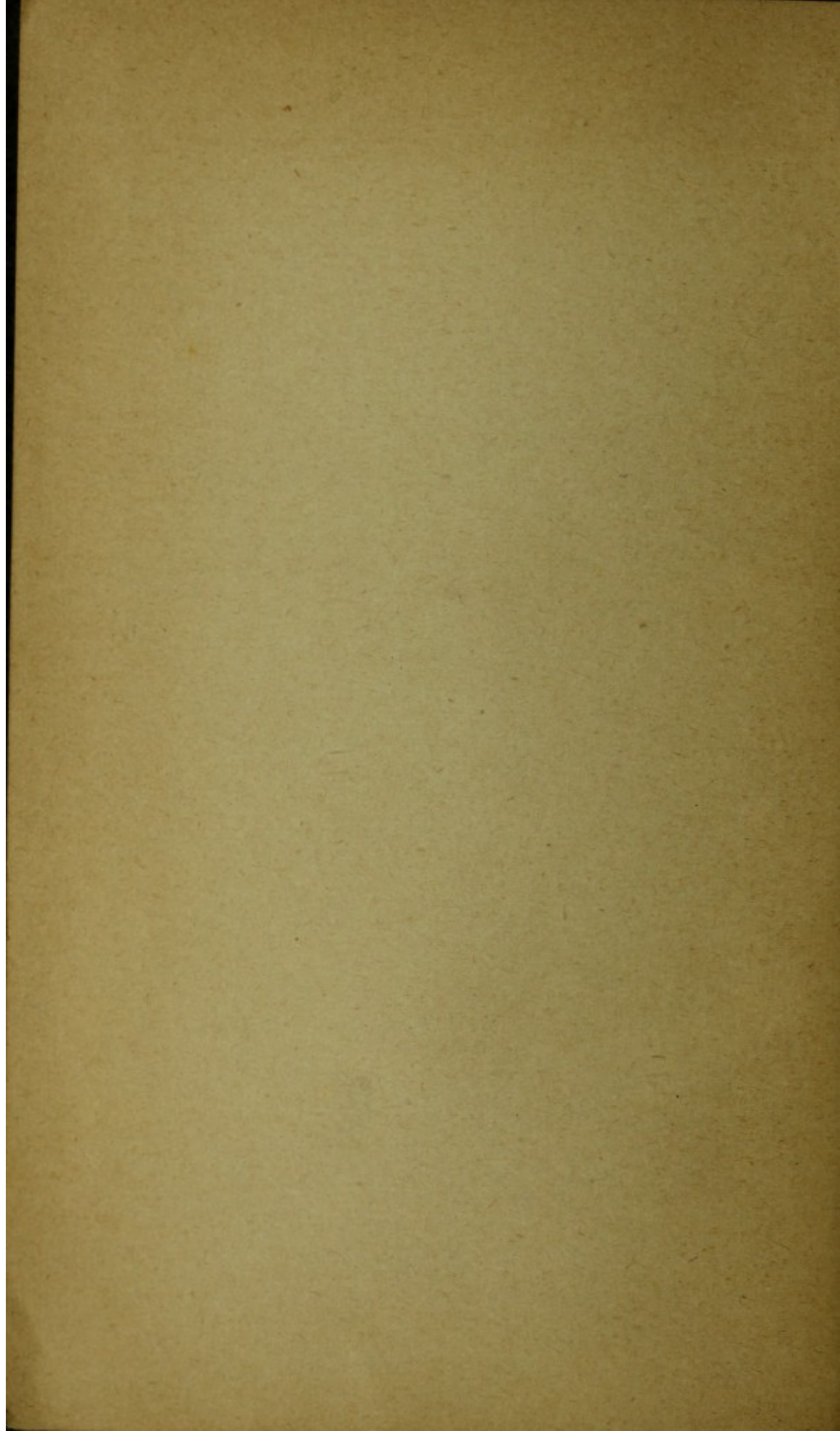


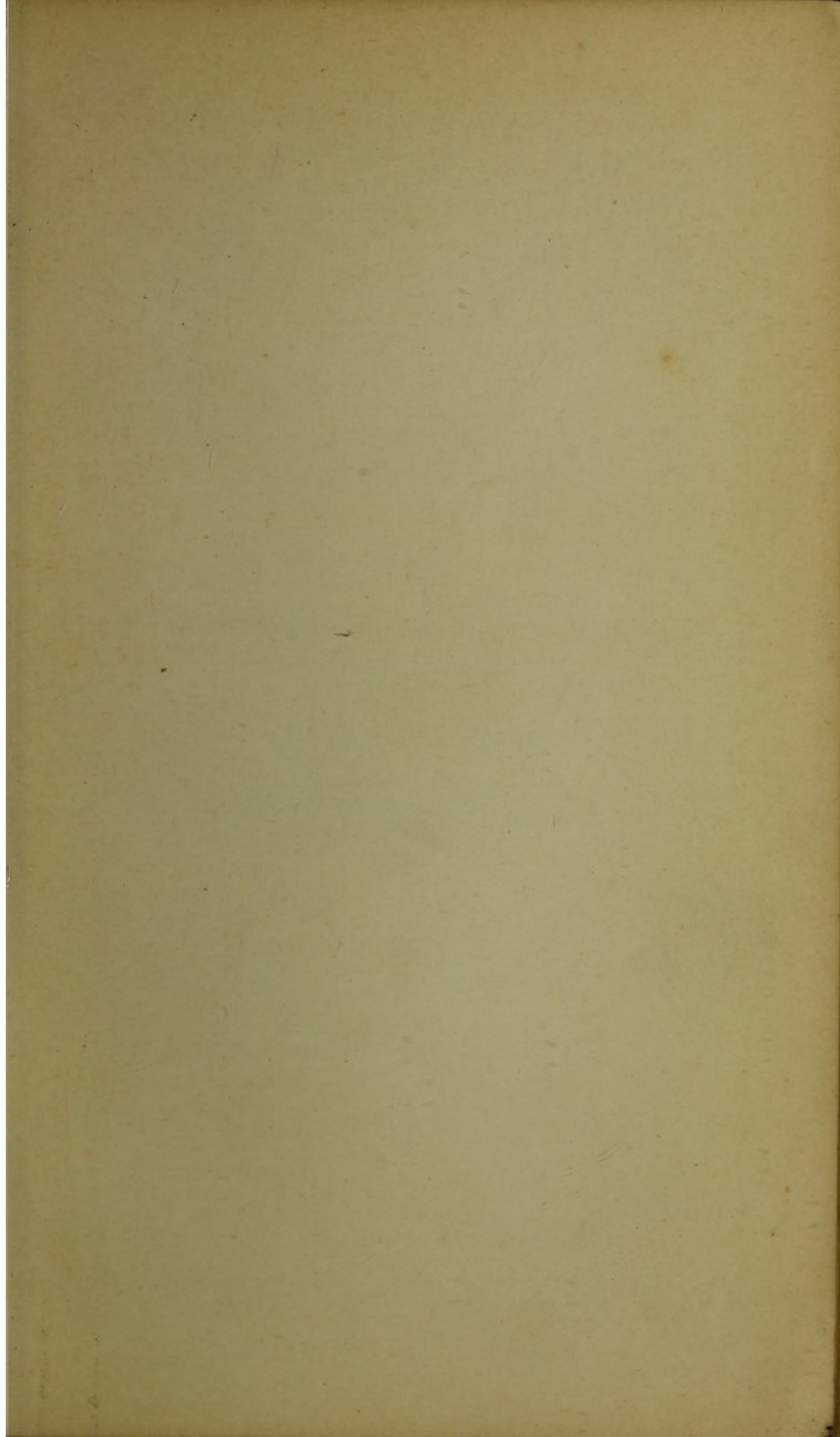


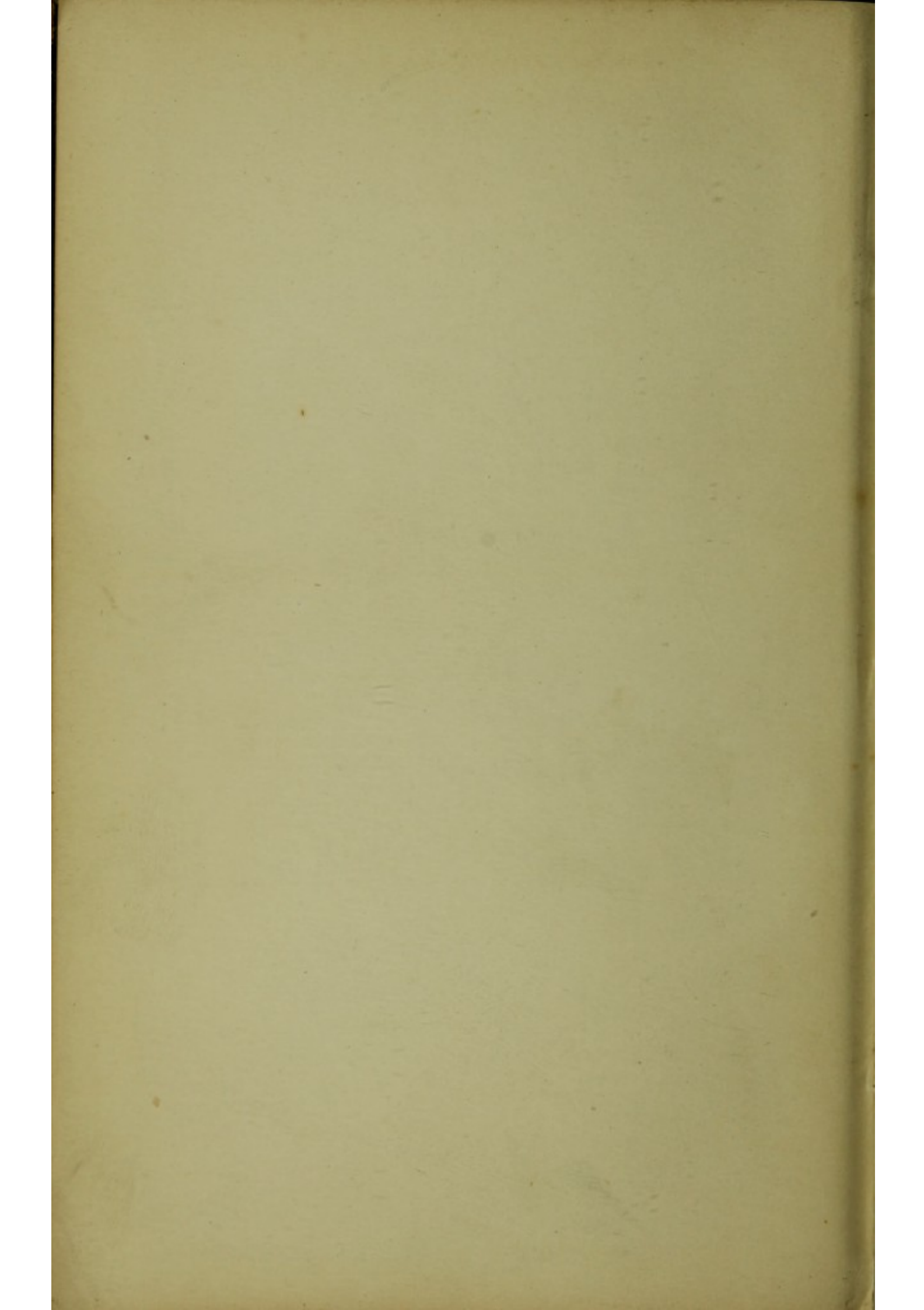
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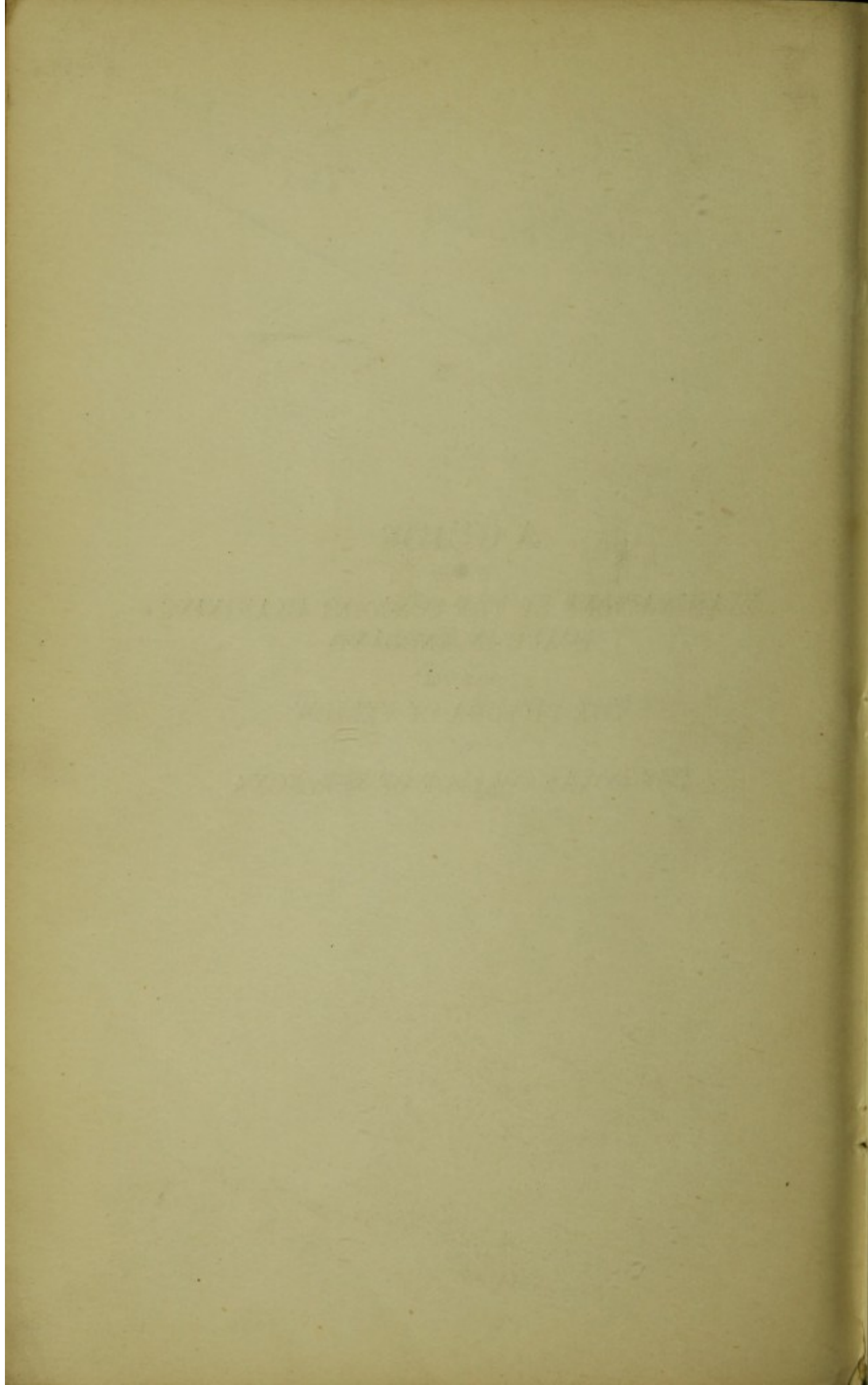




*H. M. Stanley* *Turner*

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A GUIDE  
TO THE  
EXAMINATIONS BY THE CONJOINT EXAMINING  
BOARD IN ENGLAND,  
AND FOR  
THE DIPLOMA OF FELLOW  
OF  
THE ROYAL COLLEGE OF SURGEONS.



A GUIDE  
TO  
THE EXAMINATIONS BY THE CONJOINT  
EXAMINING BOARD IN ENGLAND,  
AND FOR  
The Diploma of Fellow  
OF THE  
ROYAL COLLEGE OF SURGEONS OF ENGLAND.

BY  
FREDERICK JAMES GANT, F.R.C.S.

*SEVENTH EDITION,*  
REVISED THROUGHOUT BY  
WILLMOTT EVANS, M.D., B.S., B.Sc. LOND., F.R.C.S.



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## PREFATORY NOTE.

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THIS seventh edition of the Guide has been prepared entirely by my colleague, H. Willmott Evans, M.D., B.Sc. Lond., F.R.C.S., whose large experience in examinations and literary ability are well known.

The new regulations for the examinations by the Conjoint Board in England and for the Diploma of Fellow of the Royal College of Surgeons have involved considerable alterations in the character and the course of all the examinations; the omission of whatever had become obsolete, and the introduction of much new matter.

By careful revision of the text throughout, the whole work has been brought up to date.

With its renewed vitality, this Guide, which in successive editions, for a period of thirty years, has justified its title in the hands of thousands of students who have passed the examinations for M.R.C.S., L.R.C.P., or who have gained the distinction of F.R.C.S., will prove equally successful to another generation of legitimate aspirants.  
*Vale.*

F. J. G.

*September 18, 1898.*

## INTRODUCTION

The present volume of the series is devoted to the study of the history of the English language from the time of its first appearance in the British Isles to the present day. It is a study of the changes which have taken place in the language, and of the causes which have brought about these changes. The history of the English language is a subject of great interest and importance, and one which has attracted the attention of many of the most distinguished scholars of the world. The study of the history of the English language is not only a study of the language itself, but also a study of the history of the people who speak it, and of the history of the country in which it is spoken. It is a study of the life and thought of the English people, and of the life and thought of the English language.

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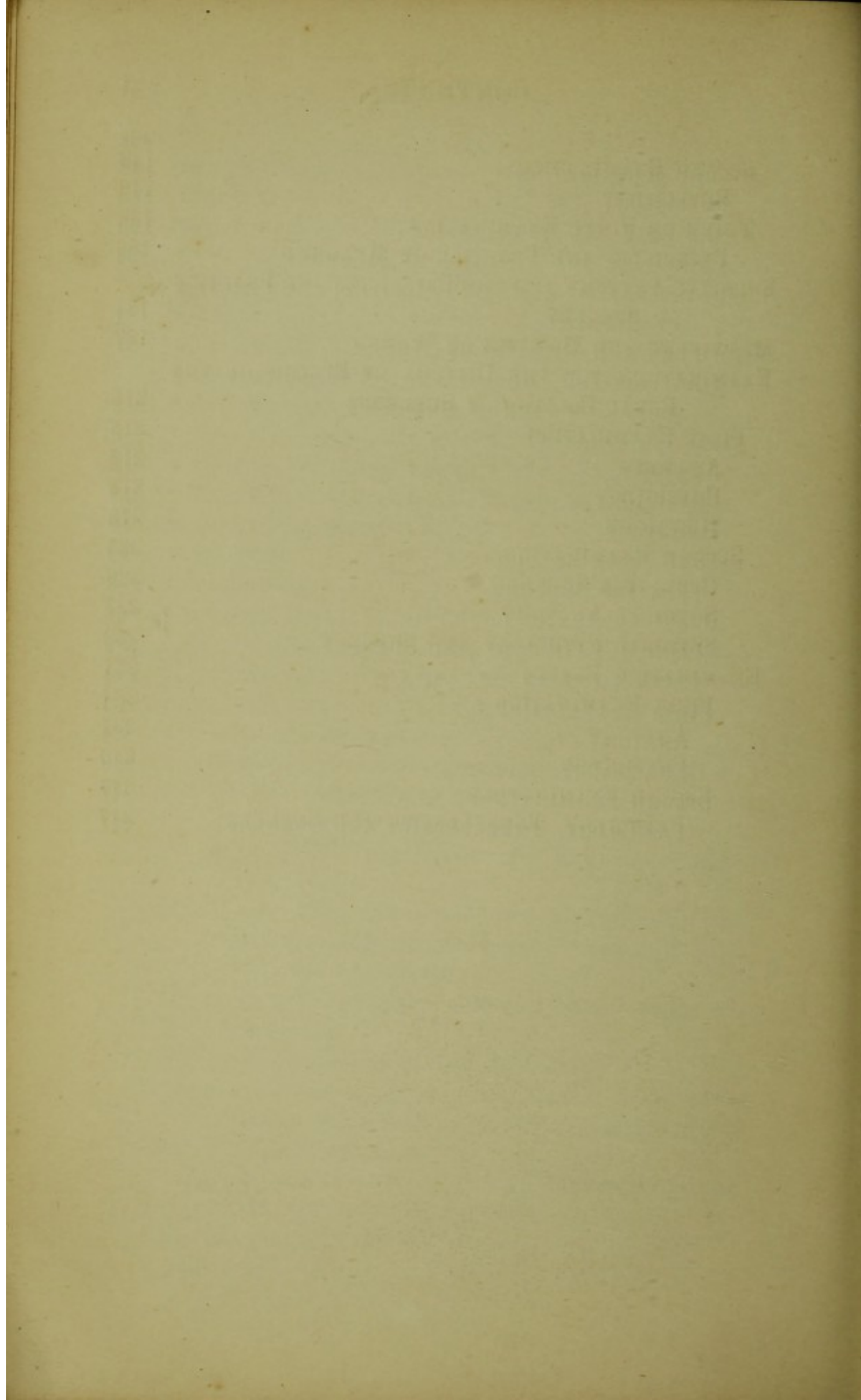
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# REGULATIONS

FOR THE

L.R.C.P. (LOND.), AND M.R.C.S. (ENG.),

FOR CANDIDATES WHO REGISTERED AS MEDICAL STUDENTS  
ON OR AFTER JANUARY 1ST, 1892.

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## SECTION I.

### PROFESSIONAL EDUCATION.

I. Any Candidate who desires to obtain the License of the Royal College of Physicians of London, and the Diploma of Member of the Royal College of Surgeons of England, is required to complete five years of Professional study from the date of Registration as a Medical Student, to comply with the following Regulations, and to pass the Examinations hereinafter set forth. [See Section II., p. xiv.]

II. Every such Candidate will be required to produce the following Certificates before admission to the several Examinations :

### FIRST EXAMINATION.

(Candidates may present themselves for Examination in Chemistry, Physics, Practical Chemistry, and Elementary Biology, before Registration as Medical Students.)

1. Of having been Registered as a Medical Student by the General Medical Council. [See Regulations of the General Medical Council, to be obtained of the Registrar, 299, Oxford Street, London, W.]
2. Of having received instruction in the following subjects :
  - (a) *Chemistry and Physics, and Practical Chemistry.* [See note to (c).]
  - (b) *Practical Pharmacy.*—The instruction in this subject must be given by a Registered



Medical Practitioner, or by a Member of the Pharmaceutical Society of Great Britain, or in a Public Hospital, Infirmary, or Dispensary, and may be taken before Registration.

- (c) *Elementary Biology*.—The Chemistry and Physics, the Practical Chemistry, and the Elementary Biology may be studied before Registration at Institutions recognised for the purpose by the Examining Board in England, a list of which may be obtained on application. Of the time spent in the study of Chemistry and Physics, and Practical Chemistry at a recognised Institution, six months may be reckoned towards the five years of Professional Study; and, similarly, six months may be reckoned for the study of Elementary Biology.

#### SECOND EXAMINATION.

3. Of having dissected, at a recognised Medical School, for not less than twelve months, during the regular Sessions, the Dissections to have included the whole human body.
4. Of having attended at a recognised Medical School :
  - (a) A course of Lectures on Anatomy during not less than six months, or one Winter Session.
  - (b) A course of Lectures on Physiology.
  - (c) A course of Practical Physiology, including Histology, extending over a period of six months.

#### THIRD OR FINAL EXAMINATION.

5. Of having attended, at a recognised Medical School :
  - (a) A course of Lectures on Medicine during not less than six months, or one Winter Session.
  - (b) A course of Lectures on Surgery during not less than six months, or one Winter Session.
  - (c) A course of Lectures on Midwifery during not less than three months.
  - (d) A course of Lectures on Pathology, including practical instruction in Pathological His-



tology and in Bacteriology, during not less than three months.

- (e) A course of Lectures on Pharmacology and Therapeutics during not less than three months.
  - (f) A course of Lectures on Forensic Medicine, including Insanity, during not less than three months.
  - (g) A course of Lectures on Public Health.
  - (h) Systematic Practical Instruction in Medicine, Surgery, and Midwifery, including:
    - 1. The application of Anatomical knowledge to the investigation of Disease.
    - 2. The methods of examining various Organs and other Parts of the Body, in order to detect the evidence of Disease or the effects of Accidents.
    - 3. The employment of Instruments and Apparatus used in diagnosis or treatment.
    - 4. The Examination of Diseased Structures, whether recent or preserved.
    - 5. The Examination of the Urine and other secretions and of Morbid products.
    - 6. Post-mortem Examinations.
  - (i) Of having himself performed Operations upon the Dead Subject to the Satisfaction of his Teacher. The Certificate must state the number of Operations performed.
6. Of having attended, at a recognised Hospital with a Medical School, after passing the Second Examination:
- (a) The Practice of Medicine and Surgery, including Clinical Instruction during two Winter and two Summer Sessions. Six months of the last year of the curriculum may be spent in Clinical Study at, at least, two Hospitals or Infirmaries specially recognised for the purpose, a list of which may be obtained on application.
  - (b) Demonstrations in the Post-mortem Room, including Practical Instruction in making Post-mortem Examinations during twelve months.
  - (c) Clinical Lectures on Medicine and Surgery during nine months.



- (d) A course of not less than twelve Clinical or other Lectures, with Practical Instruction in Diseases peculiar to Women.
- (e) Of having discharged the duties of Medical Clinical Clerk during six months, and of Surgical Dresser during other six months, of which in each case not less than three months shall have been in the Wards.
- 7. Of having attended Clinical Instruction in Ophthalmic Surgery at an Ophthalmic Hospital recognised for the purpose, or in the Special Ophthalmic department of a recognised General Hospital during not less than three months.
- 8. Of attendance at a Fever Hospital.
- 9. Of having attended Clinical Demonstrations at a recognised Lunatic Asylum.
- 10. Of attendance on twenty Labours. This Certificate must be signed by one or more legally qualified practitioners.
- 11. Of having received Instruction in Vaccination. The Certificate must be such as will qualify its holder to contract as a Public Vaccinator under the Regulations of the Local Government Board.
- 12. Of being Twenty-one Years of age.

The Certificates of Professional Study will be required to show that Students have attended the courses of Professional Study to the satisfaction of their Teachers. Students are required to attend the Examinations which are held in the several Classes.

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## SECTION II.

### PROFESSIONAL EXAMINATIONS.

I. There are three Examinations, called the First, the Second, and the Third (or Final) Examination.

II. These Examinations will be held in the months of January, April, July, and October, unless otherwise appointed. Every Candidate intending to present himself for examination is required to give notice in writing to the Secretary of the Examining Board in England fourteen clear days before the day on which the Examination commences, transmitting at the same time the required Certificates.



III. All Fees must be paid three days prior to the day on which the Examination commences.

#### THE FIRST EXAMINATION.

IV. The Subjects are :

Part I. Chemistry and Physics.

Part II. Practical Pharmacy.

Part III. Elementary Biology.

The Examination is partly written, partly oral, and partly practical. For Synopses indicating the range of Subjects in this Examination *see* pp. xxi to xxvii.

V. A Candidate may take this Examination in three parts at different times, or he may present himself for the whole at one time.

VI. A Candidate will be admitted to Examination in Chemistry and Physics, and Elementary Biology, on producing evidence of having complied with the Regulations prescribed in Section I., Paragraph II., Clause 2, (a) and (c); and to Examination in Practical Pharmacy on producing evidence of having been Registered as a Medical Student by the General Medical Council, and of having complied with the Regulations prescribed in Section I., Paragraph II., Clause 2, (b), *or he may take Pharmacy at any time during the Curriculum.*

VII. A Candidate referred in any Part, or in all three Parts, of the First Examination will not be admitted to re-examination until after the lapse of a period of not less than three months from the date of his reference, and he will be re-examined in the Subject or Subjects in which he has been referred. A Candidate referred in Chemistry and Physics, or in Elementary Biology, will be required, before being admitted to re-examination, to produce a Certificate that he has received further instruction in that Subject, to the satisfaction of his Teacher, at an Institution recognised for the purpose by the Examining Board, for a period of not less than three months subsequently to the date of his reference.

VIII. The Fees for Admission to the First Examination are as follows :

	£	s.
For the whole Examination ... ..	10	10
Re-examination after rejection in Part I. ....	3	3
Re-examination after rejection in Part II. ....	2	2
Re-examination after rejection in Part III. ....	2	2



IX. A Candidate who shall produce satisfactory evidence of having passed an Examination for a Degree in Medicine on any of the Subjects of the First Examination conducted at a University in the United Kingdom, in India, or in a British Colony, will be exempt from examination in the subjects in which he has passed.

#### SECOND EXAMINATION.

I. The Subjects of this Examination are :  
Anatomy and Physiology.

The Examination is partly written, partly oral, and partly practical. A Synopsis indicating the range of Subjects in the Examination in Physiology will be found on p. xxvii.

II. Candidates will be required to pass in both Subjects at one and the same time.

III. Candidates will be admissible to the Second Examination at the expiration of two Winter Sessions and one Summer Session (or fifteen months during the ordinary Sessions) from the date of Registration as Medical Students, and after the lapse of not less than six months from the date of passing Part I. and III. of the First Examination, and on producing evidence of having complied with the Regulations prescribed in Section I., Paragraph II., Clauses 3 and 4.

IV. A Candidate referred on the Second Examination will be required, before being admitted to re-examination, to produce a Certificate that he has pursued, to the satisfaction of his Teachers, in a recognised place of Study, his Anatomical and Physiological Studies during a period of not less than three months subsequently to the date of his reference.

V. The Fees for Admission to the Second Examination are as follows :

	£	s.
For the whole Examination ...	10	10
For re-examination after rejection ...	6	6

#### THE THIRD OR FINAL EXAMINATION.

I. The Subjects are :

Part I. Medicine, including Medical Anatomy, Pathology, Practical Pharmacy (unless the Candidate has previously passed in this subject), Therapeutics, Forensic Medicine, and Public



Health. Synopses indicating the range of Subjects in the Examination in Forensic Medicine and Public Health will be found on p. xxviii to xxx.

Part II. Surgery, including Pathology, Surgical Anatomy, and the use of Surgical Appliances.

Part III. Midwifery, and Diseases peculiar to Women. Candidates may present themselves for Examination in this Subject at any time after the completion of the *fourth* year of Professional Study, not less than one year after the passing of the Second Examination.

The Examination in Medicine and Surgery comprises Written Papers, and Clinical, Practical, and *Vivâ Voce* Examinations. The Examination in Midwifery and Diseases of Women comprises a written paper, and a *Vivâ Voce* Examination. Candidates will be examined on Diseased Structures, whether recent or preserved, including microscopical specimens, in each part of the Examination.

II. Candidates may take this Examination in parts, or they may present themselves for the whole Examination at one time. They will be required to produce the following Certificates before being admitted to the respective parts of the Examination, viz.:

In Medicine:

Of having attended the courses prescribed in Section I., Paragraph II., Clauses 5, (a) (d) (e) (f) (g) (h), 6, (a) (b) (c) (e), 8, 9, and 11, and of being Twenty-one Years of age.

In Surgery:

Of having attended the courses prescribed in Section I., Paragraph II., Clauses 5, (b) (d) (h) (i), 6, (a) (b) (c) (e), 7, and 11, and of being Twenty-one Years of age.

In Midwifery:

Of having attended the courses prescribed in Section I., Paragraph II., Clauses 5, (c) (h), 6, (d), and 10, and of being Twenty-one Years of age.

III. Candidates who have passed the Second Examination will be admissible to the Third or Final Examination on production of the required Certificates of Study at the expiration of five years (five Winter and five Summer Sessions) from the date of Registration as Medical Students, and at the expiration of two years (two Winter



and two Summer Sessions) from the date of passing the Second Examination.

IV. A Candidate referred on the Third or Final Examination, or on one or more of the three Parts into which he may have divided it, will not be admitted to re-examination until after the lapse of a period of not less than three months from the date of rejection, and will be required, before being admitted to re-examination, to produce a Certificate, in regard to Medicine and Surgery, of having attended the Medical and Surgical Practice, or the Medical or Surgical Practice, as the case may be, at a recognised Hospital during the period of his reference; and, in regard to Midwifery and Diseases peculiar to Women, a Certificate of having received, subsequently to the date of his reference, not less than three months' instruction in that Subject by a recognised Teacher.

V. Fees for admission to the Final Examination are as follows :

	£	s.
For the whole Examination ... ..	*15	15
Part I. For re-examination in Medicine, including Medical Anatomy, Pathology, Therapeutics, and Public Health ... ..	5	5
For re-examination in Practical Pharmacy (if taken at this Examination) ... ..	2	2
Part II. For re-examination in Surgery ...	5	5
Part III. For re-examination in Midwifery and Diseases Peculiar to Women	3	3

VI. Every Candidate who shall have passed the Third or Final Examination, and who shall have paid the required Fees, is, subject to the Bye-laws of the two Colleges, entitled to receive :

The License of the Royal College of Physicians of London, and the Diploma of Member of the Royal College of Surgeons of England.

Forms of the required Certificates may be obtained of the Secretary of the Examining Board in England, Examination Hall, Victoria Embankment, London.

\* On and after January 1, 1900, the Fee for this Examination will be raised to Twenty Guineas.



## SECTION III.

## SPECIAL REGULATIONS.

I. A Candidate who shall have obtained a Colonial, Indian, or Foreign Qualification, which entitles him to practise Medicine or Surgery in the country where such Qualification has been conferred, after a course of Study and Examination equivalent to those required by the regulations of the two Colleges, will, on production of satisfactory evidence as to age and proficiency in Vaccination, and on payment of the required Fees, be admissible to the Second and Third Examinations without any interval between them.

II. Any Member of an English University who shall have passed such an Examination or Examinations at his University as shall comprise the Subjects of the First and Second Examinations of the Examining Board in England, and who shall have completed the curriculum of medical study required by the Regulations of the Board, will, two years after his having passed all the other required Examinations, be eligible for admission to the Third or Final Examination of the Board. Any Candidate so admitted to Examination will be required to pay a Fee of Five Guineas; and any such Candidate who shall have passed the Third or Final Examination shall, on the further payment of not less than Thirty Guineas,\* and subject to the Bye-laws of each College, be entitled to receive the Licence of the Royal College of Physicians of London, and the Diploma of Member of the Royal College of Surgeons of England.

III. Any Member of a Scotch or Irish University, where it is required that not less than two of the five years' Curriculum of Professional Education shall have been spent in residence at the University, who shall have passed such Examinations at his University as shall comprise the subjects of the First and Second Examinations of the Examining Board in England, and who shall have completed the curriculum of Medical Study according to the Regulations required by his University, will, two years after his having passed all the other required

\* On and after January 1, 1900, this Fee will be Thirty-five Guineas.



Examinations, be eligible for admission to the Final Examination on the same terms as Candidates coming under Paragraph II.

IV. Any Doctor or Bachelor of Medicine or Surgery of a Colonial, Indian, or Foreign University recognised from time to time for the purpose,\* who shall have passed such Examinations at his University as shall comprise the Subjects of the First and Second Examinations of the Examining Board in England, and who shall have completed the curriculum of Medical Study required by the Regulations of the Board, will be eligible for admission to the Final Examination of the Board two years after his having passed the said Examinations; any Candidate so admitted will be required to pay a Fee of Fifteen Guineas† before admission to the Final Examination. Any such Candidate who shall have passed the Final Examination shall, on the further payment of not less than Twenty Guineas, and subject to the Bye-laws of each College, be entitled to receive the Licence of the Royal College of Physicians of London, and the Diploma of Member of the Royal College of Surgeons of England.

Exceptions to the conditions of admission to the several Examinations can be granted only by the Committee of Management.

The Regulations for Candidates who Registered as Medical Students *before* January 1, 1892, are somewhat different; but the differences are slight and unimportant. The chief difference is that they have only one paper in the Examination in Medicine.

\* A list of these Universities may be obtained on application.

† After January 1, 1900, the Fee payable will be Twenty Guineas.



## SYNOPSIS.

## FIRST EXAMINATION.

CHEMISTRY, PHYSICS IN RELATION TO  
CHEMISTRY, AND PRACTICAL CHEMISTRY.

## PHYSICS.

MATTER.—Solution and Mixture. Diffusion of Gases and Liquids. Dialysis. Osmosis.

WEIGHT. *Relative Weight* (Specific Gravity). Atmospheric Pressure. Air-pump. Barometer. Boyle's Law.

HEAT.—Temperature. Thermometers. Expansion of Gases. Heat of Evaporation. Pressure of Vapours. Boiling-Point. Dew-Point. Hygrometers. Conduction, Radiation, and Convection. Calorimeter. Relation of Heat to Work. Specific Heat. Heat of Combustion.

ELECTRICITY.—(a) *Frictional Electricity*.—The two Electrical States. Conduction. Insulation. Potential. Quantity. (b) *Galvanic Electricity*.—Constant Currents. Simple forms of Batteries. Induced Currents.

## INORGANIC CHEMISTRY.

ELEMENTS. — Mechanical Mixture. Chemical Compounds. Laws of Chemical Combination. Atomic Theory. Meaning and Use of Chemical Symbols.

HYDROGEN.—Units of Weight and Volume.

OXYGEN.—Natural Occurrence. Ozone. Combustion. Respiration. Oxidation and Reduction. Oxides. Bases. Acids. Salts.

WATER.—Composition and Properties. Composition of Water by volume. Rain, River, and Spring Water. Properties of Hard and Soft Waters.

NITROGEN.—The Atmosphere. Methods of determining its Composition.

AMMONIA.—Composition by Volume. Oxides of Nitro-



gen. Nitric Acid. General characters of Nitrates and Nitrites.

CARBON.—Allotropic forms. Carbon dioxide. Carbonates. Carbon monoxide.

HALOGENS. CHLORINE.—Hydrochloric Acid. Composition by volume. Hypochlorous Acid. Sodium Hypochlorite. Potassium Chlorate.

BROMINE. IODINE.—Hydrobromic and Hydriodic Acids.

SULPHUR.—Allotropic forms. Hydrogen Sulphide. Sulphur dioxide and trioxide. Sulphurous and Sulphuric Acids. General characters of Sulphates and Sulphites. Sodium Thiosulphate.

PHOSPHORUS.—Allotropic forms. Phosphorus pentoxide. Ortho-phosphoric Acid. Phosphoretted Hydrogen.

### METALS.

The following Metals, with their compounds, as enumerated below :

(a) Sodium, Potassium. (b) Calcium, Barium. (c) Magnesium, Zinc. (d) Aluminium. (e) Manganese, Iron. (f) Silver, Copper, Lead, Mercury. (g) Arsenic, Antimony, Bismuth.

Borax and Boric Acid.

Chlorides of the Metals already specified.

Bromides of Sodium, Potassium, Ammonium.

Iodides of Potassium, Iron, Mercury.

Oxides of the Metals already specified.

Sulphides of Sodium, Potassium, Ammonium, Zinc, Manganese, Iron, Silver, Copper, Lead, Mercury, Arsenic, Antimony, Bismuth.

Carbonates of Sodium, Potassium, Calcium, Magnesium, Iron, Lead.

Sulphates of Sodium, Potassium, Calcium, Barium, Magnesium, Zinc, Aluminium (Alum), Iron, Manganese, Copper, Lead.

Nitrates of Sodium, Potassium, Ammonium, Barium, Bismuth, Mercury, and Silver.

Orthophosphates of Sodium. Microcosmic Salt. Ammoniomagnesium Phosphate. Bone Phosphate. Acid Calcium Phosphate.

Potassium Permanganate.



## ORGANIC CHEMISTRY.

Ultimate Organic Analysis as regards C, H, and N. Determination of empirical formulæ, and molecular weight.

HYDROCARBONS.—Homologous Series, as illustrated by the Paraffins. Methane (Marsh-Gas). Coal-Gas. Chloroform. Iodoform.

ALCOHOLS.—Methyl. Ethyl. Acetic-Aldehyde. Chloral. Formic and Acetic Acids. Acetates of Sodium, Ammonium, Potassium, and Lead.

CYANOGEN.—Hydrocyanic Acid. Cyanides. Cyanates. Urea.

Palmitic, Oleic, and Stearic Acids.

Lactic, Oxalic, Tartaric, and Citric Acids.

GLYCERINE.—Constitution of Fats. Saponification.

CARBOHYDRATES.—Grape, Cane, and Milk Sugar. Fermentation. Dextrin. Starch, Cellulin.

BENZENE.—Phenol. Benzoic and Salicylic Acids.

## PRACTICAL CHEMISTRY.

Identification of substances included in the following lists :

## INORGANIC.

METALS.—Sodium, Potassium, Ammonium, Calcium, Barium, Magnesium, Zinc, Iron, Aluminium, Copper, Silver, Lead, Mercury, Bismuth, Antimony, Arsenic.

ACIDS.—Hydrochloric, Hydrobromic, Hydriodic, Nitric, Carbonic, Sulphuric, Phosphoric.

The Metals may be present as metal, oxide, sulphide, or as a simple salt. The Acids Hydrochloric, Nitric, Sulphuric may be present in the free state.

## ORGANIC.

Acetic, Oxalic, Tartaric, and Hydrocyanic Acids, and their salts with Potassium, Sodium, and Ammonium. Cane and Grape Sugars. Urea.

Candidates will be required to give equations illustrating the chemical reactions involved in testing for the above substances, and, if requested, to explain the same.

Preparation of one of the following compounds :

Chloride of Sodium, of Ammonium, or of Lead.

Iodide of Lead or of Mercury.

Oxide of Copper or of Mercury.

Hydroxide of Sodium or of Copper.



Carbonate of Sodium, of Calcium, of Magnesium, or of Bismuth.

Oxalate of Ammonium.

Oxalate of Urea.

Nitrate of Potassium, of Barium, or of Lead.

Phosphate of Calcium or of Iron.

Sulphate of Sodium, of Calcium, of Magnesium, of Zinc, or of Copper.

Candidates will be required to exhibit to the Examiners the preparations which they have made, and to represent by equations the reactions involved.

### PRACTICAL PHARMACY.

- (a) The general nature and composition, and the most important physical and chemical characters, of the Pharmacopœial drugs named in the annexed Schedule.
- (b) The composition of the Pharmacopœial preparations of these drugs, and the processes employed in making them.
- (c) The doses of these drugs and of their preparations.
- (d) The Candidate will be required to recognise the drugs indicated by *italics* in the annexed Schedule.

### SCHEDULE OF DRUGS.

Liquor Chlori; *Calx Chlorinata*; Liquor Sodæ Chlorinatæ Bromum; Ammonii Bromidum; *Potassii Bromidum*; Sodii Bromidum.

*Iodum*; *Potassii Iodidum*; Sodii Iodidum; Plumbi Iodidum.

*Sulphur Sublimatum*; *Sulphur Præcipitatum*; *Calx Sulphurata*; Potassa Sulphurata.

*Phosphorus*; Calcii Phosphas; Sodii Phosphas; *Ferri Phosphas*; Calcii Hypophosphis; Sodii Hypophosphis.

Acidum Hydrochloricum; Acidum Nitricum; Acidum Sulphuricum.

Acidum Aceticum; Acidum Citricum; Acidum Tartaricum.

Acidum Boricum; Acidum Sulphurosum.

*Acidum Hydrocyanicum Dilutum*.

Liquor Ammoniæ; Liquor Potassæ; Liquor Sodæ; Potassa Caustica; Soda Caustica.

*Ammonii Carbonas*; *Ammonii Chloridum*; Liquor Ammonii Acetatis.



Potassii Bicarbonas; Potassii Sulphas; Potassii Chloras;  
Potassii Tartras Acida; *Potassii Permanganas*.

Sodii Bicarbonas; Sodii Sulphas; Sodii Nitris; Borax.  
Calx; Calcii Hydras; Creta Præparata; Calcii Carbonas  
Præcipitata.

Magnesia; Magnesii Carbonas; *Magnesii Sulphas*.  
*Alumen*; *Alumen Exsiccatum*.

Zinci Oxidum; Zinci Chloridum; *Zinci Sulphas*.  
*Cupri Sulphas*.

Argenti Nitras.

*Hydrargyrum*; *Hydrargyri Oxidum Flavum*; *Hydrargyri Oxidum Rubrum*; *Hydrargyri Subchloridum*; *Hydrargyri Perchloridum*; *Hydrargyri Iodidum Rubrum*; *Hydrargyrum Ammoniatum*; Liquor *Hydrargyri Nitratis Acidus*.

*Plumbi Oxidum*; *Plumbi Acetas*; Liquor *Plumbi Subacetatis*.

Antimonium Tartaratum.

*Acidum Arseniosum*; *Ferri Arsenias*; Sodii Arsenias  
*Arsenii Iodidum*; Liquor *Arsenii et Hydrargyri Iodidi*.

Bismuthi Subnitras; Bismuthi Carbonas; Bismuthi  
Citras.

Ferrum; *Ferri Sulphas*; *Ferri Sulphas Granulata*;  
*Ferri Sulphas Exsiccata*; Syrupus *Ferri Subchloridi*;  
*Ferri Carbonas Saccharata*; Syrupus (et Pilula) *Ferri Iodidi*; Liquor *Ferri Acetatis*; Liquor *Ferri Perchloridi*;  
Liquor *Ferri Pernitratis*; Liquor *Ferri Persulphatis*;  
*Ferri Peroxidum Hydratum*; Liquor *Ferri Dialysatus*;  
*Ferri et Ammonii Citras*; *Ferri et Quininæ Citras*;  
*Ferrum Tartaratum*; *Ferrum Redactum*.

Alcohol Ethylicum; *Spiritus Rectificatus*; *Spiritus Tenuior*; *Æther*; *Chloroformum*; *Iodoformum*.

*Chloral Hydras*; Butyl *Chloral Hydras*; *Paraldehydum*;  
*Sulphonal*.

Amyl Nitris; Tabellæ Nitroglycerini; Liquor Trinitrini;  
*Spiritus Ætheris Nitrosi*.

Acetanilidum; Phenacetin; Phenazonum.

Collodium.

*Acidum Carbolicum*; *Acidum Salicylicum*; Sodii Salicylas.

*Aconiti Radix et Folia*; Aconitina.

*Opium*; *Morphinæ Hydrochloras*; *Morphinæ Acetas*;  
*Morphinæ Sulphas*; Liquor *Morphinæ Bimeconatis*;  
*Apomorphinæ Hydrochloras*; Codeina.

*Coca*; *Cocainæ Hydrochloras*.



*Jaborandi* ; *Pilocarpinæ* Nitras.  
*Quassia Lignum* ; *Calumbæ Radix* ; *Gentianæ Radix*.  
*Physostigmatis Semen* ; *Physostigmina*.  
*Caffeina* ; *Caffeinæ Citras*.  
*Conii Fructus et Folia*.  
*Asafoetida* ; *Ammoniacum* ; *Myrrha* ; *Guaiaci Resina*.  
*Cinchonæ Cortex* ; *Cinchonæ Rubræ Cortex* ; *Quininæ Sulphas* ; *Quininæ Hydrochloras*.  
*Salicinum*.  
*Ipecacuanha* ; *Senegæ Radix*.  
*Glycerinum*.  
*Nux Vomica* ; *Strychnina*.  
*Belladonnæ Radix et Folia* ; *Atropina* ; *Atropinæ Sulphas* ;  
*Hyoscyami Folia* ; *Stramonii Semina et Folia* ; *Homatropinæ Hydrobromas*.  
*Cannabis Indica*.  
*Digitalis Folia* ; *Strophanthus*.  
*Oleum Ricini* ; *Oleum Crotonis* ; *Aloe Barbadensis* ; *Aloe Socotrina* ; *Aloin* ; *Rhamni Purshiani Cortex* ; *Colocynthidis Pulpa* ; *Elaterium* ; *Elaterinum* ; *Jalapa* ;  
*Podophylli Rhizoma* ; *Rhei Radix* ; *Senna Alexandrina et Indica* ; *Camphora* ; *Oleum Terebinthinæ*.  
*Acidum Tannicum* ; *Acidum Gallicum* ; *Kino* ; *Catechu* ;  
*Hamamelidis Cortex et Folia*.  
*Acidum Benzoicum*.  
*Copaiba*. *Cubeba*.  
*Colchici Cormus et Semina*.  
*Scilla*.  
*Filix Mas*. *Santoninum*.  
*Ergota*.  
*Oleum Morrhuæ*.  
*Cantharis*.

## ELEMENTARY BIOLOGY.

Candidates will be expected to show a practical acquaintance with the following topics :

1. The Chemical composition and properties of Protoplasm; the structure and properties of Cells; Cell-division; the general outlines of the Varieties of Cell-structure in the Tissues of Animals and Plants.

2. The structure and life-history of *Amæba*, *Vorticella*, *Protococcus*, and *Spirogyra* as illustrative of :



- (a) The differences between Plants and Animals.
- (b) The general phenomena of the Life-history of Low Organisms.

3. The structure and mode of life of *Saccharomyces* and *Bacteria*; Fermentation; Putrefaction; modes of spread of *Bacteria*.

4. The relations between Multicellular and Unicellular Animals, as illustrated by a comparison of the structure, physiology, and life-history of *Hydra* and *Amœba*.

5. The *Cœlomata-Invertebrata*, as illustrated by the anatomy of *Lumbricus*.

6. The *Cœlomata-Vertebrata*, as illustrated by a comparison of the general characters of the skeleton, and of the digestive, circulatory, respiratory, genito-urinary, and nervous systems of the Dogfish and the Frog.

7. The structure of Ova and Spermatozoa; Fertilization; the early stages of Development; the formation of the Segmentation-cavity, of the Gastrula, Archenteron, and Cœlom, and of the Epiblast, Mesoblast, and Hypoblast, with an enumeration of the chief systems of organs derived from the three layers in a Vertebrate.

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## SECOND EXAMINATION.

### PHYSIOLOGY.

The Subjects required at the Second Examination in Physiology are comprised under the following heads:

#### 1. HISTOLOGICAL.

The Structure of the Tissues of the body; the Structure of the Organs of the body; recognition of microscopical preparations of the Tissues and Organs.

#### 2. CHEMICAL.

The Composition of Food, and of the Tissues, Secretions, Excretions, and other Fluids of the body.

#### 3. PHYSIOLOGICAL.

The Physiology of Digestion, Absorption, Circulation, Respiration, Secretion, Nutrition, Animal Heat, and Animal Motion. The Functions of the Nervous System and Sense-Organs. Reproduction.

\*.\* Candidates are expected to have practised, and to be familiar with, general histological methods, including



the examination of fresh tissues, the fixing and hardening of tissues and organs, the cutting, staining, and mounting of sections. They may be called upon either to perform or to describe any of these methods. They are also expected to be able to practise at the Examination the usual methods of chemical and physical examination of the various fluids and solids of the food and of the animal body, as well as the special tests by which the more important substances (both inorganic and organic) occurring in the body are detected and estimated. Candidates may further be required to show an acquaintance with the mode of action and methods of employment of the commoner kinds of apparatus which are used in physiological work, especially in regard to the investigation of muscle, the heart, the pulse, and respiration.

### THIRD OR FINAL EXAMINATION.

#### FORENSIC MEDICINE.

I. Examination of Persons found dead, with reference to :

1. Identification.
2. Time of Death.
3. Cause of Death.

II. Violent causes of Death :

1. Drowning.
2. Strangulation.
3. Suffocation.
4. Mechanical Injuries and Wounds.

III. Poisons and Poisoning :

1. Symptoms and post-mortem appearances in cases of poisoning by the following agents :

#### INORGANIC.

Mineral Acids.  
Solutions of Alkalies.  
Copper.  
Lead.  
Mercury.  
Antimony.  
Arsenic.  
Phosphorus.

## ORGANIC.

Oxalic Acid.  
Carbolic Acid.  
Opium.  
Strychnine.  
Belladonna.  
Aconite.  
Chloroform.  
Chloral Hydrate.  
Cyanides.

2. Duties of Medical Men in cases of Poisoning, as regards Observation ; Treatment and Preservation of parts for Analysis.

3. Preliminary Tests for Poisonous Substances for Clinical Use, before reference to an Analyst.

IV. Medico-legal points in connection with Pregnancy, Delivery, Rape, Criminal Abortion, Infanticide.

V. The Lunacy Laws, in so far as they affect the Medical Practitioner, when signing Certificates of Lunacy.

## PUBLIC HEALTH.

I. WATER, in its relation to Health and Diseases :

1. The Characters and Classification of Drinking-Water.
2. The Causes and Sources of the Impurities found in Water, and the Methods of Purification.
3. The Diseases conveyed by Water and the Methods of dealing with Epidemics of such Diseases.

II. AIR, in relation to Health and Disease :

1. The Causes and Sources of the Impurities found in Air.
2. The Diseases conveyed through the Air.
3. The Quantity of Air necessary for Health ; the Principles of Ventilation.

III. SOIL, in relation to Health and Disease :

1. The Causes and Sources of the Impurities in the Soil, and the Methods of dealing with them.
2. Diseases connected with the Soil.
3. The Methods of dealing with Excreta and Sewage.



## IV. Food, in relation to Health and Disease :

1. Dietetics.
2. The Common Adulterations of the Chief Articles of Diet.
3. Diseases connected with deficiency or Impurity of Food-supply.

V. THE DWELLING, in relation to Health and Disease :  
The Principles of House-drainage.

## VI. The Principles of Disinfection, and the Mode of Action of the Chief Disinfecting Agents.

## VII. The Provisions of the Act for the Notification of Disease.



A G U I D E  
TO THE  
EXAMINATIONS BY THE CONJOINT  
EXAMINING BOARD IN ENGLAND,  
AND FOR  
DIPLOMA OF FELLOW  
OF  
The Royal College of Surgeons.

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EXAMINATIONS OF THE CONJOINT  
EXAMINING BOARD.

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FIRST EXAMINATION.

PART I.—CHEMISTRY AND CHEMICAL PHYSICS.

THE examination in this subject consists of two portions: the written and the practical examination. For the written portion of the examination the candidate is allowed three hours, and eight questions are set; these are divided into three sections. The first section contains two questions, and relates to chemical physics; the second contains three questions and relates to inorganic chemistry; the third also contains three questions, and is concerned with organic chemistry; the candidate must answer at least four questions and not more than six; and at least *one* question in each section must be answered. It is decidedly advisable for the candidate to answer *six* questions. In Sections II. and III., in which the questions are chemical, equations should be given wherever possible. The synopsis in this subject is given on pages xxi to xxiii.

In the examination in practical chemistry one substance is given for analysis, and it may be a solid or a solution. The candidate is required to give in writing the



reasons on which he bases his opinion as to the substance given for analysis. The substances which may be given for analysis are on page xxiii. The candidate is also required to prepare one compound from those given in the list on pages xxiii and xxiv. Two hours are allowed for this practical examination.

#### PART II.—PRACTICAL PHARMACY.

As mentioned on page xv, this portion of the first examination may be taken at any time during the curriculum, and if not taken previously, it will form part of the final examination in medicine.

The examination in practical pharmacy consists of a written paper and a *vivâ voce* examination. In the paper the candidate has six questions set him, and he is required to answer at least four; it is advisable to answer all six questions if possible. The schedule is given on pages xxiv to xxvi. The recent publication of the new edition of the Pharmacopœia will alter somewhat the questions which may be set, but a knowledge of it will not be required of candidates until 1899.

In the *vivâ voce* portion of this examination the candidate has to identify some of the drugs which are printed in italics in the schedule on pages xxiv to xxvi. He is asked their doses and the preparations made from them.

#### PART III.—ELEMENTARY BIOLOGY.

The whole examination on this subject is *vivâ voce*. It lasts a quarter of an hour, and the examiner is easily able to judge in that time of the amount of knowledge possessed by the candidate. The synopsis is given on pages xxvi and xxvii.

### SECOND EXAMINATION.

#### 1. ANATOMY.

The examination in this subject consists of a written paper and a *vivâ voce*. In the written portion of the examination six questions are set, and the candidate *must* answer four, but he is strongly advised to answer *all* the questions. Three hours are allowed for the written paper.



## 2. PHYSIOLOGY.

The portions of the subject required at this examination are given on pages xxvii and xxviii. The time and the number of the questions are the same as for the corresponding paper on anatomy. In this paper also it is desirable that the candidate should, if possible, answer all the six questions.

PRACTICAL EXAMINATION ON ANATOMY AND ON PHYSIOLOGY.—In the room where the examination is held several tables are arranged; on two or three of these are distributed many recent dissections and anatomical preparations of dissections (the latter under spirit in flat glass receptacles), showing the regional and visceral anatomy of the body. One or two recently-dissected subjects—male and female—are used to test the student's own knowledge of regional and visceral anatomy, as learnt in the ordinary work of the dissecting-room. Osteology is represented by a skeleton and a plentiful supply of bones, including sections of the skull and other bones. The other tables are devoted to physiology and to physiological anatomy. The minute structure of organs and general histology are provided for by microscopes, and a very useful series of microscopic preparations. At each table two examiners are engaged with a candidate. But the same candidate is examined at only *two* tables: on anatomy a quarter of an hour, and on physiology a quarter of an hour.

PART I. ANATOMY.—The general features of the anatomical examination may be here noted. It is essentially *objective*. Accordingly, the *questions* asked are principally in the form of 'What's this?' the examiner pointing at the same time to the object of his query. It will be evident that by this mode of examination a wide range of matter can be gone over in a limited time, and the examiner can estimate easily the student's knowledge of anatomical objects and facts. Occasionally, only, the student is asked to *describe* an object before him, for that would imply the power of describing, and a facility of descriptive language, neither of which might be readily at command under the trying circumstances of a *vivâ voce* examination.

An enumeration of the following series of dissections and preparations will suffice to indicate the principal objects by which the candidate's practical knowledge of anatomy is tested.



*Regional Anatomy.*—Triangles of the neck, showing principally the relations and distribution of the blood-vessels; parotid region and side of the cheek, showing the course and opening of Stenson's duct; occipital region, showing the deep muscles recti and obliqui; anatomy of the axilla; bend of the elbow; palm of the hand; Scarpa's triangle, showing the relations and distribution of the femoral vessels and anterior crural nerve; popliteal region, showing its boundaries, and the relations and course of the popliteal vessels and nerves; sole of the foot.—*Ligaments*: Temporo-maxillary articulation, ligaments, and inter-articular cartilage; a section-view. Articulations and ligaments of the first two cervical vertebræ, one with the other, and as connected with the occipital bone; articulations and ligaments of the clavicle, shoulder-joint, elbow-joint, ligaments of the wrist and hand; hip-joint; knee-joint, showing the relative position of the crucial ligaments; head of the tibia, with the semilunar cartilages, showing their relative shape and size, as determining whether they formed part of the right or left knee-joint; ligaments of the ankle-joint, and of the foot.—*Bones*: Separate, and articulated in the skeleton.

*Visceral Anatomy.*—Dissections and preparations of the brain. Lungs and heart, with their vessels in relative position, as seen when the anterior wall of the thorax is removed. Heart: section-view, showing the course of the blood through its cavities. Stomach and liver: longitudinal section of the former organ when distended, showing its curvatures and fundus, orifices, cardiac and pyloric, and commencement of the duodenum; longitudinal section of the gall-bladder. Liver: showing its ligaments, lobes, and fissures; portal vein, hepatic duct, and hepatic artery, with their relative position at the transverse fissure. Intestinal canal: longitudinal section of the jejunum, presenting its valvulæ conniventes. Kidney, injected: longitudinal section, showing the relative position of the renal vessels and ureter at the hilum; also the relative appearance and thickness of the pyramidal and cortical portions. Bladder, and urethra, with penis, opened anteriorly, showing openings of the ureters, neck of the bladder, prostatic sinus, veru-montanum and sinus pocularis, with the openings of the common ejaculatory ducts; remainder of urethra, and trabecular structure of corpora cavernosa. Perineum, the ischio-rectal fossæ and their boundaries. For further anatomical specimens and preparations, see pages 37 to 44.



*Form of Examination in Anatomy.*—The practical nature and the direction of this examination are sufficiently shown by the subjects dealt with in the examination of some candidates.

Candidate 1: Bones.—The palate bone: point out the horizontal plate—the pterygoid process. The radius: is it right or left? Point out insertion of the biceps, or the attachments of other muscles. Cuneiform bones of the tarsus: what are their articulations? pointing out each separately. A vertebra: to what region does it belong? Why is it the last lumbar vertebra? On the recently dissected subject: indicate the scalenus anticus muscle; the scalenus posticus; the scalenus medius. What is this?—the transversalis colli artery; name its branches. Subclavius muscle: point out its origin and insertion. What nerve supplies it? Pericardium, its structure; point out the vena cava superior; the vena cava inferior. The right auricle—the openings into it. The Eustachian valve. Iliacus muscle: show its origin and insertion. Sole of the foot—the plantar fascia, its arrangement; abductor minimi digiti and its nerve-supply. Beneath what muscle does the external plantar nerve pass? Mention the nerve to the flexor accessorius muscle, and to flexor brevis digitorum. Tendon of flexor longus hallucis—where is it inserted? Specimen in spirit, showing bladder and urethra opened anteriorly; point out the trigone; the openings of the ureters; the veru-montanum.

Candidate 2: Bones.—Tibia: name this part or that—for instance, the condyles, the crest, the tubercle. Point out the tibial origin of the soleus muscle. Fibula: point out precisely the attachments of muscles. On the dissected subject: indicate the sartorius muscle, the rectus femoris, and the tensor vaginæ femoris. External circumflex artery, its anastomosis: what nerve supplies the tensor? What bursæ are there in the region of the patella? What point in the abdominal wall corresponds to bifurcation of the aorta? What part of crest of ilium has the same relation? Point out a lumbar artery and vein. What are the arteries of the spinal cord? How are the spinal arteries reinforced in the lumbar region? how in the dorsal region? Pericardium, its openings. How much of inferior vena cava is above the diaphragm? How much of superior vena cava is in the pericardium? What veins enter the inferior cava just as it pierces the diaphragm? How many hepatic veins are there? Point



out the phrenic nerve. What does it supply? Vagus nerve, and its recurrent laryngeal branch. Internal mammary artery and its branches. Thyroid axis and its branches. Ascending cervical artery: its direction and anastomosis. Ascending pharyngeal artery and its branches. What arteries supply the tonsil? Point out external pterygoid muscle and internal pterygoid. Styloglossus muscle. Lingual nerve, and its connection with the hypoglossal nerve. Inferior dental nerve: a branch of what nerve? Mylo-hyoid branch of inferior dental: what does it supply?

Candidate 3: Pelvis.—Point out the ilio-lumbar ligament: the sacro-sciatic ligaments. What pass through the sacro-sciatic foramina—large and small? Os calcis, its articulations; origin of muscles; flexor accessorius, and flexor brevis digitorum, abductor pollicis, and abductor minimi digiti. Origin of plantar ligaments, long and short. Sternum: muscles attached to inner surface of manubrium. Nasal fossæ: what bones enter into formation of the fossæ? Point out the openings into the fossæ. Posterior palatine canal: what it transmits. Brain—a longitudinal section: point out this or that; *e.g.*, corpus callosum; marginal fissure, fissure of Rolando; lateral ventricle, and parts seen in the ventricle. Back of hand: point out the several tendons and their insertions. Palm of hand: palmar fascia; superficial palmar arch and branches. What artery supplies the thumb and radial side of the index-finger? What forms the deep palmar arch? Ulnar and median nerves in hand, and their digital branches. The insertions of the lumbricales muscles and of the interossei.

Candidate 4: The humerus: to which side does it belong? What muscles are attached to the great tuberosity? What is the nerve-supply of the teres minor? Where is the teres major attached? What muscle is inserted into the floor of the bicipital groove? What muscles arise from the inner condyle? The ulna: point out its articulations; does its head enter into the wrist-joint? Where is the triangular ligament attached? The clavicle: to which side does it belong? Point out the muscular attachment, and the ligaments. How is it developed? Scarpa's triangle: the origin of the sartorius; its nerve-supply; its action. The femoral artery: its branches. Is there a deep epigastric artery? Where does it come from? Is there any other branch from the



external iliac? What is the origin of the adductor magnus? Its nerve-supply? How does the great sciatic nerve end? What are the branches of the peroneal nerve? Does the anterior tibial nerve supply any of the skin of the foot?

PART II. PHYSIOLOGY.—In this division of the practical examination the histological portion is still objective, but supplemented by questions as to the functions of the various organs and tissues.

*Histology.*—As already stated, a series of specimens is used, in order to test the student's knowledge of histology. On one occasion the following microscopic specimens were used, *each* candidate being required to name and describe *four* such specimens: (1) Hyaline cartilage. (2) Ossifying cartilage. (3) Transverse section of bone. (4) Longitudinal section of bone. (5) White fibrous tissues. (6) Yellow elastic tissue. (7) Pavement epithelium. (8) Salivary gland. (9) Tongue. (10) Stomach. (11) Small intestine. (12) Liver. (13) Kidney. (14) Lung. (15) Striated muscle. (16) Non-striated muscle. (17) Skin. (18) Hair. (19) Longitudinal section of tooth. (20) Transverse section of tooth. (21) Transverse section of spinal cord. (22) Uric acid. (23) Ammonium urate. (24) Triple phosphates. (25) Calcium oxalate. See also pages 44 and 45.

*Specimens.*—Blood, milk, urine, bile, with chemical reagents.

*Form of Examination in Histology and in Physiology.*—The course of this part of the examination is indicated by the questions put to each of *six* candidates.

Candidate 1: *Four microscopic* specimens usually having been recognised, questions arise from each kind of specimen submitted for inspection. The candidate is afterwards examined upon other *preparations* as relating to physiology. (1) Describe the arrangement of the vessels around the air-cells of the lungs. What form of epithelium exists in the cells? What form of epithelium on the bronchial mucous membrane? How much air is changed in ordinary respiration? What is the amount of residual air in the lungs? Describe the structure of a bronchial tube. What membrane covers the lung? What is its structure? Its function? (2) What is this?—Coagulum of blood. What does it consist of? The proportion of corpuscles? The proportion of red and white corpuscles? The circumstances which modify this pro-



portion? (3) White fibrous tissue. The characters of the fibres? Where is this tissue found in the body? In what parts the yellow elastic tissue?

Candidate 2: Four specimens under microscope. Then—(1) Eye. What are the ciliary processes? What are the layers of the choroid? The use of the lens? Its modifying action according to near and distant vision? How accomplished? Structure of the ciliary muscle? What cranial nerve controls its action? The use of the iris? Its condition in distant vision? What is spherical aberration? (2) Tongue. Point out the papillæ. Name and distinguish them. What is the structure of the epiglottis; and the form of epithelium on it? Its function? Show the vocal cords. Give their structure. What muscle separates them? (3) Heart, with cavities, open. Name them. Show auriculo-ventricular opening, right and left. What are the valves? Their function? Show aorta. What are its valves? Their function? What is the cause of the second sound of the heart?

Candidate 3: Four specimens under microscope. Then—(1) Liver. Structure of a lobule. What is the function of liver-cells? What are the constituents of bile? The test for biliary salts? Pettenkofer's test? What are the uses of bile? (2) Digestion. What are the movements of the food in the stomach? Their purpose? The action of the gastric juice? Its chemical reaction? The acid present in this fluid? Has it any effect on starch? What is peptone? What is the action of saliva on food? What is the reaction of pancreatic secretion? Describe the structure of solitary glands of intestine. Their function? (3) Blood, and circulation. What are the corpuscles? The red—their size? their structure? The white—their size? their structure? What are the differences between arterial and venous blood? What is the quantity of blood in the body? How estimated? Do some organs receive more blood than others? Which most? What part of the brain is most vascular? Is there any increased supply of blood to the stomach during digestion? What may be the physiological explanation of the hyperæmia? What is the influence of vaso-motor nerves? Do all the organs vary in the quantity of blood received under different circumstances? What is the effect of dividing the sympathetic nerve in the neck? Any effect on the eye? Any effect on the amount of sweat?



Candidate 4: Four specimens under microscope. Then—(1) Urine. Average quantity in twenty-four hours? Average specific gravity? What variations under different circumstances? What is the composition of urine? What its reaction? Test a sample of urine, and take its specific gravity. What is urea? What its source in the body? What is the structure of the kidney? Its cortical and pyramidal portions? Describe a Malpighian body. What is the secretory portion of the kidney? The evidence of secretory power? The effect of blood-pressure? (2) Milk. What is its specific gravity? What are its constituents? On standing, what does milk divide into? The difference between butter and cream? Any envelope to a milk-globule? What average quantity of mother's milk required for a child three months old? Is there any difference between woman's milk and cow's milk? How would you make the latter resemble the former for administration to an infant? (3) Ossification of the humerus. How old is this specimen? What features indicate the age? How is the epiphyseal head united with the shaft? What arrangement of cells precedes advancing ossification of the shaft? (4) Recognise the duodenum; portions of small and large intestine.

Candidate 5: Microscopic specimens; small intestine, in different portions. Then—(1) Saliva—nerve influence on secretion. What experimental evidence? In a rabbit decapitated, how is saliva secreted? Is all secretion produced at blood-pressure—above or below? (2) In the human body, where are elastic fibres found? How are elastic fibres prepared from the ligamentum nuchæ? or from an artery? What is the use of elasticity in an artery? (3) Is the circulation of the blood intermittent or continuous? What is the pulse, *e.g.*, in radial artery? What is dicrotism? Draw on board the dicrotic notch. What is oscillation in an artery? Draw blood-pressure in inspiration, in expiration. If intracardial pressure is increased, what happens to the heart? (4) Bile; its chief constituents. What are the tests for bile? What is the chemical difference between red and green pigment of bile?

Candidate 6: Microscopic specimens. Then—(1) Kidney. What is a Malpighian body? What epithelium in the convoluted tubules? What is its function? (2) Artery. Arrangements of muscular fibres; what is the use of the



muscular coat? How does contraction increase the blood-pressure? (3) Section of spinal cord: its effect on blood-pressure. What is the vaso-motor centre? Where situated? In dilatation of arteries, what is the effect on blood-pressure? In what arteries is the blood-pressure greatest? Amount of in aorta? When least in veins? In which veins? (4) An aperture in thorax: what effect on respiration? Why would not lung expand? What is the effect of inspiration on the circulation? Is movement of blood in vena cava affected? How? (5) Blood: examination of deoxidized by spectroscope. What number of bands seen? (6) Urine. What is urea? How to detect grape-sugar?

### THIRD OR FINAL EXAMINATION.

#### PART I.—MEDICINE.

This part of the final examination consists of a written examination, a clinical examination, and a *vivâ voce*. For the *written portion* two papers are now set for candidates registered on or after January 1, 1892. For each paper three hours are allowed, and the candidate must answer at least four questions out of the six which are set.

*Clinical Examination.*—This examination is designed to test the candidate's personal and practical knowledge of disease, with regard to the questions of diagnosis and treatment. The patients are selected from the various Metropolitan hospitals and brought to the Examination Hall. Obviously, only such patients as can be safely removed from bed, and excluding cases of contagious disease, are submitted to examination; the cases, therefore, are chiefly examples of *chronic* disease (especially of the thoracic and abdominal viscera), paralysis, diabetes.

In the physical examination of the chest or abdomen, the patients lie comfortably on bed-tables; other patients are accommodated with chairs.

Each candidate is requested to examine a patient by himself; for this, ten minutes are allowed. As the time is so short, the candidate's attention is generally directed by the examiner to the particular *region* of the body which is affected, in order that time may not be wasted in investigating organs which are healthy. Thus, he may be asked to examine the chest, the abdomen, and so on.



At the end of the ten minutes the examiner, if the candidate has finished, takes him away from the cases and questions him on what he has found. If the candidate has not finished, a few minutes more are generally allowed him. The questions refer to the physical signs and symptoms which the candidate has elicited; he is asked to give the conclusions he has founded on these data, and his reasons for arriving at those conclusions, and questions on the treatment may follow. The candidates may also be asked to examine other patients. This *vivâ voce* lasts twenty minutes. The candidate is then given some prescriptions to write, and for this a quarter of an hour is allowed.

On one occasion the clinical examination comprised the following series of cases: (1) Mitral presystolic murmur. (2) Mitral systolic murmur. (3) Ascites—due to cirrhosis of liver. (4) Phthisis, with cavity in apex of left lung. (5) Aortic valvular regurgitation. (6) Dilatation of stomach, consequent on old ulcer of pyloric orifice, with contraction. (7) Enlargement of the liver, from amyloid degeneration. (8) Progressive muscular atrophy, affecting flexor muscles, chiefly of upper extremities. (9) Locomotor ataxy. (10) Pemphigus, over chest and abdomen, in a child. (11) Hemiplegia, with aphasia. (12) Cirrhosis of liver, ascites and jaundice.

Another examination presented a different series of cases: (1) Hydrothorax. (2) Paralysis agitans. (3) Mitral stenosis. (4) Mitral regurgitation, with asthma. (5) Pleurisy, with considerable effusion. (6) Phthisis, with cavity in apex of right lung. (7) Hemiplegia—left, with lingual paralysis; from syphilis. (8) Aortic aneurism. (9) Spastic paralysis. (10) Double aortic murmur. (11) Enlargement of liver and spleen, with jaundice.

*Vivâ Voce Examination in Medicine.*—The kind of oral examination by which the candidate's medical knowledge is thus further tested will be seen in the following series of questions as relating to *four* candidates. Such questions frequently arise out of some point in the written examination, wherein it seemed that some error or deficiency had been shown. *First* candidate: What are the signs of aortic regurgitation? What is the character of the pulse, and the cause of it? What condition of the left ventricle results? What is cirrhosis of the liver? What are its symptoms or signs, and its consequences? What are the signs of ascites? In the female, how



would you diagnose ascites from an ovarian cyst? What other causes are there of hæmatemesis besides cirrhosis? What are the different kinds of ulcer of the stomach? What is the situation of the small circular ulcer, and the usual age of the patient? What are the characters of the cancerous ulcer, and the probable age of the patient? How would you diagnose this ulcer before hæmatemesis occurs? A *second* candidate might be asked as follows: Diabetes mellitus—what is Fehling's test, and what the advantage of it? What is this pathological specimen?—typhoid ulceration of the intestine. What are its characteristic appearances? How is the ulcer produced? What are the abdominal symptoms of typhoid fever? What kind of motions are passed? What are the febrile symptoms? What the characters of the eruption? How many spots usually, and their situation? What is the appearance of the tongue? What the average duration of the fever? The period of incubation? What are the causes of a fatal issue? The symptoms of peritonitis from perforation of the intestine? What the treatment, and of intestinal hæmorrhage? A *third* candidate might be questioned in another direction: What is this skin eruption, depicted in a coloured lithograph?—herpes zoster. What is its nature and common situation? What is this eruption?—molluscum. Another drawing showing congenital syphilitic eruption. Another, showing impetigo. What is this specimen?—aortic valvular disease. What is the character of the pulse (Corrigan's)? What are the signs of mitral incompetence? What is there peculiar in the patient's appearance? A *fourth* candidate may be submitted to the following questions: What are the signs of pericarditis? State the diagnostic signs of pleurisy and pneumonia. The tests for sugar in the urine, Trommer's test more particularly? The kind of diet, and the reasons for it? Why is almond bread ordered? What is this specimen?—an injected lung, showing a cavity at the apex, and abundant tubercular deposit. What are the signs of a cavity? Name the sound of the percussion note. The signs of pneumothorax, from rupture of a cavity? What are the consequences? Describe the signs arising from the presence of air and fluid in the pleural cavity.

This portion of the examination lasts twenty minutes.



## PART II.—SURGICAL ANATOMY AND THE PRINCIPLES AND PRACTICE OF SURGERY.

This consists of three parts : A written paper, a clinical examination, and a *vivâ voce*.

In the written paper six questions are set, and the candidate must answer *at least four*, though he is strongly advised to answer *all* the questions. For this paper three hours are allowed.

## CLINICAL EXAMINATION.

This examination consists in the diagnosis of, and statement of the treatment appropriate for, injury or disease, as exhibited by *patients* in the average course of surgical practice. The cases are such as may be seen in the out-patients' room of any general hospital, and would be almost certainly met with during the period of dressership required by the regulations of the College.

Each candidate is examined for a quarter of an hour.

The following cases are typical of those which are shown to the candidate at this examination : Angular curvature of the spine, with double lumbar abscess ; the disease of five or six years' duration. Fracture of the tibia and fibula just above the ankle-joint ; the foot had been forcibly everted by slipping on a doorstep five years since ; union of both fractures. Recurrent cancer of breast, and near cicatrix of operation for removal of the primary tumour, two years ago, in a man seventy-six years of age. Chronic teno-synovitis of the flexor tendons, just above the wrist ; hand not involved. Suppurating inguinal glands. Fatty tumour of small size, in the posterior triangle of the neck. Tumour of antrum, with protrusion of the eyeball, and projection of the growth, into the nasal fossæ ; small fistulous opening over the lachrymal sac, the sight unaffected ; enlargement of the cervical glands ; date of the disease, six months, and referred to a blow on the bridge of the nose sixteen years previously ; the patient's age, thirty-one. Caries of ulna just below the olecranon, in a boy seven years old. Cancellous exostosis close above the outer condyle of the femur ; from three to four years' duration, in a youth seventeen years of age. Necrosis of the humerus, in the upper third of its shaft ; two fistulous openings on the



inner aspect of the arm, presenting fungatory granulations. Disease of the shoulder-joint, with marked flattening of the deltoid muscle. Epithelioma of the tongue; two months from date of its first appearance, in a man aged fifty-six. Epithelioma over the root of the thumb. Bursa in the popliteal space. Spina bifida, in lumbar region. Hydrocele of the spermatic cord, of eight years' duration, in a boy aged sixteen. Keloid of scar after laparotomy. Inguino-scrotal hernia of two years' standing, but reducible. Popliteal aneurism, of the size of a hen's egg, consolidated after ligature of the superficial femoral. Lupus of nose and upper lip, of six years' duration, in a boy aged thirteen. Tuberculous disease of elbow in a child of six. Ganglion on back of wrist. Gummatous ulceration of leg. Dupuytren's contraction of little finger.

The *histories* in connection with the various forms of disease and injury have to be ascertained by the candidates by questioning the patient, after having examined the case. The examiner sometimes asks the candidate to give his diagnosis in the presence of the patient, and sometimes takes him away from the patient, in order to see if the candidate has investigated all the points of importance. In some cases the examiner requires merely the diagnosis, in others he asks for the reasons on which the diagnosis is based.

One feature in these Practical Examinations seems especially worthy of notice—it is the freedom from any embarrassment or difficulty to the candidate, assuming him to be well prepared. This agreeable circumstance is partly due to the *objective* character of the examination, whereby readiness of language and much descriptive power are not at all essential to success; and the composure of the student is aided by the calmness and considerate bearing of the examiners. In one case, a candidate who laboured under great impediment of speech, but who evidently possessed the requisite knowledge, was facilitated by answering in writing, just a word or two on a piece of paper with a pencil being quite sufficient to the questions, 'What's this?' and 'What's that?'

#### SURGICAL ANATOMY AND SURGICAL INSTRUMENTS.

A quarter of an hour is devoted to this portion of the examination. There are two tables, on each of which



lies a man stripped for the purpose of examination, and other tables are provided with bandages, splints, trusses, and other surgical apparatus. The nude recumbent *figures* are well formed and well developed; but they present very different degrees of muscular development and contour, selected apparently for different objects of surgical examination. Thus, one man is of spare muscular development, but in his body the various bony prominences in the upper and lower extremities stand out conspicuously. He is an excellent subject for *topographical* anatomy. Another man, of ample muscular form, is more suitable for amputation and the application of splints. Red chalk is provided, so that the students shall mark the course of the arteries, or of other adjacent parts, and the relative position of internal organs. Wooden knives—in the shape of large scalpels and amputating knives—are used for the representation of various surgical operations, in the ligature of arteries, excisions, and amputations.

The following questions illustrate the nature of the practical examination on Surgery:

*Lower Extremity.*—In synovitis of the knee-joint, point out the situations where the swelling presents. What structures restrain or prevent the appearance of swelling in certain parts of the joint? Put your finger on the insertion of the ligamentum patellæ, and name the prominence of bone. Mark, with chalk, on the skin, the course of the anterior tibial nerve, from its commencement to the ankle-joint. Under what muscle does the external popliteal nerve pass below the head of the fibula? Point out the most common situation of fracture of the tibia. Point out the situation of fracture in the fibula and internal malleolus, constituting Pott's fracture. Twist the foot in the direction it then assumes; and why is it so turned? What splints would be used for a broken leg—fracture of both bones? Apply M'Intyre's splint. Apply side-splints. These questions included the bandaging of the limb to secure the splints. Lay hold of the foot, and mark the line of incision as for Chopart's amputation. Between what bones of the tarsus do you disarticulate? Do the same as for Lisfranc's amputation. Lay hold of the second toe, and feel for the joint for amputation at the metatarso-phalangeal articulation. Mark the line of incision. Mark the course of the superficial femoral artery. Where would you compress the common femoral



with your finger? Apply a tourniquet. For flap-amputation of the thigh, in its middle third, direct how the leg should be held. Take this spatula and show where you would enter the knife, how transfix the limb, and where bring out the point of the knife. Indicate the lines of the flaps. Prepare the bone for the saw. Apply the saw. What main artery will require ligature, and where would you find that vessel? For ligature of the posterior tibial artery, laterally, under the gastrocnemius, mark the line of incision; what muscle will be divided, and where will the artery be found? Apply lateral splints to the leg, and bandage from the foot. Put your finger on the internal abdominal ring; also into the external abdominal ring. What point of bone can be felt in the latter ring? Describe the course of oblique inguinal hernia. Show how to reduce the hernia. Select a proper truss; apply it. Make the requisite measurements with a tape, so that an instrument-maker in London may forward to you in the country a properly fitting truss. Put your finger on the saphenous opening in the thigh. What bounds it externally? Show how to reduce a femoral hernia, indicating the directions in which compression should be made, successively. Apply a spica bandage, also double spica bandage.

*Upper Extremity.*—Compress the brachial artery with your fingers. Mark, with chalk, the course of the artery from the armpit to the bend of the elbow. Name the superficial veins in the arm, pointing them out severally. Apply a bandage, as for bleeding at the bend of the elbow. Place the arm in the direction it assumes from dislocation of the humerus into the axilla, or forwards, or backwards. What is the position of the arm in fracture of the clavicle? Point out the acromion. Reduce a dislocation of the forearm backwards, placing your knee in position for counter-extension.

*Neck.*—Place the head as for tracheotomy. Mark the incision. Where should the trachea be opened? What vessels are in the way or proximate? Put your finger on the seventh cervical vertebra, and how do you know it? Compress the subclavian artery with your thumb, in the third part of its course.

*Thorax.*—Point out the situation of puncture for paracentesis thoracis. Mark, with chalk, the arch of the aorta; also the outline of the heart, and the apex where it strikes the wall of the chest. Point out where you would tap



the chest, which margin of the intercostal space you would avoid, and why? Amputation of the breast: Place the arm in position, mark with red chalk the incisions, show how you would raise the breast, and to what depth, and how to remove any diseased axillary glands. The treatment of hæmorrhage in the operation, and secondary.

*Abdomen.*—Point out the situation of puncture for tapping the abdomen. Why is that spot selected? Mark the lineæ semilunares. Mark the course of the abdominal aorta, and its termination. Also of the external iliac arteries. What is the relative position of the iliac veins? Where would you puncture the bladder above the pubes?

*Instruments.*—Select the instruments for lateral lithotomy. Apply a trephine to the skull, placing the centre-pin in position. When should the latter be withdrawn? Apply a ligature to an artery, represented by the end of a bougie. Plug the nares, anterior and posterior, in the skull. Name various instruments on the table, and describe their uses.

The following are examples of the method of examination:

Candidate 1: Name the structures in the middle line of the neck, from the chin to the sternum. Is the trachea of unvarying depth in the neck? Do any natural movements affect the length of the trachea in the neck? What is the effect of deglutition? What that of deep inspiration? Name the bones in the wrist-joint. Mention the articulations of these bones. What synovial membranes are there in the radio-carpal and ulnar articulations? Point out and name the tendons around the wrist. What do the radial extensors pass over to their insertion? Mark Poupart's ligament, and the boundaries of Scarpa's triangle. Mark the incision for ligature of the superficial femoral artery. What is the course of the artery? Where is the profunda given off? How would the collateral circulation be carried on after operation? What is this?—a double roller. Apply a capeline bandage to the head of this man.

*Instruments.*—Name lithotomy scoop; how is it used? Name retractors, lion forceps, œsophageal probang, and for the removal of what kind of foreign bodies is it used? Nasal speculum, clamp for internal hæmorrhoids, bullet-forceps, actual cautery. Inguinal region.—Name the structures exposed on dissection. What are the origins and insertions of the external oblique muscle? How is



the sheath of the rectus muscle formed? What are the coverings of the spermatic cord?

Candidate 2: Compress the femoral artery in the groin. What are the relations of the femoral vein? Compress the artery in the middle third of the thigh. What is Hunter's canal? What nerve accompanies the artery in the canal? What is the relation of the vein? What are the relations of the artery and vein in the popliteal space? Put your finger on the gall-bladder. Mark the position of the cæcum. Mark the colon throughout its course. What is Amussat's operation? Indicate the regions of the abdomen. What operations are performed in the hypogastric region? In tapping the abdomen, what precautions would you take? Mark the course and extent of the axillary artery. Mark incision for ligature of the external iliac artery. What structures are divided and exposed in the operation? How is the internal abdominal ring formed? Point out the crural ring. What are the boundaries of the crural canal? Where is the usual stricture in operating for femoral hernia? How is the saphenous opening formed? Abscess in the axilla—mark incision. What parts would you avoid? Indicate the course of the long thoracic and subscapular arteries. Excision of the knee-joint—mark the incision. In applying the saw, is there any danger to the popliteal artery? Might the limb in a young person eventually become shorter after operation? Why?

**PATHOLOGY AND SURGERY.**—This concluding subject of the practical pass-examination is held in the Council-room of the College. It is oral or *vivâ voce*; and each candidate is subjected to examination at two tables for a period of *ten* minutes at each table, making *twenty* minutes' examination in all. Pathology being so directly supplemental to Practical Surgery, this part of the College examination is most important.

*Form of Examination.*—The questions put to three candidates will illustrate the course of this examination:

Candidate 1: (1) Necrosis of the tibia. What is this specimen? Point out the sequestrum. What is the external sheath? From what structure is new bone formed chiefly? Are there any other sources? In what probable period would the changes have occurred in the specimen? Mention the causes of necrosis. Is acute or chronic inflammation the more common cause? What are the consequences of chronic inflammation of bone?



(2) Calcareous degeneration of an artery. What is this? At what period of life is arterial degeneration most common? What is the chemical composition of the deposit? What effects are produced on the artery? What influence on the circulation? The consequences of arterial degeneration?

Same Candidate, Second Table: (1) Fracture of base of the skull. Point out the injury. The cause? How does indirect violence produce fracture of the base? (2) Fracture of the neck of the femur, extra-capsular. Point out the nature of the injury, and its relation to the capsule. Was it caused by direct or indirect violence? Signs of the fracture. Diagnosis from intra-capsular fracture. In which fracture would the limb be most shortened, and to what amount? Difference with regard to age of the patient. How is impacted fracture of the femoral neck produced?

Candidate 2: (1) Fracture of lower ends of tibia and fibula. State the nature of the specimen. What is the displacement of the fragments? What is the position of the os calcis? For what dislocation of the foot might this displacement be mistaken? What splint should be used to prevent traction of the heel backwards? What should be the position of the leg to the thigh? Under what circumstances might you have to perform tenotomy, by division of the tendo Achillis? (2) Atheroma of aorta. What is this degeneration? The seat of the change in the coats of the artery? What is the structure of the middle coat of the vessel?

Same Candidate, Second Table: (1) Phlebitis. State the changes which the coats of the vein have undergone. To what is the coagulum due? Do clots form after death? How would postmortem clot-formation be distinguished? (2) Depressed fracture of the skull. Mention the forms of fracture. Is there any repair in the specimen? What would be the immediate effects of depressed fracture? What are the symptoms of concussion? The treatment of compression? (3) Iritis. Its symptoms? What vessels form the vascularity? The treatment of simple iritis?

Candidate 3: (1) A 'stump' sequestrum from the femur. What is this? To what is it due? What amount of time was needed for its separation? By what process was the dead bone separated from the living? (2) Tuberculous disease of knee-joint. What is this? In what



structure did the disease commence? How is the cartilage destroyed? Why is the joint flexed? What results would follow? In this stage what treatment do you recommend?

Same Candidate, Second Table: (1) Central sarcoma of head of tibia. What is this? What variety of sarcoma is this probably? Is it a very malignant form? Would it be likely to burst into the joint? Are any lymphatic glands likely to have been affected? What should be done for such a condition? (2) A 'mulberry' calculus? What is this? Of what is it composed? Why is it so dark in colour? Does this form of calculus occur more commonly in the old or the young? Is this variety easily crushed with a lithotrite? (3) A fractured patella united by fibrous tissue. Was this fracture caused by direct or indirect violence? Is this form of union usual? Why? Does it ever unite by bone? How may it be treated?

### PART III.—MIDWIFERY.

The examination in this subject consists of two parts, a written paper and a *vivâ voce*. In the written paper six questions are set, and the candidate must answer four; but here, as elsewhere, he is earnestly advised to answer if possible all the *six* questions. Three hours are allowed for the paper.

The *vivâ voce* examination lasts twenty minutes, the candidates being questioned for ten minutes on midwifery and for ten minutes on gynæcology. The candidate may be required to show how a fœtal head passes through a pelvis in, say, the second vertex presentation, or a first face presentation, and questions may be asked on gynæcological specimens preserved in jars.

The following remarks on the general character of the examinations of the Conjoint Board may not be unacceptable:

As regards the *written* examination, the general characteristics of a 'good' paper may be gathered from some of the most satisfactory which I have had the opportunity of carefully perusing. Each element of any question was answered successively, and nothing foreign to the question introduced. Conciseness and brevity are not only good qualities in a paper, but they enable the well-informed student to answer all the six questions, and with due allotment of space to each, instead perhaps of his being com-



pelled to restrict his answers to the minimum requirement of only four questions, and possibly with an inadequate consideration of even these. Disregard of conciseness might lead the student unwittingly to be beaten by time, and the mere length of a paper is no measure of its sufficiency.

Throughout the course of *practical* examination in Anatomy and Surgery, it has seemed to my judgment that students fail to acquit themselves satisfactorily mostly in topographical or external anatomy, in the use and application of surgical apparatus, and in the clinical examination. The former deficiency would appear referable to neglect on the part of the students to handle and observe for themselves the configuration of the body in the living, or even in the dead subject. Most dissectors' manuals give directions for observing, and a descriptive examination of, the various prominences and depressions to be seen and felt on the surface of the body, *before* commencing the dissection of the part in hand. But the student, in his eagerness to get the skin off and begin dissection, overlooks this very important preliminary knowledge of anatomy, and its relation to that beneath the surface. It should, however, always be remembered that the surgeon in practice approaches the body from its exterior, and that the topography of the surface guides to the interior. The 'crammed' student soon betrays his ignorance by looking up to the ceiling for recollection when asked questions which can only be answered by using his unused eyes to see and his hands to feel. I once heard a candidate betray his want of practical knowledge by a chance word. While pointing out the parts lying within the sheath of the common carotid artery, he said, 'Behind, and between the artery and the internal jugular vein, there *will be*'—instead of *there is*—'the pneumogastric nerve.' In regard to surgical apparatus, the want of practical knowledge must be referred to inadequate instruction in the Hospitals.

#### ANATOMICAL SPECIMENS.

The following are given as examples of the specimens on which the anatomical knowledge of the candidates is tested, both for the Conjoint Examination and for the Fellowship of the College of Surgeons. The list, though lengthy, is necessarily incomplete, as new specimens are added from time to time, but it may prove useful.



**OSSEOUS SYSTEM.**—(1) Articulated skeleton. (2) Separate bones. (3) Prepared bones; two ribs softened in acid; right scapula softened; left humerus calcined; portion of tibia, showing periosteum reflected; portion of tibia and fibula, with interosseous membrane; and a transverse section of the same structures.

**CARTILAGES.**—(1) Articular.—Glenoid cavity of right scapula, with long tendon of biceps muscle. Lateral section of lower end of right humerus, showing articular surface, with ulna and radius; anterior aspect. The same, posterior aspect. Lateral section of lower ends of tibia and fibula, with articular surfaces. Two sections of lower ends of tibia and fibula, and their articular surfaces. Scaphoid and three cuneiform bones, articular surfaces and sections. Antero-posterior vertical section of ankle and foot—through tibia, astragalus, os calcis, scaphoid, internal cuneiform, and first metatarsal bone, and phalanges of great-toe. (2) Connecting fibro-cartilages.—Transverse and vertical sections of lumbar vertebræ, showing intervertebral substance. Section of pelvis at inlet, showing sacro-iliac articulation and symphysis pubis, with their cartilages. Section through symphysis, showing the dentated cartilaginous plates. (3) Inter-articular cartilages.—Upper articular surface of tibia with semilunar cartilages and attachments of crucial ligaments.

**LIGAMENTS.**—Ligamenta subflava. Transverse ligament of atlas. Orbicular ligament of upper radio-ulnar articulation. Temporo-maxillary ligaments; capsular ligament of lower jaw; the inter-articular cartilage. Stylo-maxillary ligament, and muscles of soft palate. Capsular ligament of shoulder-joint; coraco-clavicular, coraco-acromial, and coraco-humeral ligaments; transverse scapular ligament. Ligaments of elbow-joint—vertical antero-posterior section of elbow-joint, showing attachments of ligaments in the coronoid and olecranon fossæ of the humerus. Orbicular ligament of radius and insertion of tendon of biceps muscle. Ligaments of elbow and forearm. Ligaments of wrist and hand. Lateral ligaments of fingers: sections of metacarpal bones and phalanges. Hip-joint laid open, showing ligamentum teres. Ligaments of knee-joint, showing synovial membrane on its outer and upper side; the quadriceps extensor tendon and the ligamentum patellæ. Knee-joint; showing lateral, transverse and crucial ligaments. Posterior aspect; lateral and crucial ligaments, expansion of tendon of semimembranosus,



semilunar cartilages, and ligamentum mucosum. Crucial ligaments and semilunar cartilages of knee-joint. Ankle-joint and foot; ligaments, with insertions of tibial and peroneal tendons, and tendo Achillis. Tarsal interosseous ligaments. Metatarso-phalangeal joint of great-toe laid open, showing sesamoid bones.

MUSCULAR SYSTEM.—Muscles of head, face, and neck. Muscles of orbit. Front view of orbit, showing insertions of recti and obliqui muscles. View of internal wall of orbit, showing tensor tarsi muscle and pulley of superior oblique muscle. External muscles of mastication. Internal muscles of mastication. Levator palati and internal pterygoid muscles. Muscles of the pharynx, and extrinsic muscles of the tongue and larynx. Muscles of the tongue, and intrinsic muscles of the larynx. Diaphragm, thoracic aspect. View from the abdominal aspect. Hand; interossei muscles, palmar aspect. Dorsal interossei of hand. Femur; neck, and trochanters, showing insertion of muscles. Knee, showing insertion and origin of muscles around.

Separate muscles and tendon: Temporal muscle, radiated. Digastric, double-bellied. Rectus femoris, bipenniform. Extensor longus digitorum, penniform. Semitendinosus, fusiform. Tendo Achillis.

BLOODVESSELS—ARTERIES AND VEINS.—Neck and face; branches of external carotid. Superficial palmar arch; with distribution of nerves and anatomy of palm of hand. Superficial and deep palmar arches. Finger injected, showing vascularity of matrix. Elbow; front, superficial veins and nerves. Relations of superficial and deep vessels and nerves in front of elbow. Leg; transverse section, showing vessels. Ankle and foot; dissection showing arteries.

NERVOUS SYSTEM.—Spinal cord, shown by removal of arches of lower cervical and upper dorsal vertebræ, and membranes removed. Connections of spinal cord with trunk of the sympathetic nerve. Brain; base of brain, with membranes. The same, after removal of membranes. Dissection of corpus callosum. Left lateral ventricle, with descending cornu. Left ventricle exposed, and descending cornu of right dissected out, showing hippocampus major. Lateral ventricles, with velum interpositum and descending cornu exposed. View of left ventricle, third ventricle, corpora quadrigemina, and portion of hippocampus, with optic tract between it and



optic thalamus. Anterior pillars of fornix, third ventricle, pineal gland, corpora quadrigemina and fourth ventricle, shown by a section through both hemispheres of cerebellum. Antero-posterior vertical section of head and neck, showing left hemisphere of encephalon and left halves of pons, medulla oblongata, and spinal cord. The same without the cord. Base of skull, with cranial nerves, dura mater removed on left side. Olfactory nerves, distribution on perpendicular plate of ethmoid bone. Distribution of same nerves on superior and middle turbinate bones. Orbit; nerves and ophthalmic ganglion, side view. The same, upper view. Dissection, showing the orbital nerves, ophthalmic ganglion, Gasserian ganglion, with the three divisions of the fifth nerve, the facial nerve, and its junction with the infra-orbital; the Vidian nerve and sphenopalatine ganglion; also the external carotid artery, with its facial branch and its terminal branches, viz., the temporal and internal maxillary; the membrana tympani and ossicula of the ear, etc.

A dissection of a portion of a head to show nerves of orbit; ophthalmic ganglion; Gasserian ganglion; and the divisions of fifth nerve; internal carotid artery; and eighth and ninth nerves. Second division of the fifth, and branches, with sphenopalatine ganglion; Vidian nerve with its sympathetic branch, and its branch communicating with the facial nerve. Second division of the fifth from internal aspect, with Meckel's ganglion; Vidian nerve, and its branches to sympathetic and facial, and the nasal and palatine branches of the superior maxillary nerve; the sympathetic nerve is seen ramifying on the internal carotid artery, and the muscles of the soft palate are exposed, together with the internal pterygoid muscle. Branches of the third division of the fifth, seen from above as they pass over and under the external pterygoid muscle. A dissection of the third division of the fifth, showing the branches to the temporal, masseter, and buccinator muscles; also the inferior dental nerve and its mylohyoid branch; the lingual and the auriculo-temporal, with its junction with the facial. A dissection of the third division of the fifth, showing its motor and sensory roots; the otic ganglion with the lesser petrosal nerve; the lingual branch with the chorda-tympani nerve coming off the facial, passing between the malleus and incus, and joining the lingual; the inferior dental and its mylohyoid branch, and the auriculo-temporal with the middle



meningeal artery passing external to it. The two roots of the third division of the fifth; the lingual branch joined by the chorda-tympani, which is seen coming off the facial, and passing between the ossicula of the middle ear; the inferior dental with its mylo-hyoid branch, which in this case passes through a canal in the ramus of the jaw; and the auriculo-temporal with the meningeal artery passing internal to it. A dissection to show the Gasserian ganglion and the three divisions of the fifth; with the supra-orbital branch of the first; the infra-orbital branch of the second division; the temporal cut short; the buccal, the lingual with the chorda-tympani traced to its origin, and the submaxillary ganglion; the inferior dental, with its junction with the lingual and its mylo-hyoid branch; and the auriculo-temporal branches of the third division of the fifth. The distribution of the hypoglossal nerve is also shown. Dissection of under surface of tongue and its muscles, showing the distribution of the lingual and hypoglossal nerves; the submaxillary ganglion and the duct of Wharton. Dissection of perineum to show distribution of pudic nerves, and the pudendal branch of the small sciatic passing below the tuberosity of the ischium.

ORGANS OF SPECIAL SENSE.—Upper surface of the tongue, tonsils, posterior view of larynx, and part of œsophagus. Outer surface of auricle of ear and cartilages of the same. Front view of organ of hearing, left side, the semicircular canals and cochlea laid open. A vertical transverse section of head through the centre of the superior maxillary bones, displaying nasal cavities from behind. External cartilages of the nose.

ORGANS OF DIGESTION.—A section showing side view of nose, mouth, pharynx, and larynx; also the muscles of the orbit, the semicircular canals of the ear, and the temporo-maxillary articulation laid open from above. A horizontal section through the angles of the mouth and the occipito-atloid articulation, showing upper surface of tongue and upper part of pharynx and larynx. A vertical transverse section through the external auditory canal, laying open the back of pharynx, and bringing into view the posterior nares, base of tongue and epiglottis. Superficial dissection of side of face to show the salivary glands and their relations. Deep dissection, displaying salivary glands and ducts. Parotid gland with its duct, and the portion of buccinator muscle it pierces to enter the



mouth. Injected œsophagus, showing the arrangement of its muscular fibres, and outer surface of mucous membrane. View of external surface of stomach, with portion of duodenum and pancreas. Dissection displaying the stomach laid open, the pyloric valve and part of duodenum, with commencement of valvulæ conniventes; the liver with section of gall-bladder; the pancreas and the ducts and vessels in connection therewith. Pyloric valve as seen by two vertical sections across lower end of stomach and upper part of duodenum. Vertical section across pyloric valve. Portion of small intestine distended and opened laterally to show valvulæ conniventes. The same injected. Transverse section of small intestine distended to show the valvulæ conniventes in action. The same injected. Distended cæcum to show ileo-cæcal valve. Distended and dried cæcum, showing ileo-cæcal valve and opening of appendix vermiformis. Rectum, showing its longitudinal and transverse muscular fibres, the two sphincters and part of the levator ani and coccygeus muscles. Two dissections of rectum, giving external and internal views of the muscles in connection with it. Liver of child with gall-bladder injected. The same; gall-bladder injected, the ductus communis, portion of duodenum and part of diaphragm. Adult liver and gall-bladder. The same; with part of duodenum and pancreas, and the gall and pancreatic ducts. Dissection to show the pyloric valve and valvulæ conniventes by openings in duodenum; also a section of gall-bladder and duct, and the pancreas. Transverse section of pyloric end of stomach, showing the valve closed; also sections of gall-bladder and pancreas, showing their ducts with their openings into the duodenum.

THE THORAX.—Front view of thorax, showing the viscera *in situ*, with vessels injected; the liver and gall-bladder are seen beneath the diaphragm. Front view of thoracic viscera of a child, the pericardium laid open. Posterior mediastinum, and parts contained. Dissection of heart, with auricles and ventricles laid open to show valves; the roots of the pulmonary artery and aorta and the terminations of the venæ cavæ and pulmonary veins are displayed. Dissection of heart, with auricles removed and ventricles opened, to show auriculo-ventricular valves; the pulmonary artery and aorta are opened at the side to show the semilunar valves. Heart, with its vessels injected, dried, and painted. Heart, with the carotid and



subclavian arteries and descending aorta, with their branches; the internal jugular, subclavian and descending cava and branches; the larynx, trachea, and thoracic duct. Preparation of foetal circulation, injected, dried, and painted. Foetal heart, seven months, showing ductus arteriosus. Foetal thoracic viscera, injected.

ORGANS OF VOICE AND RESPIRATION. — Cartilages of larynx and hyoid bone. Section of trachea, with its bifurcation. Lungs distended, showing their form during inspiration. Thyroid and thymus glands.

URINARY ORGANS.—Section of kidney, with vessels injected. The same, one half removed. Bladder and urethra laid open, seen from above; the ureters entering bladder, prostate with the vasa deferentia and vesiculæ seminales and ducts; membranous portion of urethra, Cowper's glands, bulb, crura, and under part of penis are dissected out. Section of bladder and prostate, from above.

MALE ORGANS OF GENERATION.—Upper surface of prostate; under surface of prostate, with third lobe and entrance of common seminal ducts; urethra laid open to show roof with bristles inserted into the lacunæ. Bladder, prostate, vesiculæ seminales, vasa deferentia, and ureters. Vertical longitudinal section of penis, showing cavernous and spongy bodies, the septum and artery. Transverse section of penis, and penis laid open from below to show lacunæ of urethra. Transverse section of penis through glans. Horizontal section of prostate, to show the openings of ejaculatory ducts; and two antero-posterior sections of testicle. Testicle seen from the front, tunica vaginalis being laid open. Testis, epididymis, spermatic cord and artery. Section of bladder and prostate, with bristles in the openings of ureters; vesiculæ reflected outwards, and unravelled; right testicle, with tunica vaginalis reflected; left testicle, with tunica albuginea reflected and epididymis unravelled. Dissection of all the organs of generation, in their relative positions; right testicle denuded of its tunica vaginalis.

FEMALE ORGANS OF GENERATION. — Generative and urinary organs of a child, fifteen months. Lower part of abdomen and pelvis of a child laid open to show generative and urinary organs *in situ*; section of right kidney, to show its pelvis; bladder opened, and right side removed, left side with hypogastric artery reflected outwards and downwards, bristles inserted in the ureters, and



a glass rod passed through the urethra; the vessels are injected, and a bristle is inserted in the right Fallopian tube. Uterus, Fallopian tubes, and ovaries of a child; and left half of uterus with Fallopian tube and ovary of adult, anterior view. Vertical section through bladder and urethra, vagina and uterus laid open from above. Fallopian tubes, ovaries, and rectum of a girl aged fourteen. Vertical section through bladder and urethra, vagina and uterus, and rectum of a woman aged twenty-one. Similar section, including symphysis pubis and external organs of an aged woman.

PELVIS.—Side view of pelvis with viscera *in situ*; the section carried through the obturator foramen, an inch external to symphysis pubis. Side view of pelvis, section carried through the middle of sacrum and symphysis. Vertical antero-posterior section of pelvis, carried through the viscera.

ADDITIONAL DISSECTIONS AND PREPARATIONS. — Dissection of back of head and neck, showing recti and obliqui muscles. Front of sternum, with articulations of clavicle and attachment of costal cartilages; section of right side to show interior of articulations. Back of sternum, showing triangularis sterni muscle. Hand, showing thecæ of the flexor tendons. Dissection of sole of foot, showing superficial layer of muscles; posteriorly these muscles have been removed, with a portion of os calcis, showing the nerves and vessels above them. Dissection of sole of foot; the superficial layer of muscles has been removed, leaving the nerves and arteries. Fœtus and placenta injected to show circulation. Heart opened, showing valves, etc. Bones of upper extremity of child, eighteen months; section to show epiphyses. The same of lower extremity. Sub-occipital region, relative anatomy. Axilla. Bend of the elbow. Superficial and deep nerves at bend of the elbow. Front of thigh. Popliteal space. Knee-joint, showing subcrureus. Constrictor muscles of pharynx, seen from behind. The same, side view. Muscles of larynx. Intrinsic muscles of larynx. Œsophagus, showing muscular layers, longitudinal and transverse. Ascending and descending colon, showing relation to kidneys. Digestive tract of child, eighteen months.



## MICROSCOPIC SPECIMENS FOR EXAMINATION IN HISTOLOGY.

MICROSCOPIC SPECIMENS IN PHYSIOLOGICAL EXAMINATIONS.—Hyaline cartilage. Ossifying cartilage. Transverse section of bone. Longitudinal section of bone. White fibrous tissue. Yellow elastic tissue. Pavement epithelium. Choroidal epithelium. Salivary glands. Tongue. Injected capillaries. Stomach. Small intestine. Large intestine. Kidney. Lung. Liver. Striated muscle. Non-striated muscle. Skin. Hair. Tooth, sections longitudinal and transverse. Spinal cord. Transverse section of nerve-fibres. Cerebellum. Ovary with ova *in situ*. Uric acid. Urate of ammonia. Triple phosphate. Oxalate of lime. Section of retina. Section of cornea. Section through all the tissues of the eye. Section through entrance of optic nerve. Iris. Epiglottis. Soft palate with racemose glands. Liver for high powers, showing hepatic cells. Intestine of frog with Auerbach's plexus. Spleen. Developing tooth. Omentum. White fibro-cartilage. Ossification in membrane. Muscular fibres of tongue.



## PATHOLOGICAL SPECIMENS

FOR

### THE EXAMINATION IN SURGERY FOR THE CONJOINT BOARD AND ALSO FOR THE FELLOWSHIP.

THE following list includes most of the specimens which are shown in the *vivâ voce*, or Surgical Pathology :

Healing by Granulation.—A portion of a leg and of a large healthily granulating sore upon its anterior aspect. Part of the tibia is exposed, and is increased in vascularity; granulations have arisen from the surface of another part.

Ulceration of skin.

False Membrane from the Peritoneum, minutely injected, showing looped arrangement of the new vessels.

Organized Lymph.—Portions of liver and diaphragm, with long, slender, and very delicate bands and threads of false membrane extended between their adjacent surfaces. Both the peritoneal surfaces to which the adhesions are attached are thickened and opaque.

Caries of Vertebrae.—The lumbar vertebrae of a person who died with lumbar abscess. The lower part of the body of the second lumbar vertebra, and the intervertebral substance beneath it, have been destroyed by ulceration. The remaining parts have approximated, producing a slight projection backwards into the vertebral canal. The anterior ligament and periosteum of the vertebrae, both above and below the diseased part, are reflected. They are thickened and consolidated, and appear to have been widely separated from the spine by a collection of pus and thick caseous substance, some of which remains adherent.

Dry Gangrene of both hands.

Senile Gangrene of the foot.

Cyst attached to Epididymis.—An apparently healthy testicle, with a thin-walled, transparent, and nearly globular membranous cyst, three-quarters of an inch in



diameter, attached to the middle of the posterior margin of the epididymis. The cyst appears to have been enclosed within the spermatic cord, the constituents of which are partially expanded around it. It has the usual characters of cysts in which seminal fluid is contained.

Sebaceous Cyst from the lumbar region, opened, and the contents removed.

A large flat fatty Tumour, uniform in its substance, and with a deeply lobulated outline. It was removed from a woman's shoulder, and is a characteristic specimen of the most common form of fatty tumour. There is an imperfect cicatrix on the skin covering the tumour, as if some escharotic had been applied.

Fatty Tumour from the Groin.

Cartilaginous Tumour.

Cartilaginous Tumour from near the Parotid Gland, showing gelatinous softening in parts, and cavities.

Fibrous Tumour.—A tumour which was attached to the capsule of the hip-joint. It has a regularly oval outline, is rather flattened, has a nearly smooth surface, and measures about three inches in its chief diameter. It consists of a firm, tough, and compact grayish basis, traversed in various directions by curving and interweaving bundles of opaque white fibres.

Fibrous Tumour from beneath the skin of the gluteal region.

Epithelioma of Skin of Leg.

Epithelioma in Cicatrix of a Burn.

Section of a Melanotic Sarcoma from the Skin of the Back.

Right Femoral Artery and Vein, gangrene of the leg having occurred. The artery is plugged with coagulum, and the vein is partially occluded.

Bifurcation of Abdominal Aorta and Vena Cava. Thrombosis of the right common and external iliac arteries.

The front of a Knee with an enlarged Bursa over the Patella.—The interior of the bursa appears fasciculated with interlacing bands of shining fibres.

An enlarged and Consolidated Bursa from over the Patella.

Enlarged Bursa over the first metatarso-phalangeal articulation.

Vertical Section of a Knee-joint, showing atrophy of the bones from long disease. Bony union of the femur



and tibia at a right angle, with union of the patella to the outer condyle of the femur.

Section of Right Knee-joint, showing partial ankylosis, with atrophy of the bones.

Atrophy of Left Tibia.

Double Fracture of the Olecranon, without union.

Intracapsular Fracture of Neck of Femur.—The upper part of a femur, the neck of which was fractured within the capsule shortly before death. The fibrous investment of the neck is torn on only the anterior part; its upper, lower, and posterior parts are entire, and hold the fragments close together.

Extracapsular fracture of the Neck of the Femur.

Transverse Fracture of the Patella, with separation of the fragments, and ligamentous union.

Section of a Patella, fractured transversely and united by ligament.

Fracture of Patella.—The outer and lower margin has been obliquely broken off. The portions lie close together, but are not united.

Patella fractured transversely in an irregular line through its middle. — The lower portion is fractured vertically. The transverse fracture is united by fibrous tissue; the vertical one is completely united by bone, with considerable enlargement.

Transversely fractured Patella, of which the parts are in close apposition, and in part united by bone.—A small piece of the inner angle of the upper portion perished, and was in process of separation.

Inflammation of Bone, with superficial formation of new bone: section of Tibia macerated and dried.—It shows that the disease, which has all the appearance of an ossified syphilitic node, is almost confined to the anterior part of the tibia, only a small similar deposit existing on the posterior surface. The medullary tissue appears healthy. Except in the part beneath the ulcer of the integuments, the surface of the new bone is smooth, not porous.

Inflammation of Bone, resulting in expansion of its walls, and induration by the formation of new bone in the expanded substance. Section of a Tibia, of which the whole shaft is enlarged and increased in weight.—Its surface is, for the most part, smooth, hard, and marked by superficial transverse branching grooves. At the posterior and upper part of the shaft are two small oval



apertures through its walls—'cloacæ.' They lead to a large-chambered cavity in the interior, which contained pus, and probably a sequestrum.

Section of Femur, showing similar results of Inflammation.

Necrosis, and Formation of New Bone.—Tibia, of which nearly all the anterior and posterior walls of the shaft underwent necrosis. The dead portion is surrounded by an irregular deep groove, and its anterior part is perforated by numerous small apertures, through which the cancellous tissue appears more than usually vascular. A large quantity of new bone has been produced. The case which it forms is incomplete at the anterior and inner part, where the outer layers of the original wall perished, and at the outer part is continuous with that portion of the wall of the original shaft which survived. A periosteum invests all the new bone, and is continuous with the periosteum surrounding the epiphyses and the surviving portion of the shaft, as shown at the back of the preparation. Near the union of the shaft with the epiphyses are several small round apertures, some of which pass through the new bone. The superior internal articular surface of the tibia, and the cartilage covering it, are perforated by a small round aperture with smooth edges, through which pus escaped from the head of the bone into the knee-joint. The necrosis was of six months' duration. Amputation performed.

Necrosis of Jaw in consequence of Exposure to Phosphorus Fumes.

The Bones of a Finger, showing destruction of the interior of the first phalanx, with expansion of the walls of the bone, probably consequent on necrosis of the cancellous tissue.

Necrosis of Femur.

Necrosis and Formation of New Bone.—Tibia, in which, after necrosis of nearly the whole length and thickness of the shaft, an almost complete case of new bone was formed around the sequestrum. The epiphyses, with which the case of new bone is firmly and smoothly connected, are unaltered. The interior of the case is compact and nearly smooth; its exterior also is hard, but more rugged. There are several apertures in it, especially along its anterior part, through which the size and form of the enclosed sequestrum may be seen. The surface of the sequestrum is, in nearly every part, rough.



Left Tibia and Fibula, showing necrosis of nearly the entire shaft of the former bone, in the form of two sequestra, enclosed in an involucrum or sheath of new bone, continuous posteriorly, but having large cloacæ or openings in front. New bone, in scaly deposit, has been thrown out on the surface of the fibula.

Section of Ankle-joint, showing Necrosis of Os calcis : disease of the Articulation.

Necrosis of Tarsal Bones.

Cartilaginous Tumour or Enchondroma. — Fingers, with the heads of the metacarpal bones, in which are several cartilaginous tumours. Two or three of these tumours are connected with the ends of the metacarpal bones ; there are two on the phalanges of the forefinger, two on those of the second finger, three or four on the third, and one is contained within the first phalanx of the little finger. All the tumours are globular, or approach that form ; they are from half an inch to an inch and a half in diameter, nearly smooth on their surfaces, and each is covered with a thin layer of fibrous tissue. A section of one on the forefinger shows that it is composed of cartilage, like those in the preceding specimens, but more vascular. The section of the little finger displays a similar tumour in the medullary tissue of the first phalanx, and the commencing expansion of the surrounding wall ; and it is most probable that some of the tumours which exhibit a more distinct swelling than this presents originated in the same manner within the phalanges, and in growing have either expanded or burst through their walls. The tumours had been growing eleven years, the patient a girl, aged thirteen years and a half ; and the hand was amputated.

Bones of a Forefinger, showing enchondromatous tumour of first phalanx.

Old Dislocation of Shoulder-joint.

A vertical and longitudinal section of a left Foot, injected, showing Inflammation of the Synovial Membrane, and complete destruction of the cartilages of the Ankle-joint. From a man aged thirty-seven.

Excision of Knee-joint, portions of bones removed.

Excision of Elbow-joint for disease, portions of bone removed.

Suppurative disease of the Hip-joint : Morbus Coxarius : Coxalgia.—The head of the femur has been almost entirely destroyed, and a small portion of its lower border alone



remains; its exposed surface presents an apparently healthy cancellous tissue. There are traces of superficial caries of the neck, and new bone has been deposited about the attachment of the capsular ligament, and along the *linea aspera*. The acetabulum is extensively ulcerated; all its margin is destroyed, and at its floor a wide irregular opening into the pelvis nearly separates the pubic and ischiatic portions from the iliac portion of the *os innominatum*. The tissue of all the bones is light, dry, and spongy. The patient was twenty-five years old. Disease induced by the kick of a horse eighteen months previously; death from exhaustion.

**Caries of Spine.**—A vertical section of the lumbar and part of the dorsal portion of a child's vertebral column, with the spinal cord. The bodies of the twelfth dorsal and first lumbar vertebræ, with their intervertebral cartilage, are wholly removed, and those of the eleventh dorsal and second lumbar are in great part removed, by ulceration. The bodies of the other lumbar vertebræ appear to contain tuberculous material in their cancellous spaces. The rest of the intervertebral cartilages, and the other adjacent tissues, are healthy. The parts above and below the ulcerated vertebræ coming together, a considerable angular curvature of the spine is produced; but, through the enlargement of the spaces between the arches of the vertebræ, the spinal canal is not diminished in calibre. The spinal cord and the roots of the nerves appear healthy.

**Caries, and Angular Curvature of the Vertebræ**—lower dorsal and upper lumbar—in a child. Tuberculous material deposited in cup-shaped cavities in the bodies of the vertebræ, with destruction of the inter-vertebral fibro-cartilages.

**Tumour of Lower Jaw;** part of left Ramus, from the interior of which has grown a Tumour about the size of a hen's egg.—A small portion of the tumour projects through the internal, but the greater part through the external, wall of the ramus. A vertical section nearly through its outer part shows the interior structure to be that of a multilocular cyst. The cavities are mostly of small size, and divided from each other by strong fibrous septa, containing numerous spicules and plates, with no very definite arrangement. It is an Epithelial Odontome.

**Osseous Tumour of Lower Jaw.**—Part of the right side of a lower jaw, with sections of a large bony tumour at



its angle. The angle of the jaw rests in a deep groove in the middle of the upper surface of the tumour, and in some situations their respective substances are continuous. The tumour projects both below and on each side of the jaw, is of irregular shape, measures nearly three inches in its chief diameter, and is deeply nodulated. It is composed throughout of bone, uniform in texture, and as hard and heavy as ivory.

Fistula in Ano.—Part of a rectum, vagina, and perineum. Portions of whalebone are placed in a fistulous passage which has a small external opening near the margin of the anus, and extends upwards for an inch and a half by the side of the rectum, becoming wider as it ascends. At its upper part it opens abruptly into the rectum by a short and narrow passage, which is directed at a right angle to the rest of its course. The adjacent tissues are healthy.

The lower part of a rectum, with the anus, at the margin of which are two large hæmorrhoids. A portion of quill is passed through a small, round, ulcerated aperture in the coats of the rectum into a cavity external to it, which opens by a large aperture in the skin at the margin of the anus. The coats of the rectum are thickened and consolidated with the surrounding tissues.

Rectum, showing internal Hæmorrhoids.

Hæmorrhoids.—The lower part of a rectum with large hæmorrhoids around the margin of the anus. The hæmorrhoids are nearly separated into two rows (the smaller ones lying above the larger), by a constriction extending round the rectum at the situation of the lower margin of the sphincter ani.

Rectum and Anus, showing thickening and contraction with prominent folds of the mucous membrane which probably cover internal piles; also external piles, around the anus, covered by thin integument, slightly excoriated.

Inguinal Hernia, on the left side, in a woman. The sac contains a portion of strangulated and adherent jejunum. Minute injection of the vessels could not pass into the herniated intestine, owing to the tight state of the strangulation.

Inguinal Hernia.—Part of the pelvis and abdominal walls of a young child, with the sac of an inguinal hernia, nearly two inches long, on the right side. The testicle is directly below the hernia; the cavity of the tunica



vaginalis is closed above and has no connection with the hernial sac.

An Inguinal Hernia, with Hydrocele of the Tunica Vaginalis.—The hernial sac is placed directly above that of the hydrocele, and projects a little into its upper wall; it contains omentum adherent to its inner surface. The testicle is situated in the middle of the posterior wall of the tunica vaginalis sac.

Artificial Anus of Colon.

Arteries and Veins of the upper part of the Thigh, showing gunshot wound of the superficial femoral vein, involving also the profunda artery; with a false aneurism from the latter vessel, containing firm laminated coagulum.

Traumatic Aneurism of Femoral Artery.

Atheromatous Degeneration of Aorta, with destruction of the inner coat of the artery, over several patches of the deposit.

Abdominal Aorta and Iliac arteries, showing similar changes.

Aneurism of the Superficial Femoral Artery, an inch below the origin of the Profunda.—Section of the sac shows that all three coats of the vessel enter into its formation; and that there is some thickening of the inner coat, with abundant yellow deposit beneath; the middle coat is thinner than natural; the outer coat of usual thickness, but indurated. The remainder of the artery is of ordinary size, and appears healthy.

Fusiform Aneurismal Dilatation of both Popliteal Arteries.

Varicose Veins of Leg.

Thrombosis of Femoral Vein, and Vena Cava.

Sacculated Urinary Bladder, from Stricture of the Urethra.—In consequence of the Stricture, the muscular coat of the bladder is hypertrophied; and in the posterior wall there are many pouches of the mucous membrane, unusually regular in form and size, pushed between the fasciculi, but not protruded far enough to be prominent externally. The prostate is enlarged.

Papillomatous Growths in the Neck of the Bladder, and Prostatic Urethra.—Hypertrophy of the muscular coat of the bladder, and dilatation of the ureters.

Malignant Disease of the Bladder.—A bladder, with the prostate gland and other adjacent parts. The posterior wall of the bladder has been removed to show two vascular, tufted, shreddy, and flocculent growths from the



mucous membrane near the orifice of the ureter, and one of much smaller size from the membrane an inch above the prostate. The larger growths are close together; they are of a spheroidal form, about three-quarters of an inch in diameter, and attached by narrow bases; the branching filaments and tufts of which they are composed, and which when recent were of a bright red colour, float free within the cavity of the bladder. Among the filaments some small portions of a soft substance are here and there entangled. The rest of the mucous membrane is healthy, the muscular coat is a little hypertrophied; and the prostate gland is healthy. The patient aged sixty-five years. Death from recurring hæmorrhage.

Bladder Hypertrophied and Sacculated, containing a large Calculus.

Fracture of Base of Skull with a large clot of blood effused between the bone and dura mater.

Section of Boy's Head, showing Polypi Nasi *in situ*.—One growth is attached by a slender pedicle to the inferior spongy bone—the lower margin of its anterior half; another such growth is attached to the middle spongy bone—its lower and anterior margin. The cells of the ethmoid bone are completely filled with a firm, elastic, pale, and semi-transparent growth, like foetal cartilage; and the mass projects forward as a round tumour into the upper part of the nasal fossæ. The section of this growth resembles a cartilaginous tumour—enchondroma.

Nasal Polypi.—Several specimens showing some of the various forms of gelatinous nasal polypi, and their various modes of attachment to the spongy bones.

Hydrocele of Tunica Vaginalis.—Testicle, with its tunica vaginalis, exhibiting the enlargement and distension of the latter, constituting simple hydrocele. It shows, also, the kind of recess, half partitioned from the main cavity, which the distended sac forms by the side of the epididymis.

Double Hydrocele of the Tunicae Vaginales.—In front of the spermatic cords, the component parts of which are separated.

Testicle with Hæmatocele.

Testicle and Spermatic Cord, containing deposits of tuberculous material.

Part of Bladder with Enlarged Prostate, especially of the middle lobe.—The muscular coat of the bladder is hypertrophied, and its mucous membrane sacculated.



The enlargement has especially affected the prostate in the situation of the middle lobe, which projects in a broad nipple-like process, behind and over the vesical orifice of the urethra, giving the orifice the form of a narrow crescent with its horns turned backwards.

Enlargement of the Prostate Gland, affecting all its Lobes.—Calculus in the prostatic urethra, just over the caput gallinaginis. Thickening of the muscular coat of the bladder. Death from retention of urine.

Stricture of Urethra.—Penis, having the urethra laid open from below. There are two narrow and very close strictures—one about an inch and a half, the other four inches from the external orifice of the urethra. At these parts the canal of the urethra, which in both instances is gradually and regularly narrowed as it approaches the stricture, is not laid open. The whole of the rest of the surface of the urethra is uneven and corrugated, as if by numerous little cord-like thickenings of its walls. It presents, also, a multitude of small orifices and shallow depressions, some of which are probably dilated lacunæ. Behind the second stricture the canal is enlarged and strongly fasciculated. The caput gallinaginis is effaced. At the left side of the membranous portion there is a small cavity, the remains probably of an abscess in the adjacent tissues; it does not communicate with the urethra. The patient was thirty-six years old. Signs of stricture for six years before death.

Epithelioma of Penis.

Cystic Tumour of Breast.

Schirrus of Breast, with Blood-cyst.

Atrophy of Bone.—The upper part of a skull, which has become much thickened, but it is light and porous, and hardening has taken place to a considerable extent, especially on its inner surface. The average thickness of the walls is three-quarters of an inch, and the channels for the meningeal arteries are very deeply marked.

Rickets, affecting Tibia and Fibula.

Rickets.—A Tibia and Fibula, the shafts of which, in consequence of rickets, are remarkably curved inwards and flattened. At the most prominent part of its curve, which is just above the junction of its middle and lower thirds, the shaft of the fibula is an inch and a quarter in depth, but not more than two lines in thickness. Just below this part an irregular process of bone has grown from the outer border of the tibia, and is received in a



corresponding cavity on the inner border of the fibula, so as to form a kind of false joint between them. There is a similar smaller growth on the inner margin of the tibia. In other respects the bones are healthy.

Fracture of Skull, with depression and bony union.—The upper part of a skull, in which there has been a circumscribed fracture, with central depression of the lower and anterior part of the left parietal bone. A piece of bone was removed from the posterior margin of the fracture, but the portions were imperfectly, if at all, elevated. They have, however, united firmly, and, by the closeness of the union, and the smooth roundness of their margins, it is probable that the patient lived a long time, although one narrow portion of bone projects inwards half an inch below the level of the surrounding parts.

Fracture of Skull, incomplete and comminuted, with bony union.—Part of a skull, on which a deep oblique wound was inflicted near the middle of the frontal bone. A portion of the outer table and diploe was broken into three pieces, and nearly detached, but complete reunion has taken place, though the deeper edge of the wound remains open. The inner table of the skull was not injured.

A Skull.—A portion of the frontal bone, including both tables, removed by an oblique incised wound. Partial closure of wound.

Fracture of Skull, complete and comminuted, with bony union.—A skull, on which a very broad deep wound was made through the front of the frontal bone. The wound is more than three inches long, and its edges are nearly an inch apart. The same kind of healing has occurred as in the preceding specimens, and portions detached from one of the margins of the wound have been reunited. Another obliquely penetrating wound, about an inch long, in the occipital bone, is similarly healed.

Base of the Skull, its posterior half, showing fracture of the occipital bone from gunshot wound.—Trephine applied between the occipital protuberance and the lambdoid suture, on the left side of the bone. From this point a fissure extends downwards and forwards, close to the left condyle, and into the jugular foramen.

Fracture of Rib, union, without displacement.—A second rib, fractured through its middle, and united, without displacement of the portions. The situation of



the fracture is indicated only by a rough thickening of the borders and the inner wall.

An eleventh Rib, fractured through its middle, and united without displacement, but with considerable thickening, and the formation of ridges of bone on both its borders.

Fracture of Os Innominatum; little displacement, and bony union, with great accumulation of bone around. The articular cartilage of the acetabulum is cracked in a stellate manner.

Fracture of Clavicle, union, with displacement.—A left clavicle, fractured through the middle of its shaft, and repaired, with considerable displacement. The scapular portion has passed behind the sternal one, and the bridge of bone uniting them is smooth and flat.

Comminuted Fracture of Clavicle, united.

A Clavicle, fractured obliquely through the middle of its shaft.—The scapular portion has passed directly under the sternal one, and in this position they are smoothly united by intermediate new bone.

A left Clavicle, fractured obliquely through the middle of the shaft.—The scapular portion has passed behind the sternal one. Firm union. The bone has been longitudinally bisected.

Fracture of Humerus, union, with displacement, and atrophy of upper fragment.—A right humerus, which was fractured transversely just below its tuberosities. The upper end of the shaft appears to have been drawn forwards, and is united by a short bridge of bone to the anterior border of the head and neck. The head and its tuberosities are reduced to a disc-like mass, less than an inch in thickness, and having externally a smooth flat surface, continuous with the outer wall of the shaft. The articular surface of the head is ulcerated at its centre, and bone is irregularly accumulated around its margin.

Fracture of Humerus, transversely, just below the tuberosities; bony union.—Oblique fracture through the lower part of its shaft; united, with slight lateral displacement.

Fracture of the Left Humerus, obliquely, just below the Head and through the Tuberosities.—The shaft is drawn forwards, upwards, and inwards; the outer surface of its upper end is united by bridges of bone to the broken surface of the head and neck, and the anterior fourth of the head rests in a cavity on the top of the shaft.



Fracture of Lower End of Radius.

Extra-capsular Fracture of Neck of Femur; impacted; union.—A femur, from a woman twenty-four years old, which was fractured through the base of the neck and the great trochanter. The portions are smoothly united, and with but little addition of bone. The neck appears to have been driven down between the trochanters; its axis is now nearly at a right angle with that of the shaft, and the head is below the level of the great trochanter.

Double Fracture of the Femur.—The upper one passes obliquely across the neck, from the upper and back part to the anterior intertrochanteric line, with displacement of the fragment downwards and forwards, and deposit of new bone on the upper and anterior surface of the neck; the lower fracture extends obliquely through the upper third of the shaft, from two inches below the great trochanter, downwards and inwards, with considerable displacement, the end of the lower fragment being drawn up to within half an inch of the trochanter. This injury occurred in a man seventy-five years old. Bony union has taken place.

Gunshot Fracture of the upper end of the Femur, detaching the great trochanter and adjoining portion of the neck; with an oblique fracture below the trochanter, from the anterior surface of the shaft downwards and backwards, to the middle of the linea aspera.

Comminuted Gunshot Fracture, extending from the small Trochanter obliquely downwards and forwards.—Union, with much new bone between the fragments, and displacement to an angle of about  $130^{\circ}$ .

Left Femur, which has been fractured near the middle of the shaft, and united.

Right Femur, of which the shaft was broken near the junction of the middle and lower thirds.—The portions considerably overlapped each other, the lower one having passed far upwards behind the upper one, but they are united by a strong intermediate mass of bone, and though there is great shortening of the limb, there is no eversion of the condyles.

Transverse Fracture of the Patella, with a band of ligamentous union. Hypertrophy of the two fragments of bone.

Left tibia and fibula, showing fractures, firmly united, with displacement of the lower fragments upwards, and their approximation inwards.



Fracture of Tibia and Fibula, just below the middle of their shafts. Considerable longitudinal displacement, but firm union; the end of the lower portion of the fibula being fixed to that of the upper portion of the tibia.

Vertical Section of Shaft of the Femur, showing expansion, hypertrophy, and sclerosis of the compact tissue of the walls of the bone. The inner surface is covered with laminated new bone, encroaching on the cavity of the medullary canal.

Syphilitic Ulcer, perforating both tables of the frontal bone, on the right side. On the left side of the bone a larger portion of bone has been removed by caries or necrosis.

Syphilitic Caries of the upper part of the Skull, involving both tables.

Necrosis of Tibia.—A tibia, of which a large portion of the shaft, including more than half its anterior wall, suffered necrosis. The dead portion is completely separated, but is retained with an imperfect cavity formed by the remaining portions of the shaft, and by the new bone deposited upon them, some of which has grown so as to project over the margins of the sequestrum. No new bone has been formed opposite that part of the sequestrum which comprises the superficial layers of the original shaft.

Subcoracoid Dislocation of Humerus.

Dislocation of Humerus, unreduced, and new articulation.—The head of the humerus was dislocated downwards, forwards, and inwards, many years before death, and was not reduced. It became flattened and enlarged, and its articular surface rested on a deep concave surface of new bone deposited on the front and inferior costa of the scapula, immediately below and on the inner side of the glenoid cavity. A large irregular prominence of new bone is directed backwards and upwards from the great tuberosity of the humerus: it is probable the elongated supra-spinatus and infra-spinatus muscles were attached to it. The glenoid cavity has lost its original form, its outline and surface are irregular, and all its articular cartilage is removed. The humerus appears to have moved freely in its new articulation.

Comminuted Fracture of the Tibia and Fibula, at their lower ends, with displacement of the Tibia forwards and outwards, over the astragalus. Slight displacement of the malleoli forwards. Bony union, and ankylosis of



ankle-joint, consequent on destruction of the articular cartilages by ulceration.

Disease of Hip-joint, affecting chiefly the head of the femur; and new bone has been formed at the bottom of the acetabulum. By adaptation of the nodulated surface on the acetabulum with the anterior part of the head of the femur, the limb was much inverted. The projections of new bone below the small trochanter, and a similar one on the os pubis, may have served for the attachment of the muscles, which were stretched, and perhaps ligamentous.

Bony Anchylosis of Hip-joint, with malposition of Limb.—The femur is directed almost straight forwards, but the form of that part of it which is not enclosed in the acetabulum is little altered. The border of the acetabulum has grown out over the base of the head of the femur, but its notch is preserved, a plate of bone united to the femur replacing that portion of the cotyloid ligament which extends across the notch. A section through the ilium and the head and neck of the femur shows that the substance of the acetabulum and that of the head of the femur have so completely coalesced that their original outlines can be nowhere traced.

Part of an Os Innominatum. — The acetabulum is reduced in depth, and its circumference is diminished, by a great accumulation of new bone upon and by the sides of its posterior border. The surface of the new bone is slightly concave, and part of it, on which probably the dislocated head of the femur rested, is smooth. The adjacent bone is healthy.

Chronic Rheumatoid Arthritis (Osteo-arthritis) of Hip-joint.—The acetabulum is much increased in depth by an accumulation of new bone upon the whole of its border, and especially upon its lower part, where a kind of ridge, shallow and grooved, is formed, which served as a support for the base of the head of the femur. A portion of the cotyloid ligament which is preserved shows that this accumulation of bone has taken place external to it, not in its substance. Part of the articular cartilage of the acetabulum has been removed; that covering its upper third remains, and appears healthy. The exposed surface of the rest of the bone is hard, in most parts compact, in some polished, but in all parts perforated by numerous minute round apertures, that made it look like worm-eaten wood. Bone deposited on each side of the groove over



which the tendon of the psoas muscle passed formed a deep channel for it. The head of the femur is flattened and conical, as if a portion of its upper surface had been removed; its base is greatly enlarged by an accumulation of new bone around it, especially at the lower and back part, where a ridge is formed corresponding with that already described as projecting from the lower border of the acetabulum. The articular cartilage remains on the part of the head which corresponds with that portion of the acetabulum on which also the cartilage remains; the rest of the surface of the head is hard, and in part polished, but perforated with numerous minute holes.

Bony Anchylosis of Elbow-joint.—The bones of an elbow-joint, so closely and smoothly united by bone that only traces of the forms of their articular surfaces can be discerned.

Right Humerus, Radius and Ulna, firmly and smoothly united by bone. Atrophy of the bones, but their tissue is healthy.

Cervical Vertebrae, second, third, and fourth; with osseous outgrowth on the anterior surfaces of their bodies, which, passing across the intervertebral spaces, have united the bones together.

Dorsal Vertebrae.—The six lower, showing laminar osseous outgrowths, uniting the bodies of these bones.

Four Dorsal Vertebrae, showing union of their bodies by osseous outgrowths, and thin layers of fasciculated bone unite the arches of the vertebrae, these layers having large apertures in the middle line.

Two Lumbar Vertebrae, showing ossific union of the bodies, and of the arches, spines, and articular processes.

Lateral Curvature of Spine.—An adult vertebral column, in the superior dorsal portion of which there is a considerable curvature to the right. Both the lumbar and the superior dorsal portions are, in compensation, slightly curved to the left. The bodies of the vertebrae are somewhat rotated; the left articular processes of those affected by the chief dorsal curve are turned forwards, and the right articular processes of the lumbar and superior dorsal vertebrae forwards; so that in both cases that side of the vertebrae which lies in the concavity of the curve is turned forwards.



## PATHOLOGICAL SPECIMENS FOR THE EXAMINATION IN MEDICINE.

THE following specimens may be taken as representative of those shown at the examination, though the list is necessarily not complete :

Chronic Rheumatic Arthritis of Knee-joint.

Caries of Spine.—The last three dorsal, and the first four lumbar, vertebræ of an adult. The intervertebral fibro-cartilage between the first and second vertebræ has been removed by ulceration, and the adjacent parts of their bodies are ulcerated, and broken up into portions which are nearly loose. New bone has been formed on the margins of the bodies of these two vertebræ, and in smaller quantity, and irregularly, on those adjacent to them. Ulceration has taken place, to a small extent, on the anterior part of the body of the third lumbar vertebra.

Cancer of Stomach.—A stomach of which the blood-vessels have been minutely injected. Around the cardiac orifice, and extending for a short distance along the lower curvature, is a flat, sponge-like tumour, of moderately firm consistence, having an uneven surface projecting into the cavity of the stomach, and a deeply sinuous elevated margin. The lymphatic glands immediately adjacent to the tumour are enlarged, and contain a soft pulpy substance. The coats of the stomach on which the tumour rests, and immediately adjacent to it, appear healthy. The middle of the stomach presents a very close hour-glass contraction.

Ulceration of Large Intestine.—A cæcum, with the ascending colon, and part of the ileum. Mucous membrane removed by ulceration and sloughing. The disease becomes rather less intense towards the ileo-cæcal valve, and except that its coats appear to have been too vascular and swollen, the ileum is healthy. These appearances of the intestines are probably the result of acute dysentery.

Ulceration of Intestine in Typhoid Fever.—Portion of ileum, exhibiting advanced stage of the disease. In many places large sloughs have separated from the patches of glands, exposing the submucous tissue, or the circular muscular fibres, either apparently healthy or else a little



thickened and granular. In other places, large flocculent, shrivelled-up, and dirty-brownish sloughs remain attached in the places of the glands, and hang in loose shreds into the cavity of the intestine. The solitary glands and the smaller Peyer's patches are less diseased than the larger. Wherever sloughs have separated, the sloughing has extended a little under the swollen and elevated border round the patch, which border therefore appears like a thin margin overhanging the base of the ulcer.

A Portion of Ileum injected.—There is a large oval typhoid ulcer, corresponding to one of Peyer's patches, from which the slough has separated, and which appears about to heal. There are also several circular ulcers formed by the ulceration of the solitary glands. The increased vascularity of the thickened mucous membrane around the edges, and the dense white and but slightly vascular tissue of the base of the ulcerated surfaces, are beautifully shown in the preparation.

Tuberculous ulceration of the Ileum, from a Bush-woman.

Portion of Colon, from a person who is said to have recovered from dysentery, but the ulcers have more of the tuberculous than the dysenteric characters. Two of them, elongated and oval, have their margins and bases becoming smooth, as if nearly cicatrized. The other ulcers are small, round or oval, with level bases and elevated, smoothly-rounded margins turned in over the borders of their bases.

Portion of an Ileum, showing Peyer's patches and the solitary glands swollen and elevated. In some of the former are small deep ulcers, and some of the solitary glands appear superficially ulcerated.

Strangulation of portion of the Ileum by a Constricting Band.

A portion of small Intestine and Cæcum, from a patient who died of Internal Strangulation.—There are two small diverticula from the ileum, both of which appear to be formed of all the coats of the intestine, serous, muscular, and mucous. They are situated very near each other and about two feet from the ileo-cæcal valve. One arises very obliquely from near the mesenteric border of the intestine, and is directed downwards. Its first portion is not more than a quarter of an inch in diameter, but it afterwards dilates into a flat-shaped blind extremity; its length is two inches. The second arises from the convex free



margin of the intestine, two inches above the other. It is three-quarters of an inch long, widest at its commencement, and tapers gradually to an extremity which is continuous with a strong, round, fibrous cord, also about three-quarters of an inch long, which by its other end is firmly adherent to the surface of another portion of the intestine, about a foot higher up. This diverticulum and cord form a constricting band, under which the strangulated portion of intestine, with its mesentery, had passed. This consists of about two feet of the lower end of the ileum, from immediately above the ileo-cæcal valve to the upper diverticulum. At the postmortem examination it was found to be in a state of great congestion, having much recent lymph effused upon it, especially round the seat of stricture. On the cæcum, about two inches from the ileo-cæcal valve, is a small rounded pouch of intestine, having an aperture of communication that would only admit a small probe. The vermiform appendage is adherent in its whole length to the outer surface of the cæcum, and its extremity is united by a short fibrous band to the side of the small pouch just mentioned.

The diverticulum which caused the stricture by the adhesion of its extremity to another portion of intestine appears to correspond in situation and structure to the diverticulum verum of Meckel, resulting from the non-closure of a portion of the foetal vitelline duct; but the second pouch on the ileum, and that on the colon, must have had a different origin.

Intussusception of the Jejunum.

Portion of Ileum, with Intussusception.—The intussuscepted part has been carried downwards; its lower orifice is turned towards the attachment of its mesentery, and is narrow and elongated.

Portion of Intestine, showing an intussusception of the ileum a few inches above the ileo-cæcal valve. The intussuscepted part has passed through the valve, and entered the ascending colon.

Carcinoma of Liver.—Portion of a liver, in which are numerous round and irregular masses of a soft substance. The masses nearly fill the liver, and project upon its surface: many like them have been removed from smoothly circumscribed cavities in its substance, in which they were imbedded; some appear to be surrounded by distinct membranous capsules.

Hydatid Cyst in Liver.



Gall-stones. — A gall-bladder, with two large calculi distending it just above the cystic duct. In other parts its walls are thin, though not distended; its inner surface is not reticular, but fasciculated by muscular fibres strongly developed beneath it. The cystic duct is of natural size.

Heart, showing recently deposited lymph, from pericarditis.

Pericarditis.—Heart of a child, the whole surface of which is covered with a thin and delicate layer of soft lymph. The bloodvessels are injected, and injection appears to have passed in several places into the lymph.

Heart, showing aneurism of the posterior wall of the left ventricle, near the septum, and just below the mitral valve. The sac is crossed by a main branch of the left coronary artery. The left ventricle is generally dilated, and somewhat hypertrophied, and the endocardium is thickened.

Endocarditis.—Portion of the base of a heart, with large, coarsely-granulated masses of brownish-yellow lymph firmly adherent to the mitral, and one of the aortic, valves. The mass on the mitral valve extends down the tendinous cords to one of the fleshy columns; that on the aortic valve has a somewhat conical form, and is half an inch in length, its apex projecting quite across the orifice of the aorta.

Mitral and Aortic Valves, with the adjacent parts.—The mitral valves are thickened and opaque, and their borders, more thickened than any other part, appear rigid. The tendinous cords and the summit of the fleshy columns are similarly thickened, opaque, tough, and white; the aortic valves are shrivelled, and their margins are curved backwards and irregularly thickened.

Portion of Aorta, with its valves, which are a little thickened and opaque. Two of them are so united by their adjacent edges that they present a continuous curved margin, like that of one valve. Their united edges form a prominent ridge, passing from the middle of their free border to the wall of the artery; and along this ridge a large quantity of calcareous matter is deposited in coarsely accumulated granules.

Calcareous Deposit in Aortic Valves.

Part of a Heart, showing dilatation and hypertrophy of the left ventricle. The aortic valves are thickened and opaque, and long fibrinous growths are attached around



the corpora Arantii; in the centres of two of the valves are circular ulcerated apertures, with lymph on their margins.

Dilatation of the first portion of the Aorta, close to the valves, with calcareous deposit beneath the lining membrane. Perforation of two of the valves, the margins of the ulcers being thickened with adherent lymph.

Portion of Thoracic Aorta, the walls of which are considerably dilated.—There is an abundant deposit of atheromatous and calcareous matter throughout the thickened internal coat, and its surface is in many places fissured, or removed in irregular patches.

Dilatation of Arch of Aorta.—A section of the arch of an aorta, exhibiting an irregular aneurismal dilatation extending from an inch above the valves to the commencement of the descending aorta. The dilatation appears to have occupied all the circumference as well as the whole length of this part of the artery; but both before and beyond the situations mentioned, the artery has its natural size, and the dilatation begins and ends abruptly with well-defined borders, like those of the mouth of an aneurism. The dilated part of the artery measures in its greatest calibre between two and three inches in diameter, and its length is about nine inches. All the arterial coats are dilated together, and at the back of the preparation are dissected into three layers; here also are shown two small pouches pushed outwards from the general dilatation. In the distal part of the dilatation a large quantity of laminated coagulum appears to have reduced the channel for the blood to the ordinary size of the aorta; and some of this coagulum extends into the left subclavian artery, and fills its cavity. The orifice of the aorta and its valves are healthy.

Aneurism of Arch of Aorta, with the Trachea.—The posterior wall and parts of the upper and lower walls of the arch, from the origin of the arteria innominata to the commencement of the thoracic aorta, are dilated into a large, elongated, transversely oval and flattened aneurismal sac, which is partially filled with laminated coagulum. The sac pressed backwards upon the trachea, and burst into it just above the bifurcation, with a small smooth-edged oval opening. The artery before and beyond the aneurism is slightly dilated; the trunks given off from the arch are healthy. The outer part of the sac, which was probably closely adherent to the left ribs, has been removed.



**Emphysema of Lungs.**—Part of a lung, in the edge of which many of the air-cells are dilated, and have coalesced. The diseased part projects in a multilocular or sacculated swelling, bounded by the pleura, which is opaque and somewhat thickened from previous inflammation. From a man *æt.* sixty-five, who suffered from asthma for nearly six years.

Section of the two Lungs from a middle-aged man, in an advanced state of tuberculosis, injected. Near the apices of both lungs are large cavities. The pleura is thickened, and was adherent to the parietes of the thorax.

**Phthisis Pulmonalis.**—Section of a lung which had collapsed, and was compressed by air and fluid in the pleural cavity. Tuberculous material is thickly deposited in the lung. There are also numerous cavities of various, but chiefly small, sizes; and one of these in its progress by ulceration has extended through the pleura pulmonalis, making in it a smooth-edged oval aperture, opening into the opposite wall of the same cavity.

In the inflammation of the pleura, which followed the escape of air and pus into its cavity, a thick firm layer of lymph has been deposited over the whole surface of the collapsed lung, and of the costal pleura. The further collapse of the lung appears to have been hindered by a strong old adhesion, which fixed a part of the pleura on its upper lobe to the opposite part of the costal pleura.

**Laryngeal Diphtheria.**

**Dilatation of Kidney.**—Section of a kidney, in which the pelvis and its branches are dilated, in consequence of obstruction to the secretion of urine. It shows the gradual flattening and pressing outwards of the points of the papillæ, which take place when the calyces, into which they project, are dilated around them, and which constitute the first degree of expansion or dilatation of the kidney. A slight elevation at the centre of each dilated calyx marks the former projection of the papilla, and from the centre of this elevated part the straight blood-vessels between the trunks of the tubuli uriniferi are seen radiating in every direction towards the circumference of the calyx.

**Granular Kidney.**—Section of a kidney affected with granular degeneration. It is rather smaller than natural. The outer layer of its cortical substance is very thin, and its surface is coarsely and irregularly granular, and in



some situations pitted and seamed, as if it had been drawn inwards.

Cystic Kidney.—Section of a kidney much enlarged, with the secreting structure almost, but not entirely, destroyed by the development within it of very numerous thin-walled cysts with fluid contents.

Renal Calculi.—A kidney, the bloodvessels of which are injected. The pelvis and calyces are dilated, and three of the latter are obstructed by calculi.

Kidney, showing dilatation of the pelvis, which contains two large calculi, having a branched form adapted to their receptacle. The substance of the kidney is much atrophied.

Cerebral Hæmorrhage.—The base of a brain, with the lateral ventricles exposed from above. Both the ventricles were distended with blood, which flowed into them through a rupture of the left middle cerebral artery, just below the left corpus striatum; portions of the coagula remain. The substance of the left corpus striatum, through which the blood passed, and all the adjacent part of the brain, appear to have been extensively lacerated by the effusion of blood. A distinct small effusion in the posterior lobe of the right hemisphere is exposed at the lateral surface of the specimen.



## SURGICAL INSTRUMENTS AND APPARATUS.

The following list includes most of the instruments shown :

INSTRUMENTS.—Trephines, Skulls for Operation, Hey's Saw, Elevators, Forceps, and Brush—Jaw Saws—Tracheotomy Tubes—Wire-spring Speculum for the Eye—Cataract Knife—Belloc's Sound for plugging Posterior Nares—Nasal Polypus Snare—Bivalve Speculum for Nose—Ear Speculum—Hainsby's Spring-Compressor of Cheeks, after Operation for Hare-lip—Tongue Spatula—Laryngoscope, Mirror and Reflector—Tonsil Guillotine—Fergusson's Gag for Mouth—Œsophagus Sponge-Probang—Œsophagus Expanding Brush-Probang—Coin-Catcher—Trocár and Canula for Paracentesis Abdominis—Hydrocele Trocar and Canula—Smaller Instrument for Exploratory Puncture of Abscess—Aspirator—Hypodermic-injection Syringe—Pronged Forceps for Piles—Anal Speculum, bivalve and tubular—Rectum-Bougies—Bladder Sounds—Lithotomy Staff, curved and straight; Knife; Forceps for Stone Extraction; Scoop—Urethral Calculus Forceps—Lithotrite—Catheters, silver and gum elastic—Prostatic Catheter—Catheter for washing out Bladder—Urethral Bougies, gum elastic—Female Urethra Dilator, three-bladed—Hernia Knives, curved and straight, and Director—Hæmorrhoidal Clamp—Amputation Knives—Knife for Hip-joint Amputation—Common Saws—Butcher's Saw—Fergusson's Lion Forceps—Bone Forceps—Sequestrum Forceps—Gouges—Artery Forceps—Torsion Forceps—Dissecting Forceps—Bullet Forceps—Bistouries, straight, curved, sharp-pointed, blunt-pointed—Tenotomy Knives—Scalpels—Directors—Aneurism or Ligature Needle—Retractors—Suture Needles—Suture Silk and Wire—Hare-lip Pins; Pliers for cutting pins or wire—Scissors, straight and angular—Hooks—Cauteries, bladed and button-ended.



EXAMINATION PAPERS SET BY THE  
CONJOINT EXAMINING BOARD  
FROM JANUARY, 1890, TO APRIL, 1898.

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FIRST EXAMINATION.

PART I.—CHEMISTRY, INCLUDING CHEMICAL PHYSICS.

Three hours are allowed for the paper in this subject.

Candidates *must* answer at least *four* questions, and not more than *six*. At least *one* question in each section must be answered. Candidates unable to answer *at least four* questions must report the fact to the Presiding Examiner, and they are not allowed to proceed with their examination.

In Sections II. and III. equations should be given where possible.

1890.

*January 7th.*

SECTION I.

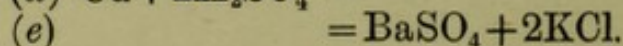
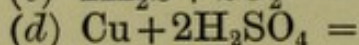
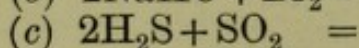
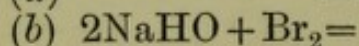
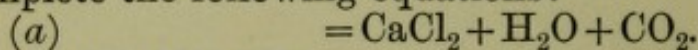
1. What happens when air saturated with moisture is cooled? How may the total amount of moisture be estimated?

2. The boiling-point of water is found to be lower at the top of a mountain than at the base. Explain the reason of this, and show in general terms how this fact can be used for estimating the height of the mountain.

SECTION II.

3. Point out the relations existing between Chlorine, Bromine, and Iodine, and illustrate your answer by reference to the physical and chemical properties of these elements.

4. Complete the following equations:





5. Give the formulæ of the orthophosphates of Sodium and Calcium. Explain and illustrate by an equation how an orthophosphate may be converted into a pyrophosphate.

### SECTION III.

6. Give two methods of forming Hydrocyanic Acid, and describe how this acid may be detected.

7. State the relationship existing between Aldehyde, Chloral, and Chloroform. How may Aldehyde be converted into Chloral, and Chloral into Chloroform?

8. An organic substance contains 20.0 per cent. of Carbon, 6.6 of Hydrogen, 46.6 of Nitrogen, and 26.6 of Oxygen. Calculate its formula.

*March 25th.*

### SECTION I.

1. Describe the physical changes which may be produced in solids by the application of Heat; give instances.

2. Describe the Leyden Jar. How can you show in which portion of the jar the charge resides?

### SECTION II.

3. State which of the following bodies are elements and which compounds: Chlorine, Chalk, Diamond, Nitre, Phosphorus, Lime, Common Salt, Water, Sal Ammoniac.

4. A solution of Ammonium Sulphide  $(\text{NH}_4)_2\text{S}$  is added respectively to solutions of Copper Nitrate, Ferric Chloride, and Magnesium Sulphate. Describe what occurs in each case, and give equations.

5. What do you understand by the term Combustion? Describe the parts of which the flame of a candle consists. What happens when gas is burned in a Bunsen burner?

### SECTION III.

6. Describe two experiments illustrative of Saponification.

7. Dilute Hydrochloric Acid is added to solutions of (a) Urea, (b) Quinine, (c) Lead Acetate. What is formed in each instance?

8. Given Methyl Iodide, Potassium Cyanide, Water, and Caustic Potash, show by equations how Potassium Acetate may be formed from these.



*July 22.*

SECTION I.

1. What is meant by 'Atmospheric pressure'? Describe a method by which it may be measured.

2. Distinguish between Conduction of Heat and Radiation. How would you determine the true rate of Conduction along a metallic bar?

SECTION II.

3. Describe a physical and chemical method by which Oxygen may be separated from Atmospheric Air.

4. What substances present a chemical analogy to Sulphuretted Hydrogen, Hydric disulphide, and Carbon disulphide?

5. What are the principal ores of Iron? How is Pig-iron obtained from these, and how may this be converted into Steel?

SECTION III.

6. Describe the preparation and the properties of Potassium Ferrocyanide. What is the action upon it of dilute and of strong Sulphuric Acid respectively?

7. How can pure Methyl Alcohol be obtained? What products result from the action of Chlorine upon Methyl Hydride?

8. What do you understand by the term 'homologous series'? Give an example.

*October 7th.*

SECTION I.

1. What do you understand by the term 'relative or specific weight'? How would you proceed to determine the Specific Gravity of (a) Sand, (b) Alcohol, (c) strong Sulphuric Acid?

2. What is meant by Dialysis? Give instances of bodies which respectively dialyse readily and with difficulty.

SECTION II.

3. How does Boric Acid occur in nature? Describe its preparation and that of its principal Salt.

4. Given the metal Magnesium, how would you prepare the Sulphate, Nitrate, Chloride, Carbonate, and Oxide?



5. Write out the chemical formulæ for the following bodies :

- (a) Slaked Lime.
- (b) Green Vitriol (crystallized).
- (c) Blue Vitriol (crystallized).
- (d) Common Salt.
- (e) Sal Ammoniac.

### SECTION III.

6. How is Glycerine formed in the process of ordinary Saponification? To what group of organic bodies does Glycerine belong?

7. Describe a method by which Oxalic Acid may be prepared. Give the formulæ of the various Potassium Oxalates.

8. How can you convert Potassium Ferrocyanide into the Ferricyanide? How can you tell when the conversion is complete?

1891.

*January 6th.*

### SECTION I.

1. How can pure Alcohol be prepared from weak Alcohol? Describe the different methods you know.

2. Describe the structure of the Incandescent Lamp, and explain why it glows.

### SECTION II.

3. Given Manganese Dioxide, Hydrochloric Acid, and Caustic Potash, describe how you would prepare (a) Potassium Chloride, (b) Potassium Chlorate, (c) Potassium Perchlorate. Exemplify by equations.

4. What are the chief properties of Sulphur? Describe the reactions that occur in the manufacture of Sulphuric Acid.

5. Give two examples illustrating the use of Oxidizing Agents in Solution.

### SECTION III.

6. What is the action of strong Sulphuric Acid on (a) Alcohol, (b) Ethylamine, (c) Benzine, (d) Sodium Stearate.

7. Give equations representing the action on Urea of (a) Potassium Nitrate with Sulphuric Acid, (b) Sodium Hypobromite.

8. Give a short account of Alcoholic, Acetic, and Lactic Acid fermentation.



*March 31st.*

SECTION I.

1. A Leyden Jar is held by the knob, and charged on the outside. Would you get a shock on setting it down on a wet table? and if so, why? How could you set it down without getting a shock?

2. Explain the following facts: (a) A metal mirror held in front of a fire gets hot very slowly; (b) hot water in a bright kettle cools slowly; (c) kettles are advantageously made with handles of wood or ivory; (d) water is more easily heated from below than from above; (e) air appears to be drawn towards a fire which is burning in a room.

SECTION II.

3. A colourless liquid is warmed, and gives off bubbles of Oxygen; on adding it to a solution containing weak Sulphuric Acid, Potassium Iodide, and Starch, a blue coloration is produced. What is the liquid? Explain these changes.

4. What would be the effect of heating the following substances with strong Hydrochloric Acid: (a) Fe, (b)  $\text{PbO}_2$ , (c) CuO, and (d)  $\text{CrO}_3$ ?

5. How is Bismuth acted on by Nitric Acid? and how is (a) the Nitrate and (b) the Chloride changed by the addition of water?

SECTION III.

6. Calcium Oxalate is heated. What Gas is evolved, and what Salt remains behind? Give the equation expressing the reaction.

7. Describe a reaction in which Aldehyde is shown to be a reducing agent. What change takes place in the Aldehyde during this reaction?

8. How may Phenol (Carbolic Acid) be prepared from Salicylic Acid, and Salicylic Acid from Phenol?

*July 28th.*

SECTION I.

1. How is the Heat of the Evaporation of Water (latent Heat of Steam) determined? Give a few instances of the absorption of Heat in the passage of substances from the solid to the liquid condition.



2. What effect would be produced if an ordinary Barometer was placed under the receiver of an Air-pump? Describe the difference in the construction of (a) the Aneroid, (b) the Mercurial Barometer.

## SECTION II.

3. What do you understand by the term Oxidation? Give equations representing the action of various Oxidizing agents.

4. Give the formulæ for the two Chlorides of Mercury. How would you prepare both Chlorides from Metallic Mercury?

5. Spring Water is commonly harder than river Water. Explain this statement. Why is hard Water often rendered softer by boiling, and always by the addition of Washing Soda (Soda Crystals)?

## SECTION III.

6. How can Aldehyde be converted into Chloroform?

7. Name the principal compounds which evolve Carbon Monoxide on heating with Sulphuric Acid. Give the equation in one instance.

8. Classify in their proper group the following substances:

(a)  $C_2H_5.OH$ ; (b)  $CH_3.COOH$ ; (c)  $CH_3.CO.OCC_2H_5$ ; (d)  $C_3H_5(OH)_3$ .

*October 6th.*

## SECTION I.

1. A spirit-flame is held inside an inverted wineglass for a few seconds, and it is then removed and the glass placed on the moistened skin. Describe what happens, and explain the reasons.

2. Describe a Dialyser, and explain how by means of it (a) Sugar can be separated from Gum, (b) Gelatine from Common Salt. How are substances classified in relation to their power of diffusion?

## SECTION II.

3. How would you determine the equivalent of Zinc, hydrogen being taken as a unity?

4. What change takes place when a fragment of Bone is heated (a) in a crucible, (b) in the open air? What is the



chief Inorganic Constituent of the Bones of animals, and how is this substance altered in composition when treated with strong Sulphuric Acid?

5. Represent by equations the action of Heat on (a) Ammonium Nitrate; (b) Mercuric Cyanide; (c) Mercuric Nitrate.

### SECTION III.

6. Describe the preparation of Citric Acid from Lemons.

7. Describe and explain a method for the determination of the Vapour Density of a substance. What is the use of such a determination? Illustrate your answer by an example.

8. What is the action of Diastase on Starch?

1892.

*January 5th.*

### SECTION I.

1. A piece of ice at  $-10^{\circ}$  C. is placed in a chamber kept heated to  $110^{\circ}$  C. Describe accurately what changes take place as the temperature rises.

2. The Atomic weight of Copper is 63.6, that of Sodium 23, and of Chlorine 35.5. What elementary substances are liberated, and in what proportion, when a current of electricity is passed successively through solutions of Cupric Chloride and a weak solution of Common Salt?

### SECTION II.

3. What is meant by the terms Atomic and Molecular Weight? Explain in full what the symbols  $\text{H}_2\text{SO}_4$ ,  $\text{KOH}$ ,  $\text{CO}_2$  and  $\text{NH}_3$  are intended to represent, and show in the case of  $\text{NH}_3$  what is the relation between the gaseous volume of the compound and the volumes of its constituents.

4. Mention the more important salts of Calcium found in nature. What is lime and how is it made? What changes take place (1) when it is exposed to the air, (2) to water? What changes are produced in diluted lime-water by passing Carbon Dioxide into it?

5. How could you prepare a sample of crystallized Lead Acetate from Metallic Lead and Acetic Acid?



## SECTION III.

6. A solution of Caustic Potash is neutralized by a known volume of a solution of Oxalic Acid. An equal volume of the last-named solution is then added, and the water is evaporated till crystallization ensues. Give the formula of the substance produced.

7. How may Benzene be produced from Benzoic Acid? and how may Benzoic Acid be produced from Benzene?

8. How may Urea be produced artificially? Mention some of its chief decompositions.

*March 29th.*

## SECTION I.

1. Describe what is to be seen when drops of (a) Water and (b) Ether are introduced into separate Mercurial Barometers. State and explain the physical conditions which determine the result.

2. Describe a method for determining the Specific Heat of a Solid Body, and indicate the manner in which the results are calculated in the method you adopt.

## SECTION II.

3. What substances are produced when Sulphur, Carbon, Phosphorus, and Magnesium, respectively, are burned in Oxygen gas? What differences are to be observed in the properties of the resulting compounds by their treatment with water?

4. Account in words and chemical symbols for the following changes:

(a) Mercury dissolved in nitric acid yields a white compound.

(b) When this white compound is heated it turns red.

(c) The red substance moistened with water and treated with hydric sulphide turns black.

(d) Corrosive sublimate treated with solution of Ammonia yields a white insoluble compound.

(e) Calomel is turned black by solutions of caustic potash.

5. How is Metallic Lead prepared from Galena or native lead sulphide? Give an account of the Oxides of Lead. What happens when Litharge is heated with (a) dilute Nitric Acid, (b) Charcoal?



## SECTION III.

6. From pure Ethylic Alcohol how would you prepare (a) Iodoform, (b) Aldehyde, (c) Ethylene? Write the formulæ for these four substances.

7. Explain how Urea may be prepared artificially by means of potassium ferrocyanide and an oxidizing agent such as potassium bichromate.

8. Describe the preparation of Tartaric Acid from Argol or crude Tartar. Give its formula. How would you prepare the following bodies from Tartaric Acid: Cream of Tartar, Tartar Emetic, and Rochelle Salt?

*July 26th.*

## SECTION I.

1. What do you understand by a Constant Current, and how can it be produced? State the points of relation between Electromotive Force, Current, and Resistance.

2. Artificial cold is produced in the following ways: (a) Mixture of Salt and Ice; (b) Ether poured on the skin; (c) Expansion of Compressed Air; (d) Addition of Water to Sal Ammoniac. Explain the reason in each case.

## SECTION II.

3. What is the chief ore of Antimony, and how can (a) Metallic Antimony, (b) Antimonious Chloride, (c) Antimonious Oxide be prepared from it?

4. Give a sketch of the methods of preparation and the properties of the Oxides of Carbon.

5. Give equations representing the action of:

(a) Hot strong Sulphuric Acid on Sulphur;

(b) A solution of Calcium Chloride on a solution of Silver Nitrate;

(c) Carbon Dioxide on a solution of Washing Soda;

(d) Nitric Acid on Chalk;

(e) Water on Bismuth Nitrate.

## SECTION III.

6. What is the difference between the empirical and constitutional formula of an Organic Compound? Give two illustrations.



7. What are the principal products of the action of strong Sulphuric Acid on Alcohol? State the conditions most favourable for the formation of each product you mention.

8. State what you know as regards the preparation and properties of Cyanogen.

*October 4th.*

### SECTION I.

1. It is required to evaporate an aqueous solution without raising its temperature to  $100^{\circ}\text{C}$ . How can this be done? Explain the nature of the action.

2. Describe the effect of radiant heat on (a) Bright silver, (b) Lamp-black, (c) A sheet of glass, (d) Clear rock-salt, (e) A thermo-electric pile.

### SECTION II.

3. What is the gas called 'Fire-damp'? What volume of air will produce complete combustion of 1 cubic foot of it? What is the 'after-damp' which remains after a colliery explosion, and what relation does it bear in volume to the original fire-damp?

4. How would you show that Bone-ash is constituted chiefly of Phosphate of Calcium? What is the composition of ordinary Phosphate of Soda, and how is it usually produced from Bone-ash?

5. Air contains Carbon Dioxide and Ammonia in small amounts; how can their presence be detected?

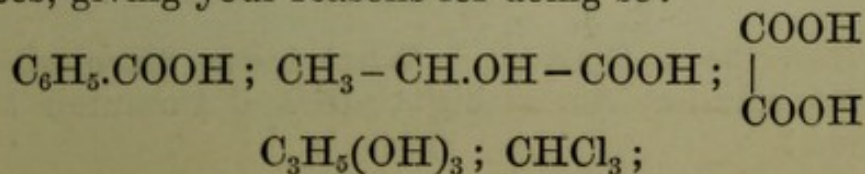
### SECTION III.

6. What are the chief resemblances and differences in properties between the following substances:

Oxalic Acid,  
Tartaric Acid,  
Benzoic Acid?

7. How can Aldehyde be converted into (a) Acetic Acid, (b) Alcohol? How are these bodies related to one another?

8. Classify in their proper groups the following substances, giving your reasons for doing so:





1893.

*January 3rd.*

## SECTION I.

1. Describe an experiment to show that the vapour-pressure of Water is less than that of Alcohol. In what way does the pressure of the vapour of a liquid vary with the temperature?

2. How can the specific gravity of a Gas (such as oxygen), and of a Vapour (such as steam) be determined?

## SECTION II.

3. How can Sodium Sulphite be prepared? How can it be converted into Sodium Hydrogen Sulphite (Acid Sulphite or Bisulphite)? How can Sodium Sulphite be converted into Sodium Sulphate?

4. How does Oxygen occur in nature, free and in combination? Describe the part it plays in the phenomena of combustion. Describe the products of combustion of (a) Carbon, (b) Zinc, (c) Sulphur.

5. Describe the preparation of Potassium Bromide from Bromine. How much Bromide can be produced from 100 grains of Bromine ( $\text{Br}=80$ ;  $\text{K}=39$ )?

## SECTION III.

6. What is the formula of Formic Acid? What is the result of heating it with strong Sulphuric Acid? Give the formulæ of Sodium and of Calcium formates.

7. Describe the manufacture of Chloroform. What is the action on it of a current of Chlorine in the sunlight? What change does it undergo when boiled with Caustic Potash? What change occurs when the vapour of Chloroform is passed through a red-hot tube?

8. What is the effect of boiling (a) Starch, (b) Cane-sugar, (c) Milk-sugar with dilute Sulphuric Acid?

*Note.*—Equations should be given where possible.

*March 28th.*

## SECTION I.

1. Describe a Dialyser. What takes place when an aqueous solution containing Gum and Common Salt is dialysed?



2. How is a Daniell's Cell constructed? What takes place at the Copper and Zinc surfaces respectively when the cell is in action? Of what is the internal resistance made up?

### SECTION II.

3. What do you mean by empirical and constitutional formulæ? Give examples. How does the formula of a substance indicate its composition by weight?

4. Write the equations representing the action—

(a) Of Aqueous Hydrochloric Acid on marble;

(b) Of Chlorine on dry slaked lime;

(c) Of Chlorine on a mixture of water, caustic potash, and lime at  $100^{\circ}$  C.

5. Describe the preparation of Corrosive Sublimate from Metallic Mercury. How can it be converted into Calomel? How much of each would 100 lb. of Mercury furnish ( $\text{Hg}=100$ ;  $\text{Cl}=35.4$ )?

### SECTION III.

6. Describe the chief chemical changes which take place (a) when Barley is made into Malt, (b) Malt into Brewer's Wort, (c) Wort into Beer.

7. How is Hydrocyanic Acid prepared? How would you convert it into Prussian Blue? and how into Cyanide of Mercury?

8. How can Benzene be prepared from Benzoic Acid? What is the relation between Benzene and Phenol, and between Benzoic Acid and Salicylic Acid?

*July 25th.*

### SECTION I.

1. What is Graham's law of the Diffusion of Gases? If Oxygen and Carbon Dioxide were allowed to diffuse through a porous diaphragm into the air, in what relative proportions would they pass through the diaphragm in equal times (atomic weight of oxygen, 16; of carbon, 12)?

2. How are the degrees of temperature, as marked on the scale of a Centigrade thermometer, determined, (a) In the case of degrees between melting-point of ice and the boiling-point of water? (b) In the case of degrees above the boiling-point of water and of degrees below the melting-point of ice?



## SECTION II.

3. What do you understand by the laws of Chemical Combination by Weight? Which are the principal of these laws? Explain your meaning, using as examples the chief combinations of Sulphur with Lead, of Lead with Oxygen, and of Oxygen with Sulphur.

4. When Chlorine is passed through a solution of Caustic Potash in the cold, it is absorbed. What product is formed? What happens if the solution is boiled? What is the action of excess of Hydrochloric Acid on the solution before boiling? What, after boiling? Give equations.

5. Describe one or two of the chief modes in which Sulphate of Magnesium is produced. How is Sulphate of Zinc produced? and how is it obtained free from iron? Describe the general characters of the two salts, and their points of similarity or dissimilarity.

## SECTION III.

6. Describe the preparation of Potassium Cyanide. How can it be converted into Potassium Cyanate? How is Urea obtainable from Potassium Cyanate?

7. Describe the successive operations by which Starch may be converted into Ethyl Alcohol, giving equations illustrating the chemical changes which occur.

8. What is a Homologous Series? In what way are two consecutive members of a Homologous Series distinguishable from one another?

*October 3rd.*

## SECTION I.

1. What happens when an open, wide-mouthed bottle, filled with a mixed solution of Cane-sugar and Common Salt, is immersed and left at rest in a jar of distilled water? What do you understand respectively by (a) Liquid Diffusion, (b) Dialysis, and (c) Osmosis?

2. Two insulated metallic cylinders, A and B, are brought near each other. A is charged positively, B is not charged. How does A affect B? What takes place when B is connected to earth, A remaining in position?



## SECTION II.

3. Explain the meaning and define the proper use of Chemical Symbols. In what sense do the symbols  $\text{HCl}$ ,  $\text{H}_2\text{SO}_4$ ,  $\text{H}_2\text{O}$ ,  $\text{KHO}$ , and  $\text{CO}_2$  express comparable weights of the compounds they respectively stand for (atomic weight: Cl, 35.5; O, 16; K, 39; C, 12; S, 32)?

4. How would you make crystallized Bismuth Nitrate? What is the action of water on the crystals, and how would you proceed in order to detect Bismuth in the product of the action?

5. Comment on the state in which Oxygen occurs in nature as a constituent of the Air and as a constituent of Water. Compare the condition in which Oxygen exists as Black Oxide of Manganese, and the condition in which it exists in Chalk or Limestone.

## SECTION III.

6. How would you prepare Oxalic Acid from Sugar? What happens when Oxalic Acid is heated with Manganese Dioxide and Dilute Sulphuric Acid?

7. What takes place when Sodium Acetate is heated—

(a) With concentrated Sulphuric Acid?

(b) With Caustic Soda?

8. How is Chloral prepared? and what is the action of a solution of Potassium Hydroxide on it?

1894.

*January 2nd.*

## SECTION I.

1. Explain what is meant by Conduction, Radiation, and Convection of Heat. Give an example of each.

2. What do you understand by the relative weight (specific gravity) of a body? The specific gravity of lead is 11.4; of alcohol (proof-spirit) 0.92; of nitrogen 0.972. Explain the meaning of these numbers and the methods by which they may be obtained.

## SECTION II.

3. How would you prepare dry Ammonia Gas? and demonstrate its composition by volume?



4. From a solution of Iodide of Potassium, how would you obtain and collect in a tube a specimen of Iodine? Make a sketch of the apparatus you would employ.

5. You are required

(a) To reduce, (b) to oxidise, Arsenious Oxide (white arsenic).

How would you do this? Describe the chief properties of the resulting bodies.

### SECTION III.

6. Describe how you would prepare Formic and Acetic Acids. State their chief points of resemblance and difference. Why is Stearic Acid classed with these compounds?

7. How can Acetic Aldehyde be prepared from alcohol? What occurs when it is heated—

(1) With a solution of soda;

(2) With sulphuric acid and potassium bichromate;

(3) With an ammoniacal solution of nitrate of silver?

8. How is Phenol obtained from coal-tar oil? What is its composition? and what are its chief properties?

*March 27th.*

### SECTION I.

1. The Coefficient of the Expansion of Air is 0.003665. Explain the meaning of this, and find what the volume of 100 cubic feet of air measured at 0° C. would be if heated to 10° C.

2. Describe the construction of three different forms of Galvanic Battery, and state the chemical changes which occur during their working.

### SECTION II.

3. Describe by what characteristic properties you would identify the following gases: Nitrogen, Chlorine, Ammonia, Nitric Oxide, Sulphur Dioxide, and Carbon Monoxide.

4. Describe the preparation of Tartar Emetic. What is its composition? In what respects does it differ from



most other Antimony compounds? How would you detect the Antimony in it?

5. How would you prepare pure and dry Hydrochloric Acid? and calculate what weight of it would be required to precipitate completely one gramme of silver nitrate.

### SECTION III.

6. Show how the following compounds can be prepared from Alcohol as a starting-point: Acetic Acid, Aldehyde, and Marsh Gas.

7. Of what does the fatty matter of Beef Suet consist? Explain what takes place when it is heated with—

(a) Dilute Caustic Soda solution;

(b) Slacked Lime and Water.

8. How would you prepare Ethylic Alcohol, and free it as far as possible from water? What weight of Oxygen is required to burn completely 10 grammes of this substance?

*July 24th.*

### SECTION I.

1. What properties render Mercury suitable for the construction of a thermometer? and how would you proceed in order to ascertain whether the gradations at  $0^{\circ}$  and  $100^{\circ}$  have been correctly made on the scale of a Centigrade thermometer?

2. The two ends of a coil of Insulated Copper Wire are connected together. Describe how an induced current may be generated and detected in this coil.

### SECTION II.

3. How would you prepare a sample, say a large test-tube full, of pure and dry Carbon Monoxide and Carbon Dioxide? and by what experiments would you demonstrate their most important properties?

4. What is the difference between Hard and Soft Water? How is the one readily distinguished from the other? and how can the hardness of a water be estimated? Explain the chemical reactions involved.



5. Solutions of Phosphoric Acid and Boric Acid are respectively neutralized with Soda, and the two liquids evaporated. What is the composition of the crystals which separate in each case?

### SECTION III.

6. How is Mucilage of Starch affected (1) by a warm infusion of malt, and (2) by boiling with dilute acids? Describe the chief properties of the principal product in each case.

7. To what group of compounds does Methane belong, and why? How is it usually prepared in the laboratory? and from what natural sources may it be procured?

8. Give an account of three important organic compounds which may be derived from common alcohol. Describe exactly how you would make them.

*October 2nd.*

### SECTION I.

1. Joule found that the mechanical equivalent of Heat for  $1^{\circ}$  C. was 1,390 footpounds, or  $1^{\circ}$  F. 772 footpounds. Explain what is meant by this statement, and describe how the result was obtained.

2. Describe three forms of Hygrometer, and explain their use.

### SECTION II.

3. How is Potassium Permanganate prepared? What is its formula? Give illustrations of its action as an oxidizing agent.

4. How would you determine whether a specimen of Calomel contained Corrosive Sublimate? whether a specimen of Potassium Iodide contained Iodate? whether Sulphuric Acid contained Arsenic? and whether a Silver Coin contained Copper?

5. Mention instances of the action of Nitric Acid (1) as an acid; (2) as an oxidizing agent; (3) as an acid and an oxidizing agent simultaneously.

### SECTION III.

6. How would you ascertain (1) the amount of Urea, (2) the total amount of combined Nitrogen, in a specimen of Urine?



7. State the composition and the most important properties of Salicylic Acid. Describe two processes of preparing it.

8. What is the nature of Fermentation? What are the conditions necessary for the conversion of Cane-sugar into Alcohol, Grape-sugar into Lactic Acid, and Alcohol into Acetic Acid?

1895.

*January 1st.*

#### SECTION I.

1. How is the Atmospheric Pressure measured? What influence has the Height above the Sea-level upon the reading of a barometer?

2. A closed box is given you containing a voltaic cell with the terminals exposed. How would you determine which was the Positive and which the Negative electrode?

#### SECTION II.

3. How does Ozone act upon a solution of Potassium Iodide? Explain how you would identify the products of the action. What significance would you attach to the presence of Ozone in air?

4. What is meant by a Reducing Agent? Give two examples of the manner in which these substances act.

5. Some of the Chlorine present in bleaching-powder is said to be 'available.' What does this mean? How would you demonstrate that the Chlorine is present in two forms of combination? How would you obtain the whole of the Chlorine present in bleaching-powder in the free state?

#### SECTION III.

6. What happens when Potassium Ferrocyanide is heated to redness? What occurs when it is fused with Potassium Carbonate? How would you prepare pure Potassium Cyanide?

7. Describe the preparation of Iodoform. How would you prove that this compound contains Iodine?

8. Give some account of the properties of Carboic Acid. What relation does this compound bear to Benzene and Benzoic Acid? How would you detect it in a specimen of Urine?



*March 26th.*

SECTION I.

1. Ten cubic feet of Hydrogen measured under a pressure of 760 mm. are compressed in a cylinder having a capacity of 5 cubic feet. At what height would the mercury stand in a mercurial gauge connected with the cylinder?

2. Explain fully the changes which occur when an electric current is passed through Potassium Chloride, (a) fused, (b) dissolved in water.

SECTION II.

3. How would you demonstrate that Hydrogen is a constituent of Ammonia? How can the amount of Hydrogen in it be estimated?

4. How does Chalk become dissolved in ordinary water? Describe and explain two methods of softening hard water.

5. How would you separate Metallic Silver and Metallic Copper from Aqueous Solutions of Silver Nitrate and of Copper Sulphate respectively?

SECTION III.

6. Calculate the percentages of Carbon, Hydrogen, and Oxygen corresponding with the formula  $C_7H_6O_2$ .

7. Trace the resemblances between the chemical reactions of Alcohol and of Sodium Hydroxide (caustic soda).

8. How would you prepare Acetic Acid (a) from Wood, (b) from Alcohol? Explain fully the changes which occur when Alcohol passes into Acetic Acid.

*July 23rd.*

SECTION I.

1. How would you determine the specific gravity of Carbon Dioxide? What means would you adopt to dry and purify the gas for this determination?

2. What is meant by the terms 'Potential' and 'Quantity' in relation to electricity?



## SECTION II.

3. How does Nitric Acid act on Copper, Antimony, and Phosphorus? What chemical changes take place?

4. How would you prepare a solution of Hydriodic Acid from Iodine; and how can the Iodine be obtained again from the Hydriodic Acid?

5. What do you mean by Allotropy? Describe the two allotropic forms of Phosphorus, and how they can be converted one into the other.

## SECTION III.

6. How would you detect Nitrogen in a proteid such as Egg-Albumen? By what means could you separate the whole of the Nitrogen as gas?

7. How is Citric Acid produced from Lemon Juice? What are its characteristic properties?

8. How are the following substances obtained from Grape-sugar: (1) Alcohol, (2) Lactic Acid, (3) Oxalic Acid?

*October 1st.*

## SECTION I.

1. Describe an experiment to show that Water is a bad conductor of Heat.

2. Describe the construction of a Leyden Jar, and explain the mode of charging and discharging it.

## SECTION II.

3. How would you prepare a specimen of (1) Sodium Bicarbonate, (2) Ferrous Carbonate, and (3) Calcium Carbonate? What is the effect of heat on each of these salts?

4. What is the action of Potash and of Ammonia on Calomel and Corrosive Sublimate?

5. How is ordinary Alum produced? Write its formula. What is the action of (a) Potash, (b) Ammonium Sulphide, on a solution of this salt?

## SECTION III.

6. How is Hydrocyanic Acid prepared from Potassium Ferrocyanide and from Mercuric Cyanide? Explain the mode of action of the usual tests for this acid.



7. What happens when Benzoic Acid and Salicylic Acid are heated with lime? Describe the properties of the chief products.

8. Describe the appearance of Chloral Hydrate. How can it be converted into Chloral and Chloroform?

1896.

*January 7th.*

### SECTION I.

1. Describe experiments illustrating:

- (a) Diffusion between two gases;
- (b) Diffusion between two liquids;
- (c) The separation of a colloidal from a crystalline substance.

2. A block of ice is heated in an open copper vessel. Trace the changes in density and temperature which take place:

- (a) As the ice melts;
- (b) As the water becomes hot and gradually boils away.

### SECTION II.

3. Classify: Chlorine, Ferric Chloride, Potassium Permanganate, Zinc-dust, Nitric Acid, and Hydrogen Peroxide as oxidizing and reducing agents. Give examples of the action of two of each class.

4. How is Hydrogen Sulphide prepared? Describe its properties, and state what action it has on each of the following substances: Bromine Water, Metallic Silver, a solution of Arsenious Oxide, a solution of Ferric Chloride.

5. How would you prepare a specimen of Boric Acid from Borax? How would you detect Boric Acid in solution?

### SECTION III.

6. Give the method of formation, and describe some of the principal salts of Tartaric Acid and of Oxalic Acid. What means would you employ to show that these Acids are dibasic?

7. Why is Acetic Acid called a 'fatty acid'? What relation does Glycerine bear to the Fats?



8. What is the composition of pure Cotton Wool? and why is it called a Carbohydrate? What is the action of a mixture of concentrated Nitric and Sulphuric Acids on it?

*March 24th.*

SECTION I.

1. Describe the effects of difference of pressure on the boiling-point of a liquid. State how you would show this effect experimentally with (a) Water, (b) Ether.

2. What is Specific Heat? Give a method by which the Specific Heat of Metallic Copper may be determined.

SECTION II.

3. How would you prove that ordinary Water contains dissolved Air? How would you collect the Gases dissolved in the Water, and what tests would you apply in order to identify them?

4. Describe a method of preparing Orthophosphoric Acid from Phosphorus. How would you convert this Acid into ordinary Sodium Phosphate and Microcosmic Salt?

5. How are Ferrous Chloride and Ferric Chloride prepared from Metallic Iron? How would you convert Ferrous Chloride into Ferric Chloride, and *vice versa*?

SECTION III.

6. Describe fully the way in which Alcohol is prepared from Sugar by fermentation. How can you remove all the Water from a Dilute Alcohol such as Proof Spirit? Give a method of preparing Aldehyde from Alcohol.

7. How can Urea be obtained from Ammonium Carbonate? Under what conditions is Urea reconverted into this Salt?

8. How far do the chemical properties of Hydrocyanic Acid resemble those of Hydrochloric Acid?

*July 28th.*

SECTION I.

1. The Vapour Pressure of Water at 32° C. is said to be 35.36 mm. What is meant by this? Describe a



method for determining the Vapour Pressure of Water at any temperature between  $0^{\circ}$  and  $100^{\circ}$  C.

2. Describe some form of 'Constant' Galvanic Cell. What is the ratio between the volume of Hydrogen liberated in a voltameter and the weight of Zinc dissolved in such a cell?

### SECTION II.

3. Explain the relations which exist between the 'Relative Densities' of Elements and Compounds in the gaseous state and their atomic and molecular weights. Give the 'Relative Densities' of Steam, Mercury Vapour, Ammonia, Chlorine.

4. What is the action of strong Sulphuric Acid when heated with the following: (a) Sodium Nitrate, (b) Charcoal, and (c) Oxalic Acid?

5. How would you prepare Bismuth Chloride and Oxychloride from Metallic Bismuth, and how would you ascertain whether the products contain Arsenic?

### SECTION III.

6. How is Chloral made, and what is its relation to Aldehyde? What chemical action takes place when Water is added to it?

7. Starting from Sodium Acetate, how would you prepare Lead Acetate?

8. How can Benzene be obtained from Benzoic Acid, and Phenol from Salicylic Acid?

*October 6th.*

### SECTION I.

1. Four cubic feet of Water are forced into a closed vessel containing 10 cubic feet of Air. What alteration takes place in the pressure of the Air in the vessel? How does the solubility of Air in Water affect the result?

2. What do you understand by the term 'Electrical Induction'? Describe what takes place when an insulated conductor charged with positive electricity is gradually brought towards an insulated neutral conductor until it touches.



## SECTION II.

3. Explain what is meant by the terms: 'Atom' and 'Molecule,' 'Element' and 'Compound,' 'Basyulous' and 'Chlorous,' 'Metal' and 'Non-Metal,' 'Acid' and 'Base.'

4. What are 'Lime' and 'Plaster of Paris'? State how they are made, and describe the changes which take place when they are exposed to (a) the Atmosphere, (b) Water.

5. What are the products formed on burning the following substances in excess of Air: (1) Sulphur, (2) Sulphuretted Hydrogen, (3) Phosphorus, (4) Carbon Bisulphide, and (5) Magnesium? Describe the products.

## SECTION III.

6. Describe the preparation of Oxalic Acid from Sugar. How would you convert it into Formic Acid? and describe experiments showing the reducing action of the latter.

7. Compare the action of boiling dilute Acids, and Fehling's solution upon (a) Grape-sugar, (b) Cane-sugar, (c) Milk-sugar.

8. How would you saponify a Fat so as to obtain the Glycerine and the Fatty Acids?

1897.

*January 5th.*

## SECTION I.

1. What is meant by the term 'Specific Heat'? Describe an experiment by which you would show that the specific heat of Iron is less than that of Water.

2. What happens when Heat-rays fall upon (a) Bright Copper, (b) a plate of Quartz, (c) a sheet of Glass, (d) Lamp-black, (e) Rock-Salt?

## SECTION II.

3. How would you prepare from Ammonium Chloride: (a) Dry Ammonia Gas, (b) Nitrogen Gas, (c) Ammonium Oxalate?

4. By what general methods may Metallic Chlorides be prepared? Give an example of each method, with equations expressing the reaction.



5. Why is the Vapour Density of Ammonium Chloride said to be abnormal? State what you know regarding the Vapour-Densities of Mercury and Phosphorus.

### SECTION III.

6. Describe two processes by which Benzoic Acid is usually obtained. Give its formula and chief properties. How would you prepare a specimen from Sodium Benzoate?

7. Point out the chief differences between 'Marsh Gas' and 'Ethylene.' What reasons can you give showing that the formula of the latter is  $C_2H_4$ , and not  $CH_2$ ?

8. How would you prepare Glacial Acetic Acid from Vinegar? What change occurs when Neutral Lead Acetate is dissolved in excess of Water?

*March 23rd.*

### SECTION I.

1. Describe carefully two methods by which you could ascertain the weight of Aqueous Vapour in the Air of a room.

2. How would you ascertain the relative conductivity for Heat of (a) two metals, (b) two liquids?

### SECTION II.

3. What is meant by a Salt? What are 'Acid' and 'Basic' Salts? Give examples. How would you make the Acid Potassium Salt of Sulphuric Acid?

4. What weight of Sulphur when burned to Sulphurous Acid ( $SO_2$ ) would be necessary in order to introduce 1 per cent. by volume of that gas into a room of 100 cubic metres' capacity?

5. How would you prepare common Potash Alum, and obtain from it some pure Alumina?

### SECTION III.

6. How is Chloroform prepared from Chloral? What is formed when Chloroform is warmed with a solution of Potash in Alcohol?

7. What are the common sources of Starch? What change takes place on boiling it with Water? How can it be converted into (a) Maltose, (b) Dextrose?



8. How can Lactic Acid be prepared from Milk? What are its characteristic properties? How does it differ from the Acid isolated from Muscle?

*July 27th.*

#### SECTION I.

1. Explain the terms Conduction, Radiation, and Convection of Heat. Describe an experiment showing the Difference between Conduction and Convection.

2. Explain the construction of a Grove's Battery, and describe the functions of its several parts, including the chemical changes which occur during its action.

#### SECTION II.

3. Write equations expressing the changes which occur when Carbon Dioxide is passed

- (a) Through a solution of Sodium Carbonate;
- (b) Over red-hot Charcoal;
- (c) Through Lime-water.

Describe what you would observe in each case.

4. If you were required to prepare a cylinder of dry Ammonia Gas, how would you proceed? Give a sketch of the apparatus you would use.

5. How is Boric Acid obtained, and converted into Borax? How would you recognise Boric Acid in a specimen of Milk?

#### SECTION III.

6. How are Cane-sugar and Grape-sugar obtained? What chemical and physical differences are to be seen between them; and what test may be employed to distinguish one from the other?

7. What are the chief points of distinction between a Fatty Oil, like Olive-oil, and a Mineral Oil, like Paraffin-oil?

8. The molecular weight of Alcohol is 46. What does this statement mean? and how is this constant experimentally determined?



*October 5th.*

SECTION I.

1. What is meant by 'Normal Atmospheric Pressure'? What would be the normal height of barometers filled with (a) Mercury (specific gravity = 13.6); (b) Water; and (c) Sulphuric Acid (specific gravity = 1.8).

2. Describe the construction and the method of using the following instruments: The Electrophorus; the Gold-leaf Electroscope; the Leyden Jar.

SECTION II.

3. Explain the phrases: 'Combining proportions by weight' and 'Combining proportions by volume.' Illustrate these terms by reference to Water.

4. Describe the methods of preparing Sulphuretted Hydrogen. How does it react with solutions of

- (a) Iodine;
- (b) Copper Sulphate;
- (c) Ferric Chloride;
- (d) Caustic Potash?

5. What are the differences between Hard and Soft Water? How can the former be softened by (a) Lime, (b) Sodium Carbonate?

SECTION III.

6. How is Iodoform prepared? What relation does it bear to Methane and to Chloroform? How can it be shown to contain a Halogen?

7. Give the formulæ and chief properties of one compound from each of the following classes of organic substances:

- (a) Hydrocarbons;
- (b) Alcohols;
- (c) Aldehydes;
- (d) Monobasic Acids;
- (e) Dibasic Acids;
- (f) Sugars.

8. How can (a) a solution of Prussic Acid, (b) Potassium Cyanide, and (c) Silver Cyanide be prepared from Potassium Ferrocyanide?



1898.

*January 4th.*

## SECTION I.

1. Describe an experiment which you have seen, illustrating each of the following :

- (a) Diffusion between two gases ;
- (b) Diffusion between two liquids ;
- (c) The separation of two substances by means of dialysis.

2. How would you carry out the following experiments ? Describe the apparatus you would employ :

- (a) Electrolysis of a solution of Copper Sulphate ;
- (b) Water acidulated with Sulphuric Acid will conduct the current from a battery, while pure water will not ;
- (c) The induction of a current in a wire by means of a magnet.

## SECTION II.

3. How has it been ascertained that water consists of one part of Hydrogen and eight parts of Oxygen by weight ? Why is 18 accepted as the molecular weight of steam ?

4. Mention the elements which form compounds with Hydrogen, and give the formulæ of the compounds. Classify these elements into gases, liquids, and solids, and point out which of them possess allotropic forms.

5. From a sample of Metallic Mercury, how could you prepare (a) Calomel, (b) Corrosive Sublimate, (c) Yellow Oxide of Mercury, (d) Red Oxide of Mercury ?

## SECTION III.

6. How is Formic Acid prepared ? What takes place when a formate is heated (a) with solid Caustic Potash, (b) With strong Sulphuric Acid ?

7. Indicate how Alcohol, Acetic Acid, and Lactic Acid are respectively produced by the agency of low forms of life.

8. What is Soap ? How would you prepare a Soap from Beef-suet ? What is the action on the Soluble Soaps of (a) Dilute Mineral Acids, (b) of ' Hard ' Water ?



*March 29th.*

SECTION I.

1. What information is conveyed by the following statement? The specific gravity of lead is 11.3. How would you actually determine the specific gravity of

- (a) A leaden bullet;
- (b) Fine sand;
- (c) A lump of sugar?

2. State how you would determine the following: (1) Whether a brass ball suspended by a silk thread is positively or negatively charged; (2) Which of the terminals of a concealed battery is connected with the zinc plate; (3) That silver is a better conductor of electricity than platinum.

SECTION II.

3. Into what large classes may Oxides be divided? Give two examples of each class, and refer the following Oxides to their respective classes, stating your reasons in each case: (a) Mercuric Oxide, (b) Lead Dioxide, (c) Arsenious Oxide, (d) Cuprous Oxide.

4. How can you prepare from a mixture of Iron filings and Sulphur, (a) Crystals of Sulphur, (b) Hydrogen Gas, (c) Sulphuretted Hydrogen, (d) Ferric Oxide?

5. What takes place when the following substances are heated with strong Sulphuric Acid: (a) Carbon, (b) Copper, (c) Potassium Bromide, (d) Manganese Peroxide?

SECTION III.

6. What is Cyanogen? What are its properties? How is it obtained? How can Hydrocyanic Acid and Oxalic Acid be obtained from it?

7. Express by equations the changes which occur (a) When a solution of Chloral Hydrate is mixed with a solution of Potassium Hydrate; (b) When Sodium Hydrate is fused with Sodium Acetate; and (c) When an Alkaline solution of Hypobromite is mixed with a solution of Urea.

8. How is Starch prepared from Flour? How is it detected in solution? How could you obtain from it (a) Dextrose, (b) Maltose?



## PART II.—MATERIA MEDICA AND PHARMACY.

Three hours are allowed for the paper on this subject.

Candidates unable to answer at least *four* questions must report the fact to the Presiding Examiner, and they are not allowed to proceed with their examination.

1890.

*January 8th.*

1. What is the origin, as given in the Pharmacopœia, of Quassia, Calumba, and Gentian? Name their official preparations, and state how each is made.

2. What are the physical properties of Iodine? Name the official preparations containing free Iodine. Describe its actions, external and internal.

3. Give the composition of:

Confectio Opii;  
Trochisci Morphinae et Ipecacuanhæ;  
Liquor Arsenicalis;  
Pilula Conii Composita;  
Mistura Ferri Composita;  
Mistura Guaiaci.

State the proportion of the active ingredients in the first three.

4. Name the Hypodermic Injections of the Pharmacopœia, their composition, strength, and doses.

5. State the official preparations (with their doses) of Ammonia, Ammonium Carbonate, and Ammonium Acetate. Describe the action of each of these drugs.

6. Describe the various actions of Aconite. What are its preparations, and from what part of the plant is each made?

*March 26th.*

1. What are the external actions of the following drugs: (1) Nitric Acid, (2) Hydrocyanic Acid, (3) Boric Acid (4) Subacetate of Lead, (5) Chloroform, (6) Croton-oil?

2. Give the composition of:

Pilula Hydrargyri Subchloridi Composita;  
Pilula Plumbi cum Opio;  
Pulvis Ipecacuanhæ Compositus;  
Pulvis Cretæ Aromaticus;  
Linimentum Camphoræ Compositum;  
Linimentum Iodi.



State the proportion of the active ingredients in the first three.

3. What are the actions respectively of Sulphate, Chlorate, and Acid Tartrate of Potassium?

4. What are the physical properties of Ether? Describe its actions, and name its preparations, their constituents, and doses.

5. Give the origin, actions, and dose of Oil of Turpentine. Name its official preparations.

6. Give the origin of Tannic and Gallic Acids. Describe their actions, and mention some drugs possessing similar actions.

*July 23rd.*

1. Describe the physical properties and the action of Carbolic Acid. Name its official preparations.

2. Enumerate the officinal Inorganic Sulphates. Give their preparations (if any), and the action of each.

3. Give the sources, preparations, dose, and action of Oil of Turpentine.

4. What are the sources of Copaiba and Cubebs, their active principles, doses and actions, respectively?

5. Give the composition of the following preparations, with the proportion of the more important ingredients in the first three :

Pilula Ipecacuanhæ cum Scillâ ;  
 Pilula Saponis Composita ;  
 Injectio Ergotini Hypodermica ;  
 Pulvis Glycyrrhizæ Compositus ;  
 Spiritus Ætheris ;  
 Tinctura Guaiaci Ammoniata.

6. Enumerate the Glycerines of the Pharmacopœia. What is the action of Glycerine?

*October 8th.*

1. What is the action respectively of the Acetate and Subacetate of Lead? Give the preparations made from each.

2. Give the actions, preparations (if any), and doses of Nitrite of Amyl, Nitro-glycerine, and Spirit of Nitrous Ether.

3. State the origin as given in the Pharmacopœia, and



give the name and nature of the most important active principles of :

Cannabis Indica ;  
Jaborandi ;  
Castor-oil ;  
Belladonna ;  
Aconite ;  
Squill.

4. What is Cantharides ? and what are its official preparations ? Describe its action.

5. Give the composition of the following preparations, with the proportion of the most important ingredients in the first two :

Pilula Phosphori ;  
Spiritus Chloroformi ;  
Pilula Aloës et Asafœtidæ ;  
Confectio Sulphuris ;  
Vapor Coninæ.

6. Name four Emetics, and state the form and dose in which they are severally administered.

1891.

*January 7th.*

1. Give an account of Digitalis ; its most important active principle ; its preparations, with their doses ; and its action.

2. What are the official forms of Calcium Carbonate ? Give the composition of the Pharmacopœial preparations containing it.

3. Give the composition of the following preparations, with the proportions of the more important ingredients in the first three :

Vinum Antimoniale ;  
Tinctura Opii Ammoniata ;  
Injectio Apomorphinæ Hypodermica ;  
Pulvis Jalapæ Compositus ;  
Linimentum Terebinthinæ Aceticum ;  
Lotio Hydrargyri Nigra.

4. Describe the official methods of preparing : (a) Infusions, (b) Decoctions, (c) Tinctures, and (d) Hypodermic Injections.

5. State the composition and bulk of the following Enemata : Enema Aloes, Enema Asafœtidæ, Enema



Magnesii Sulphatis, Enema Opii, and Enema Terebinthinæ.

6. Give an account of Nux Nomica, including its origin as stated in the Pharmacopœia; its most important active principles, its preparations, with their doses and its action.

*April 1st.*

1. What is the source of Conium? Give its Pharmacopœial preparations, with their doses, and describe its medicinal action on the body.

2. Give an account of the medicinal action of Arsenious Acid. Name the official preparations in which it is used, and give their doses. What other compounds of Arsenic are official? and what are the preparations containing them?

3. What forms of Calcium Oxide are contained in the Pharmacopœia? What are the preparations of Calcium Oxide?

4. Enumerate the official ointments containing Mercury or any of the compounds of Mercury included in the Schedule. What is the general action of Mercurials when externally applied?

5. How are the following preparations made:

Extractum Aconiti;  
Injectio Morphinae Hypodermica;  
Mistura Ammoniaci;  
Succus Hyoseyami;  
Suppositoria Acidi Carbolici;  
Vinum Quininæ?

6. Give the composition of the following preparations, with the doses of such of them as are administered internally, and the proportion of the most active ingredient in the first three:

Pilula Plumbi cum Opio;  
Pulvis Elaterini Compositus;  
Vinum Antimoniale;  
Decoctum Aloes Compositum;  
Linimentum Camphoræ;  
Linimentum Camphoræ Compositum.

*July 29th.*

1. What are the active principles of each of the following drugs:

Cinchona;  
Conium;



Hyoscyamus;  
Nux Vomica;  
Stramonium?

Describe the action of Nux Vomica.

2. What are the actions of Tartarated Antimony? Into what Pharmacopœial preparations does it enter? What is its dose? Give the strength of its preparations.

3. What is contained in:

Liquor Strychninæ Hydrochloratis;  
Enema Opii;  
Mistura Spiritus Vini Gallici;  
Mistura Ferri Composita;  
Decoctum Aloes Compositum?

4. What is Ipecacuanha, and what are its actions? Into what Pharmacopœial preparations does it enter? Give their doses.

5. What is the origin as stated in the Pharmacopœia of:

Squill;  
Ergot;  
Asafœtida;  
Kino;  
Elaterium;  
Santonin?

Give the actions of the last two.

6. What is meant by the terms (1) Hypnotic, (2) Anthelmintic, (3) Diuretic, (4) Diaphoretic, (5) Rubefacient, (6) Styptic? Give two drugs as examples of each of those modes of action.

*October 7th.*

1. What is the source of:

Caffeine;  
Physostigmine;  
Salicin;  
Camphor;  
Podophyllin;  
Apomorphine?

Give the action of the last-named.

2. What are the actions of Arsenious Acid? Give its dose and the doses of its official preparations.

3. How are the following prepared: Liquor Ferri Dialysatus, Mistura Guaiaci and Infusum Quassiae? Give the reason for the special process adopted in each.



4. What is contained in :

Pilula Ipecacuanhæ cum Scillâ ;  
Tinctura Chloroformi et Morphinae ;  
Injectio Morphinae Hypodermica ;  
Confectio Sennæ ;  
Pilula Rhei Composita ;  
Linimentum Camphoræ Compositum ?

5. Explain the terms (a) Solution, (b) Suspension, (c) Sublimation, (d) Decoction, (e) Infusion, (f) Standardized Extract. Give examples of each from the Pharmacopœia.

6. What are the source, dose, and actions of Benzoic Acid ? Into what official preparations does it enter ?

1892.

*January 6th.*

1. State the origin, as given in the Pharmacopœia, of Salicine, Salicylic Acid, and Salicylate of Sodium. Give the action of Salicylic Acid, and contrast with it that of the other two drugs.

2. What is meant in the Pharmacopœia by (1) Lotions, (2) Liniments, (3) Ointments, and (4) Plasters ? Illustrate your answers by examples.

3. Describe fully the actions, internal and external, of the following salts :

Tartarated Antimony ;  
Oxide of Zinc ;  
Acetate of Lead ;  
Hydrochlorate of Cocaine.

4. Give the composition and strengths of the following solutions :

Liquor Arsenicalis ;  
Liquor Arsenii et Hydrargyri Iodidi ;  
Liquor Hydrargyri Perchloridi ;  
Liquor Ferri Perchloridi ;  
Liquor Plumbi Subacetatis Dilutus ;  
Liquor Morphinae Bimeconatis.

5. What is Oil of Turpentine ? State its origin, doses, and actions. Name its preparations.

6. Define an 'Alkaloid.' Name six of the most important alkaloids of the Pharmacopœia, stating the source of each.



*March 30th.*

1. Name the active principles and the Pharmacopœial preparations of the following drugs :

Aconite ;  
Cannabis Indica ;  
Cinchona Rubra ;  
Hyoscyamus ;  
Jaborandi ;  
Senega.

2. Give the composition of the following Pharmacopœial preparations :

Pulvis Kino Compositus ;  
Pilula Phosphori ;  
Tinctura Nucis Vomicae ;  
Spiritus Ammoniae Aromaticus ;  
Linimentum Crotonis ;  
Collodium Vesicans.

State the proportion of the most active ingredient contained in each of the first three.

3. How are the following Pharmacopœial preparations made :

Aqua Chloroformi ;  
Emplastrum Plumbi ;  
Extractum Filicis Liquidum ;  
Injectio Morphinae Hypodermica ;  
Suppositoria Iodoformi ;  
Vapor Coninae ?

4. What forms of Sulphate of Iron occur in the Pharmacopœia, and what are their doses ? State the composition of the Pharmacopœial preparations into which Sulphate of Iron enters. Describe its actions.

5. What is Ipecacuanha ? What are its Pharmacopœial preparations and its actions ? State the doses of the drug and of its preparations.

6. Into what Pharmacopœial preparations does Acetate of Lead enter ? Give the composition of each. What are the actions of Acetate of Lead ?

*July 27th.*

1. State the origin, as given in the Pharmacopœia, and name the chief active principles of :

Belladonna ;  
Calabar Bean ;  
Ipecacuanha ;



Jaborandi ;  
 Nux Vomica ;  
 Opium ;  
 Senna ;  
 Squill.

2. Give the composition of the following Pharmacopœial preparations, and the proportion of the most active ingredient in the first three :

Liquor Morphinae Bimeconatis ;  
 Pulvis Elaterini Compositus ;  
 Suppositoria Plumbi Composita ;  
 Linimentum Calcis ;  
 Pilula Ferri ;  
 Pilula Rhei Composita.

3. What is an Enema ? State the composition and bulk of each of the following :

Enema Asafœtidæ ;  
 Enema Magnesii Sulphatis ;  
 Enema Opii.

4. Give examples of Pharmacopœial drugs which  
 (a) strengthen the beat of the heart ; (b) weaken it ;  
 (c) accelerate it ; (d) retard it ; (e) raise the blood-pressure in the arteries ; (f) lower the blood-pressure in the arteries.

5. Describe the medicinal actions of (a) Aconite, (b) Cantharides, (c) Lime.

6. How are the following preparations made :

Infusions ;  
 Decoctions ;  
 Tinctures ;  
 Spirits ;  
 Wines ?

*October 5th.*

1. Enumerate the Pharmacopœial preparations of Aconite and of Belladonna, and of their Alkaloids. Give the source and the dose of each preparation.

2. Give the quantitative composition of the following Pharmacopœial preparations :

Hydrargyrum cum Cretâ ;  
 Acidum Sulphuricum Dilutum ;  
 Spiritus Chloroformi ;  
 Liquor Trinitrini ;  
 Injectio Morphinae Hypodermica ;  
 Pulvis Ipecacuanhæ Compositus.



3. How is Emplastrum Plumbi made? What is its chemical composition? What are the external actions of Subacetate of Lead?

4. Name the chief drugs of the Pharmacopœia which (a) increase the Sweat; (b) diminish the Sweat; (c) increase the Saliva; (d) diminish the Saliva.

5. What are the sources, doses, and actions of Caffeine?

6. What is the source of Benzoic Acid? What are its actions? What is its dose? Into what Pharmacopœial preparations does it enter? What are their doses?

1893.

*January 4th.*

1. Enumerate the Glycerina of the Pharmacopœia. Give the actions of Glycerine.

2. Enumerate the principal drugs which act upon the Pupil. State the action of each upon it, and give the action of any one of these drugs upon the other organs of the body.

3. How are the following Pharmacopœial preparations made:

Extractum Colchici Aceticum;  
Liquor Calcis Saccharatus;  
Lotio Hydrargyri Flava;  
Suppositoria Acidi Carbolici cum Sapone;  
Tinctura Nucis Vomicæ;  
Vinum Ipecacuanhæ?

4. Give the strength, preparations, and actions of Acidum Hydrocyanicum Dilutum.

5. Give the ingredients of the following Pharmacopœial preparations, and state the quantitative composition of the first three:

Liquor Trinitrini;  
Liquor Hydrargyri Perchloridi;  
Injectio Apomorphinæ Hypodermica;  
Pilula Aloes et Ferri;  
Tinctura Iodi;  
Linimentum Belladonnæ.

6. Name the Pharmacopœial preparations into which Potassii Tartras Acidæ enters, and give their doses. Describe the action of this drug.



*March 29th.*

1. Give the composition of the following Pharmaceutical preparations, and the proportion of the most active ingredients in the first three :

Liquor Strychninæ Hydrochloratis ;  
Pilula Plumbi cum Opio ;  
Vinum Antimoniale ;  
Linimentum Calcis ;  
Tinctura Chloroformi et Morphinæ ;  
Mistura Ammoniæ.

2. Explain the following terms : (a) Dialysis, (b) Percolation, (c) Suspension, (d) Standardized Tincture, (e) Spiritus, (f) Vapor. Give examples of each from the Pharmacopœia.

3. Contrast the physical and the chemical properties of Castor-oil and Oil of Turpentine. What are the chemical principles involved in the preparation of Emplastrum Plumbi ?

4. Describe the actions of Liquor Ammoniæ, Ammonium Carbonate, and Ammonium Acetate. State their official preparations and their doses.

5. What are the preparations of Belladonna and its active principle ? Give an account of the action of Belladonna.

6. Name six of the most important Emetics. What dose of each is necessary to induce vomiting ? and how is each best administered ?

*July 26th.*

1. What is contained in the following preparations :

Pulvis Cretæ Aromaticus cum Opio ;  
Spiritus Ætheris ;  
Liquor Trinitrini ;  
Mistura Olei Ricini ;  
Trochisci Bismuthi ;  
Enema Magnesii Sulphatis.

Give the proportion of the most active ingredients in the first three.

2. How are the extracts of Nux Vomica, Belladonna, and Stramonium prepared respectively ? Give the dose of each.

3. What are the actions of Arsenious Acid ? Into what Pharmacopœial preparations does it enter ? What is its dose ? Give the strength of its preparations respectively.



4. What is the source of Cocaine, and into what Pharmacopœial preparations does it enter? Describe its medicinal actions.

5. Describe the actions of Squill. What is its chief active principle?

6. Give the mode of action and the dose of any four purgatives, and state in each case the kind of evacuation produced.

*October 4th.*

1. What is contained in the following preparations:

Tinctura Opii;

Trochisci Santonini;

Acidum Hydrocyanicum dilutum;

Pulvis Jalapæ Compositus;

Liquor Hydrargyri et Arsenii Iodidi;

Pulvis Rhei Compositus?

Give the proportion of the most active ingredient in the first three.

2. What are the actions respectively of the Oxide, the Sulphate, and the Chloride of Zinc? In what Pharmacopœial preparations are any of these contained?

3. What is the source of Ergot, and what are its Pharmacopœial preparations? Describe its medicinal actions.

4. Mention three of the most important Emetics, and describe their modes of action respectively. Give the dose of each.

5. What is the chief active principle of Calabar Bean? Describe fully the medicinal actions of this drug.

6. State the origin as given in the Pharmacopœia, and give the name and nature of the most important active principles of:

Conium;

Rhubarb;

Cannabis Indica;

Aconite;

Elaterium;

Senega.

1894.

*January 3rd.*

1. Give an account of Sulphur, including its origin, physical properties, official preparations, and doses.



2. State the origin of :

Copaiba ;  
Catechu ;  
Ipecacuanha ;  
Colchicum.

Name the preparations of these drugs and give their doses.

3. Name the Salts and Preparations of Iron mentioned in the Schedule. What are the vegetable bitter preparations with which the strong Iron Salts can be combined ?

4. Describe the methods of preparing (a) Tinctures, (b) Decoctions, (c) Infusions, (d) Mixtures. Illustrate your answer by examples.

5. Give the composition of :

Pilula Hydrargyri Subchloridi Composita ;  
Tinctura Camphoræ Composita ;  
Liquor Arsenicalis ;  
Mistura Sennæ Composita ;  
Spiritus Ammoniae Aromaticus ;  
Linimentum Calcis.

What is the proportion of the most active ingredient in the first three ?

6. Name the official preparations of Atropine. What are its actions on the eye and on the various organs of secretion ?

*March 28th.*

1. Describe the physical properties of Magnesium Sulphate, and state its official preparation and dose. Mention other preparations containing Magnesium.

2. Give an account of Turpentine, including its source, official preparations, actions, and doses.

3. Describe the physical properties of Carbolic Acid, and give an account of its actions. Enumerate its Official preparations.

4. Name the Hypodermic Injections of the British Pharmacopœia, and give their respective composition, strength, and dose.

5. Name the active principles of the following : Nux Vomica, Coca, Jaborandi, Senna. Give a brief account of their physiological actions.

6. What are the physical properties of Alum ? Name its official preparations, and give an account of its actions.



1895.

*January 2nd.*

1. Give the origin, and state the active principles, of the following: Cannabis Indica, Jalap, Senega, and Hyoscyamus.

2. What are Suppositories? Mention the official ones, and give their composition.

3. Enumerate the Salts of Potassium named in the Schedule. Classify them according to their medicinal action, and give their doses.

4. What is Copaiba? What is its medicinal action? How would you administer it, and in what doses?

5. State the composition of the following preparations, and the proportion of the important ingredient in each:

Pulvis Glycyrrhizæ Compositus;

Pulvis Elaterini Compositus;

Pulvis Kino Compositus;

Liquor Arsenicalis;

Syrupus Chloral.

6. What is meant by the terms: Anthelmintic, Rubefacient, Mydriatic, Ecbolic, Diuretic, Anhidrotic? Mention a drug as an example of each of these modes of action.

*March 27th.*

1. Name the preparations containing Mercury, or its salts which occur in the form of powder. State the medicinal action, and the doses in which those used internally are administered.

2. Give the origin of Salicylic Acid, Quinine, Colocynth and Colchicum. Give the composition of the compounds into which the last two enter.

3. Define the meaning of the following terms: Decoction, Alkaloid, Oleoresin, Liquid Extract. Give an example of each.

4. What is Tartarated Antimony? Name its preparations, and give the dose of each. What are its medicinal actions?

5. What are the official forms of Sulphur? Name the characters by which they may be distinguished. Give their preparations and doses.

6. Enumerate the chief constituents of the following Pharmaceutical preparations:

Pulvis Ipecacuanhæ Compositus;

Mistura Sennæ Composita;



Liquor Hydrargyri Perchloridi ;  
 Enema Magnesii Sulphatis ;  
 Glycerinum Acidi Carbolici.

*July 24th.*

1. What is contained in the following preparations :

Liquor Calcis Saccharatus ;  
 Spiritus Ammoniae Aromaticus ;  
 Pulvis Kino Compositus ;  
 Liquor Cocainae Hydrochloratis ;  
 Injectio Morphinæ Hypodermica ;  
 Liquor Arsenicalis ?

Give the proportion of the active ingredients in each of the last three.

2. State the origin, preparations, medicinal actions, and dose of Salicylic Acid.

3. Give the source, medicinal action, and preparations of Cannabis Indica.

4. Explain the following terms :

Standardized Tincture ;  
 Percolation ;  
 Emulsion ;  
 Precipitation.

Give examples of each from the Pharmacopœia.

5. Mention the chief preparations which contain Magnesium. State their modes of action, and give the doses of the preparations you name.

6. Mention the source, medicinal actions, preparations, and doses of Aconite.

*October 2nd.*

1. What is contained in each of the following preparations :

Liquor Hydrargyri Perchloridi ;  
 Mistura Sennæ Composita ;  
 Pulvis Ipecacuanhæ Compositus ;  
 Liquor Morphinæ Bimeconatis ;  
 Injectio Ergotini Hypodermica ;  
 Vinum Antimoniale ?

Give the proportions of the active ingredients in each of the last three.

2. State the origin, preparations, medicinal actions, and dose of Santoninum.

3. State the source, medicinal action, and preparations of Hyoscyamus.



4. Explain the following terms :

Dialysis ;  
Suspension ;  
Elutriation ;  
Sublimation.

Give examples of each from the Pharmacopœia.

5. Mention the chief preparations which contain Calcium. State their modes of action, and give the doses of the preparations you name.

6. Mention the source, medicinal actions, preparations, and doses of Nux Vomica.

1896.

*January 8th.*

1. State the origin of Oil of Turpentine, of Tannic Acid, and of Ergot. Name the preparations of these drugs.

2. What are the most important active ingredients in Hemlock-leaves, Aconite Root, Digitalis leaves, Belladonna Root, Elaterium, and Aloes? Point out those which are official, and state the doses in which they are given.

3. Name the chief constituents of Pulvis Rhei Compositus, Mistura Creosoti, Pilula Colocynthis Composita, Linimentum Terebinthinæ Aceticum, Linimentum Camphoræ Compositum. Give the dose of each of the first three.

4. Describe fully the actions, internal and external, of the following salts: Tartarated Antimony, Sulphate of Copper, Acetate of Lead.

5. Enumerate the official preparations of Iron, and state their doses.

6. What are the official methods of separating the active from the useless constituents of Plants? Enumerate the classes of preparations so obtained.

*March 25th.*

1. Give an account of the medicinal action of Arsenious Acid. Name its preparations, and mention the strength and dose of each.

2. What are the most important constituents of Spiritus Ætheris Nitrosi, Aloes, Cannabis Indica, Copaiba, Elaterium, Kino?



3. Give the composition of :

Vinum Antimoniale ;  
Liquor Morphinae Bimeconatis ;  
Injectio Ergotini Hypodermica ;  
Pilula Plumbi cum Opio ;  
Pulvis Kino Compositus ;  
Syrupus Chloral.

Give the exact proportion of the active ingredient in the first three.

4. Describe the actions of Belladonna. Enumerate the preparations obtained from it, and give the doses of those which are administered internally.

5. Enumerate the most important emetics, and state briefly how they act.

6. Enumerate and classify the more important drugs which exalt and diminish the reflex irritability of the Spinal Cord.

*July 29th.*

1. Mention the most important Purgatives, and classify them according to their mode of action.

2. What is the origin, as stated in the Pharmacopœia, of :

Ergot ;  
Kino ;  
Asafoetida ;  
Squill ;  
Elatarium ;  
Santonin ?

Give the doses and actions of the last two.

3. How are the Suppositories prepared ? Give the composition and the amount of the most important ingredient in the Suppositories of Lead, Morphine, and Glycerine.

4. What are the medicinal actions of Iodine and Iodide of Potassium ? Mention their preparations and doses.

5. From what source is Tannic Acid prepared ? Name its preparations, and give its actions.

6. What are the medicinal actions of Jaborandi ? Mention its active principle, and give its dose.

*October 7th.*

1. Mention the chief Cardiac Tonics. Describe their medicinal actions, enumerate their preparations, and state the dose of each.



2. What is contained in :

Pulvis Glycyrrhizæ Compositus ;  
Tinctura Camphoræ Composita ;  
Spiritus Ammoniaë Aromaticus ;  
Injectio Ergotinæ Hypodermica ;  
Liquor Hydrargyri Perchloridi ;  
Emplastrum Calefaciens ?

3. Name the preparations of Tartar Emetic. What are its medicinal actions, and in what doses would you employ it ?

4. How is Caffeine prepared ? Describe its medicinal actions. Mention its dose.

5. What is meant by an Emulsion ? Give the composition of Mistura Olei Ricini, Mistura Guaiaci, Mistura Ammoniaci. Which is the emulsifying agent in each ?

6. What are the medicinal actions of Salicylate of Soda ? State its dose.

1897.

*January 6th.*

1. Mention the most important Diuretics, and classify them according to their mode of action.

2. Describe in detail the modes of preparing :

Infusions ;  
Decoctions ;  
Tinctures.

Give examples of each from the Pharmacopœia.

3. Describe fully the internal and external actions of Lead Acetate. Enumerate its preparations, and state their composition.

4. Give the composition of the following Pharmacopœial preparations, and state the proportion of the most active ingredient in each of the first three :

Liq. Cocainæ Hydrochloratis ;  
Liq. Trinitrini ;  
Pulvis Elaterini Compositus ;  
Extractum Filicis Liquidum ;  
Pilula Ferri ;  
Pulvis Kino Compositus.

5. What is Oil of Turpentine ? State its origin, doses and actions. Name its preparations.

6. What are the physical properties of Ether ? Describe its actions. What are its official preparations ? Give the dose of each.



*March 24th.*

1. What are the active principles of each of the following drugs :

Cinchona ;  
Calabar Bean ;  
Belladonna ;  
Nux Vomica ;  
Jaborandi ?

Describe the actions of Belladonna.

2. Give an account of the medicinal action of Arsenious Acid. Name the official preparations in which it is used, and give their doses. What other compounds of Arsenic are official, and what are the preparations containing them ?

3. Give the composition of the following preparations, with the doses of such of them as are administered internally ; and the proportion of the most active ingredient in the first three :

Pulvis Ipecacuanhæ Compositus ;  
Syrupus Chloral ;  
Extractum Nucis Vomicae ;  
Enema Opii ;  
Pilula Colocynthis Composita ;  
Linimentum Camphoræ.

4. Explain the following terms :

Dialysis ;  
Sublimation ;  
Standardization ;  
Percolation.

Give examples of each from the Pharmacopœia.

5. Mention the most important expectorants, and classify them according to their mode of action.

6. What are the official forms of Sulphur ? Give the characters by which they may be distinguished. Name their preparations and doses.

*July 28th.*

1. Describe the physical properties of Calomel. Name its official preparations, with the doses of those that are given internally. State the action of the drug.

2. What is Podophyllin ? State its origin, dose, and action.

3. Enumerate the most important emetics, and classify them according to their modes of action.



4. Give the composition of :

Pilula Rhei Composita ;  
 Pulvis Ipecacuanhæ Compositus ;  
 Liquor Strychninæ Hydrochloratis ;  
 Mistura Ammoniaci ;  
 Syrupus Chloral.

5. What is the origin, as stated in the Pharmacopœia, of Jaborandi, Conium, Copaiba, Digitalis, Gentian? Name the most important active principle of each.

6. What is the dose of Spiritus Ætheris Nitrosi, and of Nitrite of Amyl? Give the composition of the former. In what way is the latter usually administered?

*October 6th.*

1. Describe the physical properties of Tartar Emetic. Give its official preparations, and state in what doses it is employed. What are the actions of Tartar Emetic?

2. What is Camphor? State its origin, physical properties, and actions. Name its preparations, and the doses employed internally.

3. How are Extracts prepared? Give examples of each method.

4. Give the composition of :

Pilula Hydrargyri Subchloridi Composita ;  
 Mistura Guaiaci ;  
 Liquor Cocainæ Hydrochloratis ;  
 Lotio Hydrargyri Flava ;  
 Pulvis Kino Compositus.

5. What is the origin, as stated in the Pharmacopœia, of :

Rhubarb ;  
 Colocynth ;  
 Ipecacuanha ;  
 Squill ;  
 Colchicum ?

Name the most important active principles of each.

6. Enumerate the chief official Diaphoretics, and discuss their mode of action.

1898.

*January 5th.*

1. Describe the physical properties of the chlorides of Mercury. Enumerate their official preparations, and give the composition and doses of those used internally.



2. What are the official preparations of Ergot, and in what doses are they employed? Describe the medicinal action of the drug.

3. Describe the physical properties of Carbolic Acid, and enumerate its preparations. State what you know of its actions.

4. How are Tinctures made? Give examples, with doses.

5. Give the composition of the following Pharmacopœial preparations, and state the proportion of the most active ingredient in each of the first three :

Acidum Hydrocyanicum Dilutum ;

Liquor Cocainæ Hydrochloratis ;

Tinctura Camphoræ Composita ;

Mistura Sennæ Composita ;

Pilula Ferri ;

Suppositoria Plumbi Composita.

6. Define Anæsthetics, Anodynes, and Hypnotics. Enumerate the chief Hypnotics, with their doses.

*March 30th.*

1. What is Opium? Describe its physical characters, mention its chief constituents, and enumerate the Pharmacopœial preparations derived from Morphine or its Salts. Give the proportion of the active ingredient in each one.

2. Describe the physical characters and name the official preparations of Potassii Iodidum, Magnesii Sulphas, Aconiti Radix.

3. What is the Pharmacopœial mode of preparing (a) Extractum Filicis Liquidum, (b) Enema Asafœtidæ, (c) Oleum Phosphoratum?

4. Describe the medicinal actions of Digitalis.

5. Give the composition of :

Liquor Trinitrini ;

Tinctura Opii Ammoniata ;

Lamellæ Physostigminæ ;

Mistura Ferri Composita ;

Pilula Colocynthis Composita ;

Confectio Sulphuris.

State the proportion of the most active ingredient in each of the first three.

6. Enumerate the chief Purgative drugs of the Pharmacopœia, and classify them according to their mode of action.



## SECOND EXAMINATION.

## ANATOMY.

Three hours are allowed for the paper in this subject.

Candidates unable to answer *at least* four questions must report the fact to the Presiding Examiner, and are not allowed to proceed with their examination.

1890.

*January 10th.*

1. Describe the bony walls of the Orbit, and enumerate the openings which lead into and out of it.

2. Describe the course, relations, and branches of the Radial Artery in the forearm.

3. Describe the Corpus Callosum, and give its relations.

4. Give the attachments, nerve-supply, and action of the following muscles :

Biceps Femoris ;

Flexor Accessorius Digitorum ;

Rhomboideus Major.

5. Describe the course, relations, peritoneal connections, and arterial supply of the Transverse Colon.

6. Give the attachments and the external relations of the fibrous Pericardium.

*March 28th.*

1. Describe the ligamentous structures of the Hip-joint.

2. Describe the course and relations of the Pulmonary Artery and its branches from the heart to the lungs.

3. Give an account of the superficial anatomy of the Spinal Cord under the following heads : (a) Its extent and length, (b) Its variations in form and size in different regions, and (c) The manner in which its surface is divided.

4. Describe the position and relations of the Stomach.

5. Give the attachments, nerve-supply, and action of the following Muscles :

Inferior Constrictor of the Pharynx ;

Flexor Carpi Ulnaris ;

Flexor Longus Hallucis.

6. Enumerate, and give the position of the structures exposed by the removal of the Deltoid Muscle.



*June 27th.*

1. Give the length, position, and relations of the Trachea.
2. Describe the ligaments uniting the Axis to the Atlas and to the Occipital Bone.
3. Describe the course, relations, and branches of the Internal Pudic Artery.
4. Describe the Inguinal Canal.
5. Give the origin, course, and distribution of the Ulnar Nerve.
6. State the attachments, nerve-supply, and actions of the following Muscles :
  - Pterygoideus Externus ;
  - Subscapularis ;
  - Semimembranosus.

*October 3rd.*

1. Describe the form, position, and relations of the Urinary Bladder in the male.
2. Give the origin, course, distribution, and anastomoses of the external and internal circumflex arteries of the Thigh.
3. Describe the ligaments of the Elbow-joint (including the Superior Radio-Ulnar Articulation), and enumerate the structures in contact with it.
4. Give the origin, course, and distribution of the left Phrenic Nerve.
5. Give the position and relations of the left Kidney.
6. Describe the attachments, nerve-supply, and actions of the following Muscles :
  - Mylo-hyoid ;
  - Rectus abdominis ;
  - Flexor Brevis Hallucis (Pollicis Pedis).

1891.

*January 9th.*

1. Give the immediate relations of the Liver.
2. Describe the origin, course, relations, and ending of the Vertebral Artery. Name the branches which the Artery gives off in each part of its course.
3. Describe the ligaments of the shoulder-joint, and enumerate the muscles in contact with its capsule.
4. Give the position and boundaries of the several openings which lead into and from the Pharynx.



5. Give the origin, course, and distribution of the External Popliteal (Peroneal) Nerve.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Psoas Magnus ;  
Pectoralis Minor ;  
Popliteus.

*April 3rd.*

1. Describe the attachments of Muscles and Ligaments to the Clavicle.

2. Describe the origin, course, relations, and branches of the Posterior Tibial Artery (the plantar arteries are not required).

3. Describe the origin (superficial and deep), course, and distribution of the Hypoglossal Nerve.

4. Give the extent and relations of the Rectum in the male.

5. Describe the sclerotic coat of the Eye, including its relations to and connections with other structures.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Scalenus Anticus ;  
Flexor Sublimis Digitorum ;  
Peroneus Longus.

*July 3rd.*

1. Describe the Temporo-maxillary Articulation.

2. Give the extent, situation, and relations of the Descending Thoracic Aorta. Name, but do not describe, the branches given off from it.

3. Give the origin, course, and distribution of the following Nerves :

Suprascapular ;  
Circumflex ;  
Posterior Interosseous.

4. State the position and relations of the Duodenum.

5. Describe the attachments, nerve-supply, and actions of the following muscles :

Genio-hyoglossus ;  
Extensor Brevis Digitorum Pedis ;  
Trapezius.

6. Give the boundaries of the Popliteal Space, and mention in their relative position the structures which it contains.



*October 2nd.*

1. Describe the Ligaments uniting the Innominate Bone with the Sacrum, and enumerate the structures passing through the Sacro-sciatic Foramina.

2. Give the attachments, nerve-supply, and actions of the following Muscles :

Abductor Hallucis ;

Gracilis ;

Subscapularis.

3. Give the origin and course, and name the branches of the following Arteries :

Deep Epigastric ;

Superficial Palmar Arch.

4. Describe the Vocal Cords, true and false ; state by what muscles the true cords are lengthened and shortened, approximated and separated.

5. Give the origin, course, and distribution of the following Nerves :

Great Occipital ;

Musculo-cutaneous (upper extremity).

External Saphenous.

6. Describe the Falx Cerebri and the Tentorium Cerebelli, together with the sinuses which they contain.

1892.

*January 8th.*

1. Describe the form and relations of the left Lung, and give the arrangement of the structures composing its root.

2. Describe the ligamentous structures uniting the Radius and Ulna, and give an account of the movements permitted between these bones.

3. Give the position and relations of the right Internal Jugular vein, and name its tributaries.

4. Give the relations of the Prostate.

5. Give the attachments, nerve-supply, and actions of the following Muscles :

Soleus ;

Digastricus ;

Latissimus Dorsi.

6. Describe the origin, course, and distribution of the Obturator Nerve.



*April 1st.*

1. Describe the ligamentous structures uniting two Lumbar Vertebrae.

2. Enumerate, and give the relative position of the parts exposed by the removal of the Gastrocnemius, Plantaris, and Soleus.

3. Describe the form, position, and relations of the Uterus.

4. Give the course and relations of the Axillary Artery, and name its branches.

5. Give the origin, course, and distribution of the Ophthalmic division of the Fifth Nerve.

6. Give attachments, nerve-supply, and actions of the following Muscles :

Buccinator ;  
Sterno-Cleido-Mastoideus ;  
Flexor Profundus Digitorum.

*July 1st.*

1. Describe the course and relations of the male Urethra.

2. Give the origin, course, and relations of the Internal Maxillary Artery, and name the branches which arise from each part of its course.

3. Describe the Ligaments which are attached to the Fibula.

4. Describe the course and distribution of the two recurrent Laryngeal Nerves.

5. Give the attachments, nerve-supply, and actions of the following Muscles :

First Dorsal Interosseous of the Hand ;  
Serratus Magnus ;  
Pectineus.

6. Describe the Right Auricle of the Heart, and give its position and relations.

*October 7th.*

1. Describe the Crucial Ligaments and the Semilunar Fibro-cartilages of the Knee-joint.

2. Give the course and relations of the Portal Vein, and name its tributaries.

3. Describe the distribution of the Median and Ulnar Nerves in the Hand.

4. Give the boundaries of the Ischio-rectal Fossa, and describe its contents.



5. Give the attachments, nerve-supply, and actions of the following Muscles :

Mylo-hyoideus :

Obliquus Oculi Inferior ;

Flexor Brevis Digitorum Pedis.

6. Describe the form, position, and relations of the Thyroid Body, and state the sources of its arterial supply.

1893.

*January 6th.*

1. Give the position, relations, and arterial supply of the Pancreas.

2. Describe the articular surfaces and the ligaments of the Ankle-joint.

3. Give the origin, course, distribution, and anastomoses of the Gluteal and of the Sciatic Arteries.

4. Describe the course and distribution of the Superior Maxillary Nerve. (A description of Meckel's ganglion is not required.)

5. Describe the clavicular portion of the posterior triangular space of the Neck and its contents.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Rhomboideus Major ;

Flexor Sublimis Digitorum ;

Tibialis Anticus.

*March 30th.*

1. Describe the Temporo-Maxillary articulation. Enumerate the movements which take place at this joint, and name the muscles which produce each movement.

2. Give the position and relations of the Cæcum, and describe the mode of entrance of the Ileum into the Large Intestine.

3. Describe the Lingual Artery and its branches.

4. Describe the origin from the Spinal Cord, the mode of division, and the distribution of the second Dorsal Nerve.

5. Describe the boundaries and contents of Hunter's Canal.

6. Describe the Azygos Veins.



*June 30th.*

1. Name and give the relative positions of the structures which are in contact with the anterior surface of the Brachialis Anticus.

2. Describe the course and relations of the Right External Iliac Artery. Name its branches and give their anastomoses.

3. Give the form, extent, position, and relations of the Trachea.

4. Give the course and distribution of the Plantar Nerves.

5. Describe the Sterno-Clavicular articulation, and mention the movements which take place at this joint.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Rectus Abdominis ;  
Scalenus Anticus ;  
Popliteus.

*October 6th.*

1. Describe the form, position, and relations of the Urinary Bladder in the male.

2. Describe the origin, course, and branches of the Internal Mammary Artery.

3. Describe the Capsular Ligament of the Hip-joint, and enumerate the muscles which are in contact with it.

4. Give the relative positions of the Structures seen on removing the Deltoid.

5. Give the origin, course, and distribution of the Third Cranial Nerve.

6. Describe the attachments, nerve-supply, and actions of the following Muscles :

Flexor Sublimis Digitorum ;  
Extensor Brevis Digitorum ;  
Stylo-Pharyngeus.

1894.

*January 5th.*

1. Describe the Ligaments uniting  
The Atlas to the Occipital Bone ;  
The Atlas to the Axis.

2. Give the relations of the Liver, and describe its Ligaments.



3. Describe the Common and Internal Iliac Veins, and name their tributaries.

4. Give the course and relations of the Profunda Femoris Artery. Enumerate its branches and their anastomoses.

5. Describe the origin and course of the Musculo-Spiral Nerve, and name its branches.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Pterygoideus Externus ;  
Trapezius ;  
Flexor Longus Hallucis.

*March 30th.*

1. Describe the Astragulus.

2. Give the course and relations of the Rectum. Mention the arteries by which it is supplied, and the destination of its veins and lymphatics.

3. Describe the mode of formation of the Circle of Willis. Enumerate the branches of the Middle Cerebral Artery, and give their distribution.

4. Describe the anterior and posterior Interosseous Nerves of the Forearm.

5. Describe the Inguinal Canal and its apertures.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Semimembranous ;  
Subscapularis ;  
Tensor Palati.

*June 29th.*

1. Give the course and relations of the Popliteal Artery. Name its branches.

2. Describe the origin, course, and distribution of the Cutaneous branches of the Cervical Plexus.

3. Give the form and relations of the Spleen.

4. Describe the ligaments of the Radio-carpal and Inferior Radio-ulnar articulations. What movements take place in these joints ?

5. Describe the boundaries and cavity of the Fourth Ventricle of the Brain.

6. Describe the attachments, nerve-supply, and actions of the following Muscles :

Flexor-Carpi Ulnaris ;  
Obturator Externus ;  
Sterno-thyroideus.



*October 5th.*

1. Give the form, position, and relations of the Duodenum.
2. Give the origin, course, and distribution of the Occipital Artery.
3. Trace the External Popliteal Nerve from its origin ; give its distribution and branches.
4. Describe the First Rib.
5. Describe the Annular Ligaments at the Wrist, and give the exact position of the structures in relation to them.
6. Describe the muscles of the Floor of the Pelvis, and mention their relations.

1895.

*January 4th.*

1. Describe the position and relations of the Submaxillary Gland and its Duct, and state the source of its nervous and vascular supply.
2. Give the naked-eye appearances of a transverse section of the Spinal Cord in the middle of the dorsal region, and describe the origin and distribution of a typical Dorsal Nerve.
3. Describe the Parietal Bone and its articulations.
4. Give the formation, course, and relations of the Axillary Vein, and enumerate its tributaries.
5. Describe the triangular ligament of the Urethra, and give the relative position of the structures situated between its layers.
6. Describe the ligaments of the Ankle-Joint.

*March 29th.*

1. Give the form, position, and relations of the Right Lung.
2. Describe the origin, course, and distribution of the Facial Artery, and give its relations.
3. Name the Cranial Nerves, and give their superficial origins. Describe the manner in which each passes through the dura mater, and mention the opening by which it leaves the cranial cavity.
4. Give the boundaries and floor of the Antecubical Space (bend of elbow). Mention and give the relative position of the structures lying superficial to it, and those contained within or beneath its lateral boundaries.



5. Describe the Crural Canal and the Saphenous opening. Give the exact relations of the Crural Ring.

6. Give the relative positions of the structures seen on removal of the Gluteus Maximus.

*June 28th.*

1. Describe the broad ligament of the Uterus, and give the relative positions of the structures between its layers.

2. Give the origin, course, and relations of the *left* Common Carotid Artery.

3. Describe the origin, course, and distribution of the Musculo-Cutaneous Nerves of the upper and lower extremities.

4. Describe the peculiarities of the *first* and *last* Dorsal Vertebrae.

5. Give the origin, insertion, nerve-supply, and actions of the muscles attached to the Thyroid Cartilage.

6. Describe the Fornix, and mention its relations and connections.

*October 4th.*

1. Give the attachments of the Diaphragm, and mention the relative position of the structures in contact with its under-surface.

2. Describe the course and distribution of the external and internal Plantar Nerves.

3. Describe the mode of origin, and give the course, relations, and terminations of the Thoracic Duct.

4. Give the attachments, nerve-supply, and relations of the Adductor Magnus.

5. Describe the Manubrium Sterni and the Sterno-Clavicular articulation.

6. Give the position, communications, and terminations of the sinuses of the Dura Mater.

1896.

*January 10th.*

1. Describe the ligaments of the Knee-joint (excluding the crucial ligaments and the semilunar fibro-cartilages), and give the arrangement of the Synovial Membrane.

2. Give the form, position, and relations of the Prostate, including an account of the Prostatic Urethra.

3. Trace the course and distribution of the Arteries



arising from the Thyroid Axis, and mention the anastomoses which they form.

4. Give the origin, course, and distribution of the Nerves supplying the Orbital Muscles.

5. Give the origin, insertion, and relations of the right Psoas Magnus Muscle.

6. Enumerate and give the relative positions of the structures exposed on the removal of the Palmar Fascia.

*March 27th.*

1. Give the position, extent, relations, and naked-eye structure of the Œsophagus.

2. Describe the origin, course, and distribution of the Superior Mesenteric Artery and its branches, and give the course and termination of the corresponding veins.

3. Describe the *third* Ventricle of the Brain.

4. Describe the ligaments of the Shoulder-joint, and give the relative position of the structures in contact with the Capsule.

5. Give the origin, course, and distribution of the Obturator Nerve.

6. Give the attachments, nerve-supply, and actions of the Pterygoid Muscles.

*July 3rd.*

1. Describe the Posterior Fossa of the base of the Skull, with its Vascular Grooves and Foramina. Mention the structures which pass through each of the latter.

2. Give the position and relations of the right Kidney and Ureter.

3. Give the course and relations of the External Plantar Artery, and describe its branches and anastomoses.

4. Describe the formation and give the position and relations of the Brachial Plexus. Enumerate its branches.

5. Give the relations of the roots of the lungs, and the relative position of the structures composing the roots.

6. Give the attachments, nerve-supply, and actions of the following Muscles :

Popliteus ;  
Digastricus ;  
Pronator Radii Teres.

*October 9th.*

1. Describe the ligaments of the Ankle-joint, and enumerate in order the parts in contact therewith.



2. Give the position and relations of the Urinary Bladder—empty and distended—in the male adult.

3. Give the course and relations of the Innominate Veins and the Superior Vena Cava. Enumerate their tributaries.

4. Give the origin, course, and distribution of the Median Nerve.

5. Give the position and relations of the Submaxillary Gland, and describe the course and termination of its duct.

6. Give the attachments, nerve-supply, and actions of the Muscles arising from the Styloid Process of the Temporal Bone.

1897.

*January 8th.*

1. Give the form and relations of the Lachrymal Gland, and describe the canals by which the tears are conveyed to the nose.

2. Describe the Tempero-Maxillary articulation, and state by what Muscles the various movements of the Lower Jaw are produced.

3. Give the course and relations of the Anterior Tibial Artery; name its branches, and state what anastomoses they form.

4. Describe the origin, course, and distribution of the Twelfth Dorsal Nerve.

5. Describe the Left Ventricle of the Heart, together with the Valves which guard its orifices.

6. What are the boundaries of the Axilla? Enumerate its contents and give their position.

*March 26th.*

1. Describe the upper extremity of the Femur, giving the exact attachments of muscles and ligaments thereto.

2. Describe the Pericardium, including its external relations, and the arrangement of its serous layer with regard to the several vessels passing to and from the Heart.

3. Describe the form and relations and connections of the Pons Varolii, together with the portion of the floor of the *fourth* Ventricle above the Medullary Striæ.

4. Give the origin, course, distribution, and anastomoses of the branches of the External Iliac Artery.



5. Describe the Carotid Triangle, and give the position of its contents.
6. Describe the Extensor Muscles of the Thumb.

*July 2nd.*

1. Describe the Right Auricle of the Heart.
2. Describe the Costo-coracoid Membrane, and mention the structures in relation therewith.
3. Give the extent, position, and relations of the Rectum in the male.
4. Give the origin, course, and relations of the Occipital Artery. Describe its branches and their anastomoses.
5. Describe the Cuboid Bone, mentioning its articulations and the ligaments attached to it.
6. Give the boundaries of the Lateral Ventricle of the Brain, indicating the structures seen in each part of the cavity.

*October 8th.*

1. Describe the Temporal Fossa, and enumerate the structures contained in it.
2. Give the attachments, nerve-supply, and actions of the following Muscles :
  - Extensor Carpi Ulnaris ;
  - Rectus Abdominis ;
  - Popliteus.
3. Give the relations of the Stomach, and name the arteries supplying it.
4. Describe the ligaments uniting :
  - the Atlas to the Occipital Bone ;
  - the Atlas to the Axis.
5. State the origin of the Median, Ulnar, and Musculo-spiral Nerves, and give their course and relations as far as the elbow.
6. Describe the origin, course, and relations of the Saphenous Veins.

1898.

*January 7th.*

1. Describe the inner surface of the Occipital Bone, and mention the structures in relation with it.
2. Give the position, extent, relations, and naked-eye structure of the Trachea.



3. Describe the formation and give the position and relations of the Lumbar Plexus. State the origin of the several nerves proceeding from it.

4. Describe the course and relations of the Posterior Tibial Artery; name its branches and the anastomoses which they form.

5. Describe the ligaments of the Elbow-joint, including the Superior Radio-Ulnar articulation.

6. Give the attachments, nerve-supply, and actions of the following Muscles:

Levator Anguli Scapulæ;  
Pectoralis Major;  
Gracilis.

*April 1st.*

1. Describe the form, position, and relations of the Pancreas.

2. Give the boundaries of the Nasal Cavities of the dry Skull. Enumerate and give the position of the openings in each wall.

3. Describe the lateral ligaments of the Knee and Ankle Joints, and state what tendons come into immediate relation with each.

4. Describe the first part of the left Subclavian Artery.

5. Give the origin, course, and distribution of the Third Nerve.

6. Give the attachments, nerve-supply, and actions of the following Muscles:

Supinator Longus;  
Supinator Brevis.

SECOND EXAMINATION.

PHYSIOLOGY.

Three hours are allowed for the paper in this subject.

Candidates unable to answer at *least four* questions must report the fact to the Presiding Examiner, and are not allowed to proceed with their examination.

1890.

*January 9th.*

1. Give the composition of Urine, and state the sources of its chief constituents.



2. Describe the structure and the physical and vital properties of the different kinds of Human Blood-corpuscles.

3. What is the use of each of the following Muscles in respiration : Diaphragm, Serratus Magnus, Obliquus Externus Abdominis ? Explain how the Lungs expand in inspiration.

4. Give an account of the structure and functions of the anterior horn of the gray matter of the Spinal Cord.

5. How may the blood-supply and pressure in any vascular area of the Body be increased or diminished ?

6. What are the immediate results of section of the Third Nerve at its superficial origin ?

*March 27th.*

1. Describe the conditions that produce the Pulse in the Arteries, and explain why it is absent in the Veins.

2. Describe the structure of the Cutaneous Glands. What is the part played by the Skin in the regulation of the temperature of the Body ?

3. Describe the process of Ossification as it takes place in a Long Bone.

4. In what form does Nitrogen enter the Body ? How is it excreted ?

5. What are the functions of the Iris and the Ciliary Muscle ?

6. Describe the Blastoderm. What structures are developed from its several layers ?

*June 26th.*

1. Describe the structure of a Lobule of the Liver.

2. What are the functions of the Vagus and its branches in relation to Respiration ?

3. Describe the structure of a tubule of the Kidney, and state what is known as to the functions of its several parts in reference to the secretion of Urine.

4. Describe the minute anatomy of the Colon. What is the use of the Large Intestine ?

5. What is the normal Temperature of the Body ? To what is the Body Heat due, and how is it controlled ?

6. How is the Voice produced ? How is it modified by the Intrinsic Laryngeal Muscles, by the Mouth, and by the Nose ?



*October 2nd.*

1. Describe the Fœtal circulation, and the changes which occur in the circulation through the Heart after birth.
2. Describe a Lobule of the Lung. Explain the gas exchanges which take place therein.
3. Enumerate in order and describe the structures forming the wall of an Artery the size of the Radial.
4. Describe the microscopic structure of the Cortex of the Cerebellum. What functions are attributed to the Cerebellum?
5. What is meant by Blood-pressure? Explain how the principal variations in the Blood-pressure in the Systemic Arteries, Capillaries, and Veins are brought about.
6. What is the chemical composition of Bone?

1891.

*January 8th.*

1. Describe Ciliary Movement. What are the circumstances which affect it? What are its uses in the Human Body?
2. Describe the mode of action of the Semilunar and Auriculo-Ventricular Valves. What share do they respectively take in the production of the Heart sounds?
3. Describe the microscopic structure of the Mucous Membrane of the Duodenum.
4. What evidence is there of the existence of Localized Motor Areas in the Cortex of the Cerebrum?
5. Describe the structure of the different kinds of Cartilage found in the body.
6. How would you separate the several Proteids of Blood-Plasma? By what characters do you distinguish between Albumins, Globulins, and Peptones?

*April 2nd.*

1. What are the ultimate forms to which the principal Food constituents are reduced prior to absorption? and by what channels are these conveyed to the Blood?
2. What are the chemical and physical characters of Urea? How does it originate in the body?
3. What share has the Nervous System in the maintenance of the Blood-pressure?
4. What phenomena are observed to follow the stimulation of a Striated Muscle?



5. Contrast the process of Respiration in the Fœtus and in the Adult.

6. Describe the plan on which Secreting Glands are constructed, and give examples of the principal types of such Glands.

*July 2nd.*

1. Describe the structure of the Muscular Fibres and Mucous Membrane of the Tongue.

2. State and explain the effect upon the Respiratory Movements of (a) division of the Spinal Cord below the Medulla, (b) division of both Vagi in the Neck, and (c) division of both Phrenics.

3. Describe the Human Blood-corpuscles, and state the views which are held with regard to their structure.

4. What special Nerve-centres exist in the Lumbar enlargement of the Spinal Cord? Illustrate their functions by reference to the action of Sphincters.

5. In what forms are Chlorine, Sulphur, and Phosphorus taken into the Body? and how are they eliminated from it?

6. Describe carefully the structure of one of the Cardiac Glands of the Stomach, and state the reasons for believing that the several kinds of Epithelium which each Gland contains discharge specific functions.

*October 1st.*

1. What are the chief products of the action of the Gastric Juice upon Proteids? Describe the properties of these products.

2. Explain how, and through what paths, the action of the Heart is modified by the Central Nervous System.

3. Describe the structure of a Lymphatic Gland. State the origin, composition, and uses of Lymph.

4. Explain the influence of the Respiratory Movements on the Systemic Circulation.

5. Describe the mechanism of the Valves of the Heart.

6. Enumerate in order the Refractive Media of the Eye, and explain the manner in which an image of external objects is formed upon the Retina.

1892.

*January 7th.*

1. From what source within the body is the Carbon Dioxide of the expired Air derived? How is it carried to



the Lungs, and how does it enter the Pulmonary Alveoli? What circumstances produce variation in the amount of the Gas excreted?

2. Describe the circulation of the Blood as observed with the microscope in the web of the Frog's foot. How is the Capillary circulation influenced by changes in the Arterial and Venous flow?

3. Describe the minute structure of a Salivary Gland, and the appearances which the cells exhibit in various stages of activity.

4. Where are the Cortical Cerebral Centres situated which are related to the movements of the upper extremity, and what paths do the Motor impulses originating in these Nerve-centres follow?

5. Give an account of the composition of Milk, and describe the manner in which the presence of each of its chief constituents can be demonstrated.

6. Describe the functions of the Liver in relation to Carbohydrate and Proteid Metabolism.

*March 31st.*

1. What Proteids are found in Blood Plasma? How may they be separated?

2. What are the functions of the Vagus nerve in relation to the Heart? How are these functions ascertained? What is the origin of the fibres upon which they depend?

3. Where is Glycogen found? What may it be formed from in the body? What is its use?

4. Describe a Urinary Tubule of the Kidney. What functions have been ascribed to its several parts?

5. What are the characteristics of Ferment action? Give examples of Fermentation-processes occurring in the body.

6. Describe the structure of a Spermatozoon. What becomes of it in the process of Fertilization?

*June 30th.*

1. What Nerves supply the Submaxillary Gland? What experiments have demonstrated their respective functions?

2. Describe the white Blood-corpuscles. What are their functions? How can their vital properties be shown?

3. What are the principal varieties of Nerve-cells?



What is their structure? Give the situations in which they occur.

4. What are the changes which occur in the Human Larynx during respiration and during phonation? Explain how these changes are brought about.

5. What is a Carbohydrate? Give examples of Carbohydrates which occur in the animal body, with their chemical reactions.

6. Describe the structure of the Villi of the Small Intestine, and the part they play in Absorption.

*October 6th.*

1. Describe the structure of the Epithelium covering the mucous membrane of the several parts of the Alimentary Canal. (A description of the Epithelium of the glands is not required.)

2. Explain how the interchange of gases takes place between the blood and the air in the Pulmonary Alveoli.

3. Why is a diet composed entirely of Proteid or one containing no Proteid whatever unsuitable? To what extent can Gelatine be used instead of Proteid as an article of diet?

4. Describe and explain the vascular effects produced by (a) section, and (b) stimulation of the Cervical Sympathetic.

5. Enumerate the principal inorganic constituents of the Urine. Whence are they derived? By what tests can they be recognised?

6. What paths of conduction have been traced in the white matter of the Spinal Cord? Illustrate your answer by means of a diagram.

1893.

*January 5th.*

1. What is the chemical composition of Fat? How is its digestion effected? What is meant by the terms 'Saponification' and 'Emulsification'?

2. Describe the structure of the semicircular canals. What is believed to be their function?

3. What agencies assist the Heart to carry on the Circulation of the Blood? Explain their mode of action.

4. Enumerate the chief Proteids which occur in the body, stating where each is found, and mentioning a characteristic property of each one.



5. State the effect produced upon the Cardiac and Respiratory functions by section of (a) one Vagus, and (b) both Vagi.

6. What method or methods would you employ to exhibit the structure of Medullated Nerve-fibres? Describe the appearances of fresh Medullated fibre.

*March 29th.*

1. Give an account of the several methods by which Blood-plasma may be obtained.

2. What changes occur in the Vascular System in the course of Asphyxia? Explain how they are brought about.

3. What are the functions of the Cerebrum? What evidence is there to show that certain functions are localized in definite regions of the Cortex?

4. Describe the minute structure of the Cornea. What part does the Cornea play in assisting to form images of objects upon the Retina?

5. Describe and explain the method you would adopt to determine the amount of Urea passed in the twenty-four hours. How may the quantity be varied by diet?

6. Describe the structure of the Thyroid Gland. What effects follow its complete removal?

*June 29th.*

1. To what class of tissues do Tendons belong? Describe the microscopical appearances of longitudinal and transverse sections of a tendon.

2. Describe the development of a Tooth. At what times are the Milk-teeth severally cut?

3. What forces determine the flow of Blood in the Veins? Describe the structure of a Vein.

4. How would you ascertain whether a red fluid submitted to you contains blood?

5. Describe and explain the immediate and remote effects of cutting (a) an Anterior and (b) a Posterior Spinal Root.

6. What are the functions of the Skin?

*October 5th.*

1. What Gaseous Interchanges take place in the Lungs, and how are these interchanges effected?

2. How would you harden and prepare for microscopical examination a piece of fresh Liver?



3. What is the 'Depressor' Nerve? Describe and explain the effect obtained on stimulating it.

4. State and explain the changes which occur in the reaction of the contents of the Alimentary Canal from the mouth downwards.

5. Name the layers of the Blastoderm in order from without in. From which of the layers are the following structures respectively derived: (a) Central Nervous System, (b) Bone, (c) Epithelium of Alimentary Canal, (d) Liver-cells, (e) Heart?

6. Describe and explain the nervous and muscular mechanisms of Micturition.

1894.

*January 4th.*

1. Describe exactly how you would test for Grape-sugar in a solution, and also how you would estimate the quantity present. Under what experimental conditions does Sugar appear in the Urine? How is its appearance explained?

2. Describe the minute structure and functions of the Spleen.

3. Describe and explain the effect of prolonged muscular exercise upon (a) the Expired Air, (b) the Urine, and (c) the Sweat.

4. Describe the minute structure of the Pancreas. What changes occur in the cells of the gland before and after secretion?

5. Explain the terms Myopia, Hypermetropia, and Astigmatism. How would you correct the errors of refraction?

6. Describe the appearances of the interior of the Larynx as seen by the Laryngoscope. What changes are noticed on phonation and respiration, and how are they brought about?

*March 29th.*

1. Describe the minute structure of the Mammary Gland, including the changes which take place in the Alveoli (a) on commencing secretion, (b) during active secretion, and (c) on cessation of secretion.

2. Explain how the image of an object is formed on the Retina. Which elements of the retina are responsive to light, and how are nerve-impulses carried from these



through the several layers of the retina, and eventually to the Brain?

3. Describe and explain a normal Pulse-tracing.

4. What are the immediate and remote effects of complete transverse section of the Spinal Cord in the mid-dorsal region?

5. How is the Placenta formed, and what are its functions?

6. Enumerate the pigments of the Blood, Bile, Urine, and Fæces. How are they related?

*July 28th.*

1. What sounds can be heard on applying the Ear to the Chest? Explain exactly how they are caused.

2. Describe and explain the changes in velocity and pressure of the Blood in the Systemic Arteries, Capillaries, and Veins.

3. What part do the Pneumogastric Nerves play in the regulation of Respiration?

4. Where is Elastic Tissue found? Describe its structure, and how would you make a teased permanent preparation of the tissue?

5. By what methods may Blood-plasma be obtained free from corpuscles? How would you separate its Proteid constituents from one another?

6. Describe the reflex movements of the Iris, and the nervous and muscular mechanisms concerned in their production.

*October 4th.*

1. What is the origin, function, and fate of the Red Blood-corpuscles?

2. Describe the minute structure of an Incisor Tooth. At what times are the Deciduous and Permanent Teeth respectively cut?

3. Describe the structure of an Acinus of the Pancreas, the changes which occur in its cells during secretion, and the action of the juice that it secretes.

4. Describe how you would ascertain the reaction and specific gravity of the Urine. To what is the normal reaction of the Urine due? Explain the changes produced in the reaction (*a*) by diet, (*b*) after the Urine is passed and allowed to stand in an open vessel for two or three days.



5. Describe the Epithelium of (*a*) the anterior surface of the Cornea, (*b*) the Alveoli of the Lung, (*c*) the Trachea. How would you demonstrate microscopically ciliary movement?

6. Describe the changes that occur in the Mammalian Ovum from the time of fertilization until the formation of the three layers of the Blastoderm.

1895.

*January 3rd.*

1. What is meant by the following terms: (*a*) Simple Muscle Curve; (*b*) Tetanus; (*c*) End Plate; (*d*) Rigor Mortis; (*e*) Metabolism?

2. Give a brief account of the functions of the Vagus Nerve in relation to the respiratory and vascular systems.

3. How is the Heat of the Body produced, and in what way is the average temperature maintained?

4. Describe the minute structure of a Lobule of the Liver, a Portal Canal, and a Liver Cell.

5. What are the conditions under which Peptones are formed? How are Peptones to be distinguished from other varieties of Proteids?

6. Describe (1) a method for estimating the number of Red Corpuscles contained in a cubic millimetre of Blood; (2) a method for estimating the amount of Colouring-matter in the Blood.

*March 28th.*

1. Describe the structure of Areolar and Adipose Tissue. State the chemical composition of Fats and of Soaps.

2. What are the results that follow excitation of the following nerves: (*a*) Chorda Tympani; (*b*) Cervical Sympathetic; (*c*) Depressor?

3. What are the physical and chemical properties of Hæmoglobin? What are its chief compounds with gases? Describe a method of obtaining Oxyhæmoglobin Crystals for microscopic examination.

4. Describe the microscopic characters of the principal varieties of Nerve-cells, and mention the destination of their axis-cylinder processes.

5. Describe the development and structure of the Placenta. What are its functions?

6. Where is Urea formed, and what are its antecedents in the body? Give the evidence upon which your statements are based.



*June 27th.*

1. What is the composition of the Atmospheric Air, and how does it differ from Expired Air? Explain the method by which the interchange takes place between the gases of the Blood and the air in the Pulmonary Alveoli.

2. What is the origin of the Lymphatic Vessels? what is the nature of the fluid they contain? and what is the direction of the Lymph Flow?

3. How is the velocity of the Circulation ascertained in Arteries? and how is the time of complete Circulation measured?

4. What is the chemical reaction of the following fluids: Blood, Milk, Urine, Saliva, and Pancreatic Juice? How would you ascertain the reaction in each case? Mention the constituents of the several fluids upon which such reaction depends.

5. What are the functions of the 3rd Cranial Nerve? Explain the results following its division.

6. Describe the minute structure of the Secretory Glands of the Stomach. What evidence is there in favour of attributing different functions to the different kinds of cells found in these Glands? From what sources is the free acid of the Gastric Juice derived?

*October 3rd.*

1. Describe the terminations of Nerves in Striped Muscle, Skin, and Cornea.

2. Describe the Circulation of the Blood in the Lungs, Liver, and Spleen.

3. Name the Inorganic Salts of Urine. What are their sources, and the tests by which they are recognised?

4. Describe the action of the chief Muscles concerned in ordinary Inspiration.

5. Give an account of the immediate and remote effects of a transverse section of the Spinal Cord in the lower dorsal region.

6. Describe the chemical, microscopic, and spectroscopic tests applied for the detection of Blood.

1896.

*January 9th.*

1. What is Rigor Mortis? Compare this condition (1) with Contraction of a living Muscle, and (2) with Coagulation of Blood.



2. Describe the arrangement and uses of Membranes, Ossicles, and Muscles in connection with the Middle Ear. What is the function of the Eustachian Tube?

3. Describe the formation and structure of the Human Ovum, and trace the changes which occur in it, prior to and after fertilization, up to the formation of the blastodermic layers.

4. Describe the immediate and remote effects (physiological and histological) of section (*a*) of the anterior root of a Spinal Nerve, (*b*) of the posterior root, and (*c*) of the mixed Nerve beyond the Ganglion.

5. Upon what fundamental facts does the proof of the Circulation of the Blood depend?

6. In what parts of the body, and by what means, are the following substances formed: (*a*) Urea, (*b*) Glycogen, (*c*) Carbonic Acid, and (*d*) Hippuric Acid?

*March 26th.*

1. What changes does the blood undergo in passing through (*a*) the Liver, (*b*) the Spleen, (*c*) the Kidneys, (*d*) the Lungs?

2. Describe the digestion and absorption of Fats.

3. Describe the structure of the Cerebellum. How is the Cerebellum connected with other parts of the nervous system? and what is known as to its functions?

4. State the distinctive characters of Albumins, Globulins, Albumoses, and Peptones.

5. Describe the muscular and nervous mechanism of Deglutition.

6. Where is Ciliated Epithelium found? How would you prepare a microscopic specimen to show Cilia in action?

*July 2nd.*

1. Describe the Normal Pulse. How can a Pulse Tracing be taken? Explain its chief features.

2. How is the Blood-supply of an Organ adapted to its physiological activity? Describe briefly experiments in support of your statements.

3. Describe a Nerve-cell. How may a stained and permanent preparation of Nerve-cells be obtained from the Spinal Cord?

4. Describe the minute structure of the Mucous Membrane, including glands of (1) a main Bronchus, (2) the



Cardiac End of the Stomach, (3) the lower part of the Ileum.

5. What is the Chemical Composition of Bone? By what means can the Organic Constituents be separated from the Inorganic? Mention the chief articles of Food containing the mineral constituents.

6. What are the chief Salts of the Blood, Milk, and Bile? What purposes do they serve?

*October 8th.*

1. Describe a method of preparing a permanent microscopical preparation of (a) Hæmin, (b) Stained Blood-corpuscles, and (c) Uric Acid from Urine.

2. What effects would follow division of the Sensory Root of the fifth Nerve?

3. What varieties of Sugar are found in the Body? By what means may they be distinguished from one another?

4. Describe the minute structure of the Submaxillary Gland, and explain the physiological effects which follow excitation of the Nerves supplying it.

5. Describe the formation of the Fœtal Membranes, and give an account of the functions of the Placenta.

6. How can the Respiratory movements be modified by Sensory impulses?

1897.

*January 7th.*

1. Describe in detail a method for demonstrating the minute structure of Unstriped Muscle. State the various points in which its structure and contraction differ from those of Striped Voluntary Muscle.

2. Describe the nervous mechanism by which the rhythm of the Heart is regulated.

3. What are the changes which Proteids undergo during their passage through the Alimentary Canal?

4. What are the Iron-free pigments of the Body? and how are they related to the colouring-matter of the Blood?

5. Draw a diagram representing a transverse section of the Spinal Cord in the thoracic region; name and describe briefly the various parts shown.

6. What is the composition of Sweat? How is the secretion of Sweat regulated?



*March 25th.*

1. Describe the minute structure of a transverse section of Dry Bone.
2. What Gases are found in the Blood? By what means can they be extracted, and in what proportion do they occur in Arterial and Venous Blood respectively?
3. How is an image of an external object formed upon the Retina? Describe the mechanism of accommodation.
4. Describe the position of the principal Cerebral 'Motor' Centres. What is the evidence on which the existence of these Centres is based?
5. Explain the production of the Pulse in the Arteries, and state why it disappears in the Capillaries. Explain also why the Blood flows more slowly in the Capillaries than in the Arteries.
6. Describe the composition of Milk. How can its constituents be isolated? and what are their chemical reactions?

*July 1st.*

1. Describe the structure of a medium-sized Artery, and give an account of the uses of (a) the Muscular, and (b) the Elastic elements in its coat.
2. Describe (a) the mode of secretion, (b) the composition, and (c) the action of Gastric Juice.
3. How is the Voice produced? Upon what do the loudness and pitch of the Voice depend? Explain the difference in the production of vowels and consonants.
4. How is Heat produced in the body? How is the Temperature of the body regulated?
5. Describe the results following section of one lateral half of the Spinal Cord in the Mid-dorsal region. Compare these results with those seen after complete transverse division of the Cord at the same level.
6. Define the terms 'Vital Capacity' and 'Tidal Air.' Explain the gaseous interchange that occurs in the Pulmonary Alveoli.

*October 7th.*

1. Describe a tracing of Arterial Blood-pressure, and the method by which it can be obtained. What conditions cause a rise or fall in Arterial Blood-pressure?
2. Describe the nervous mechanism which regulates the movements of the Iris. Under what conditions is the Pupil contracted or dilated?



3. What are the functions of the Liver in reference to Carbohydrate and Proteid Metabolism?

4. Give an account of the structure of the Skin of the Palm. What are the functions of the Skin?

5. Describe the histological characters of the principal varieties of Cartilage. Name the chief situations where each is found.

6. What is the evidence that Secretion is regulated by the Nervous System?

1898.

*January 6th.*

1. Write out a Diet Scale for an average adult. On what principles is such a scale drawn up?

2. Describe the minute structure of a Lobule of the Liver.

3. State all the immediate and remote effects of division of the Sciatic Nerve.

4. Describe the mechanism of the secretion of Saliva.

5. Describe the changes that take place in a Muscle during contraction, and state how these changes can be demonstrated. How would you make a Muscle-nerve preparation?

6. Describe fully the histological structure of one of the large cells of the Rolandic Area of the Cerebral Cortex. Trace the path taken by the principal branch of this cell to its termination. What evidence is there that the Rolandic Area is sensori-motor in function?

*March 31st.*

1. Where is Glycogen found in the body? Describe its mode of formation, and state what becomes of it.

2. Give an account of the Coagulation of the Blood. Describe the red and white corpuscles.

3. Describe the structure of the Ganglion on a posterior root of a Spinal Nerve. What effects would follow the division (on the proximal side of the ganglion) of all the posterior roots of the Sacral Plexus?

4. Give an account of the nervous mechanism of Respiration.

5. What are the principal tests for Starch, Dextrin, and Dextrose? How would you estimate the amount of Dextrose present in a solution?

6. Describe the course of the Circulation in the Fœtus, and the changes which occur after birth.



### THIRD OR FINAL EXAMINATION.

#### PRINCIPLES AND PRACTICE OF MEDICINE.

Three hours are allowed for the paper in this subject.

Candidates unable to answer at least *four* questions must report the fact to the Presiding Examiner, and are not allowed to proceed with their examination.

In referring to the use of any drugs in this paper, the doses should invariably be stated.

In answering these questions, candidates are requested to confine themselves to what is asked, and are informed that no credit will be given for irrelevant matter.

1890.

*April 9th.*

1. Indicate the position and anatomical relations of the Œsophagus. What are the causes, clinical signs, and treatment of obstruction of this tube?

2. Enumerate the chief causes of Acute (general) Peritonitis. Describe the symptoms and signs which characterise the attack, and state with what other conditions it may be confounded. How would you treat such a case?

3. What are the symptoms of Stone in the Kidney? What other affections may it resemble? and on what points would you particularly rely in making a diagnosis?

4. What are the diagnostic symptoms of Pharyngeal Diphtheria? How does it tend to destroy life? What measures would you adopt with the object of preventing the dissemination of the disease?

5. Describe the symptoms of Rickets, and the changes which it produces in the skeleton. State what treatment you would adopt.

6. Enumerate the various affections that are caused by chronic Lead-poisoning, and give a short account of those involving the nervous system.

*July 2nd.*

1. Describe the anatomical relations of the Pericardium. Give the causes, physical signs, and symptoms of a large Pericardial Effusion. What treatment would you adopt in such a case?



2. Discuss briefly the data which would guide you in forming an opinion as to the nature of the lesion causing Hemiplegia.

3. What is the most frequent form of Intestinal Obstruction in children? Describe the clinical features and treatment of such a case.

4. What are the principal vegeto-parasitic diseases of the Skin? Write two prescriptions available for the treatment of a patient suffering from any one of them.

5. Describe shortly the various types of Pyrexia met with in disease.

6. Describe and contrast the postmortem appearances in Drowning and Accidental Suffocation.

*October 15th.*

1. Describe the position of the Pylorus, with its relations to surrounding structures and to the surface. Enumerate the morbid changes to which it is liable.

2. Describe the pathological changes in the several forms of Pulmonary Emphysema. What effects may be produced upon the Heart?

3. Give a short account of the Animal Parasites of the Skin, and of the affections caused by them. What treatment would you adopt in each case?

4. Describe the symptoms and course of a case of Whooping-Cough. Indicate the chief complications and dangers which may arise. What treatment and preventive measures would you adopt?

5. What are the principal causes of obstruction of the Bile-Ducts? Discuss briefly the differential diagnosis.

6. Give an account of Sciatica, comprising its ætiology, symptoms, and treatment.

1891.

*January 14th.*

1. Describe the position of the Heart and its orifices in their relation to the anterior surface of the Chest. State the situations of maximum intensity of murmurs generated at the various orifices.

2. Enumerate the symptoms due to Uræmia occurring in the course of Bright's Disease. In what cases are such symptoms most liable to supervene? Discuss the principles of treatment of Uræmia.



3. What are the causes, symptoms, and treatment of Acute Gastritis? Indicate specially the poisons which produce this condition.

4. Describe the morbid anatomy, symptoms, and course of Infantile Paralysis. To what deformities may it give rise?

5. Give an account of Varicella, including its invasion, course, and complications. Contrast the eruption with that of Variola.

6. State the most important points in house sanitation in relation to drainage.

*April 8th.*

1. Indicate the origin, course, and area of distribution of the third and fifth Cranial Nerves. Describe the effects of their respective paralyses.

2. Describe the dangers attending the eruptive stage of Scarlet Fever. How would you treat the same respectively? Enumerate the complications which may ensue during the process of Desquamation.

3. Discuss the principles of treatment of Cardiac Dropsy.

4. By what signs and symptoms would you diagnose a dilated Stomach? What are the causes of this condition, and how may it be treated?

5. Give a summary of the various manifestations of Inherited Syphilis in infancy and childhood.

6. Describe (1) the modes, (2) the signs and symptoms, (3) the treatment, (4) the postmortem appearances of Poisoning by Carbolic Acid.

*July 8th.*

1. What is the Internal Capsule? Indicate its relations to surrounding structures. What symptoms may follow lesions of it?

2. Upon what physical signs, symptoms, and other data would you base the diagnosis of commencing Pulmonary Phthisis? What treatment would you adopt?

3. Describe the symptoms and physical signs of Aneurism of the Abdominal Aorta. What treatment would you adopt?

4. Enumerate the chief causes of Laryngeal Obstruction in children. Indicate the clinical signs of this condition, and the principles of treatment.



5. What diseases of the Liver obstruct the Portal circulation? To what symptoms does such obstruction give rise? and what changes does it produce in the affected organs?

6. How is Typhoid Fever supposed to be communicated? What duties devolve upon the practitioner to prevent its spread?

*October 14th.*

1. Describe the relations of the First Part of the Arch of the Aorta with the surrounding structures and with the anterior surface of the Chest. What are the signs and symptoms of an Aneurism of this portion of the vessel?

2. Discuss briefly the diagnosis of Meningitis in the child. What symptoms are of most diagnostic value in an early stage of the disease?

3. State fully the grounds upon which you would make a diagnosis of Calculus in the Kidney.

4. What conditions give rise to the passage of Blood *per anum*? What is their differential diagnosis, and what would be your treatment for a profuse hæmorrhage from the Small Intestine?

5. Describe the eruptions of Measles and Scarlatina. What rashes may be mistaken for them?

6. Enumerate the symptoms of Chronic Alcoholism, and the chief pathological changes associated with this condition.

1892.

*January 13th.*

1. Describe the position and relations of the Vermiform Appendix. Give a short account of the morbid changes to which it is liable, with their consequences.

2. Describe an attack of Erysipelas of the Face, with especial reference to differential diagnosis. State fully the treatment you would adopt.

3. Enumerate the causes of Hæmorrhage from the Lungs and Bronchi. What other forms of blood-spitting may be mistaken for it? Discuss briefly the principles of treatment of profuse hæmoptysis occurring in the course of Phthisis.

4. Describe a typical Epileptic Fit. Point out how this differs from a fit due to hysteria.

5. Describe briefly the causes of Diarrhœa in infants



and young children. State the principles of treatment, and write full prescriptions for a child aged two years.

6. Describe the method of making a post-mortem examination in a case of suspected poisoning, and the appearances which would lead to the presumption that Arsenic had been taken. What diseases might induce similar appearances?

*April 6th.*

1. Describe the position and anatomical relations of the Spleen. What conditions lead to enlargement of this organ?

2. Describe the treatment of a case of Acute Rheumatism, including that of its most frequent complications. Point out how the symptoms of this disease are modified in childhood.

3. What are the chief causes of Facial Neuralgia? Discuss the treatment of this affection.

4. What is the most common congenital malformation of the Heart? Describe the symptoms and physical signs by which it can be recognised during life.

5. What is Ascites? Give some account of its causation, diagnosis, and treatment.

6. What are the initial symptoms which would lead you to suspect Small-pox? What measures would you adopt to prevent the spread of the disease?

*July 6th.*

1. Describe the situation and relations of the Thyroid Gland. What morbid changes may affect this organ? Indicate the chief symptoms which may be associated therewith, and mention any diseases in which the Thyroid body is specially involved.

2. A child of two years is seized with Convulsions. What may be the various causes of such an attack? What treatment would you adopt?

3. Describe the characters of the Sputum throughout a case (1) of Acute Bronchitis, (2) Pulmonary Tuberculosis. The microscopical characters and the mode of preparation for microscopical examination to be included.

4. In a case of Pleuritic Effusion known to be serous, what conditions would tend to interfere with its natural absorption, and under what circumstances would it be desirable that its removal should be effected by operation?



5. Discuss the causes, differential diagnosis, and principles of treatment of Chronic Diarrhœa in adults.

6. Describe the symptoms and the postmortem signs which would lead you to suspect poisoning by Strychnine. From what conditions of disease would it be necessary to make a differential diagnosis during life? Indicate briefly the treatment of a case of Strychnine poisoning.

*October 12th.*

1. Give the relations of the Diaphragm to the surface of the body and to internal organs. Show how its action may be interfered with and its position altered by pathological conditions.

2. What are the causes of Anæmia? Discuss briefly the differential diagnosis of its chief forms. Indicate the principles of treatment.

3. Enumerate the various conditions under which Hyperpyrexia may occur, the symptoms that accompany it, and the treatment you would adopt under the several circumstances.

4. What are the causes of Dilatation of the Heart apart from valvular disease? How would you diagnose this condition? Indicate the principles of treatment. Write your prescriptions in full.

5. How would you discriminate between the Coma arising from Cerebral Hæmorrhage, Uræmia, Opium, and Alcohol respectively?

6. Describe concisely the Clinical history of a case of Asiatic Cholera. What measures would you adopt with the view of preventing the spread of this disease?

1893.

*January 11th.*

1. Describe the course and distribution of the Middle Cerebral Artery. State how this vessel may become occluded, and the symptoms which result from such occlusion.

2. Upon what evidence could you base the Diagnosis of Typhoid Fever during the first week? For what diseases may this condition be mistaken? What instructions would you issue to the household to prevent the spread of the disease?

3. Describe an acute attack of Gout. Give fully the



treatment which you would adopt during the attack, and also that of the general condition.

4. What forms of disease may lead to the production of a cavity within the Lung? State fully the physical signs on which you would rely for its recognition.

5. State the grounds on which you would diagnose an intussusception of the intestine in a child, and the treatment you would pursue.

6. Describe fully the appearances in the dead body of a new-born child which would enable you to state positively whether it was or was not born alive.

*April 5th.*

1. Enumerate the tributaries and describe the distribution of the Portal Vein. What results may follow obstruction to the flow of blood through that vessel?

2. Describe the course, symptoms, physical signs, and morbid anatomical changes in Acute Pericarditis. Give an outline of the treatment you would adopt.

3. Describe the symptoms, diagnosis, and treatment of Tubercular Peritonitis. What is its morbid anatomy?

4. On what grounds would you diagnose Chronic Interstitial Nephritis? Describe the changes in the Kidney and the treatment.

5. Describe fully the course and development of a typical Vaccine Vesicle. State briefly the argument in favour of the practice of Vaccination.

6. Describe the symptoms, treatment, and prophylaxis of Scurvy in the adult and in the infant.

*July 5th.*

1. Describe the course and anatomical relations of the Facial Nerve, from its nucleus of origin to its point of emergence from the temporal bone. What symptoms would result from a lesion in the course of this nerve?

2. Describe an attack of Spasmodic Asthma. With what conditions may it be associated? What treatment would you employ for its relief?

3. Give the composition and mode of formation of Gall-stones. Describe the symptoms to which they may give rise, and the treatment you would adopt.

4. Give an account of the varieties, symptoms, and treatment of Acute Tonsillitis.

5. Describe the physical signs of incompetence of the



Aortic Valves, and enumerate the morbid conditions which may produce this lesion.

6. In what ways may Lead find its way into the system? What preventive measures would you suggest?

*October 11th.*

1. Describe the relation of the transverse Colon (including the Splenic and Hepatic flexures) to the surface and to the adjacent parts. What morbid states are met with in this region of the bowel?

2. What is meant by the term 'Aphasia'? Describe the chief varieties of this affection. In what parts of the brain may a lesion causing Aphasia be situated?

3. Describe the causation, symptoms and physical signs, diagnosis, and treatment of purulent Pleuritic Effusion.

4. Describe the causes, morbid appearances, symptoms, and treatment of chronic Gastric Catarrh.

5. Describe a case of Renal Colic, and discuss its diagnosis, causes, and treatment.

6. Describe fully the steps you would take as regards diagnosis, treatment, and possible Medico-Legal proceedings in the case of a stranger found unconscious.

1894.

*January 10th.*

1. Describe the course and relations of the Superior Vena Cava, and mention its chief tributaries. What signs would indicate obstruction of this vessel?

2. What are the causes, symptoms, morbid anatomy, diagnosis, and treatment of acute lobar Pneumonia?

3. What are the symptoms, complications, diagnosis, and treatment of simple Ulcer of the Stomach?

4. Give the symptoms, diagnosis, and treatment of Acute Myelitis.

5. Give the symptoms, course, diagnosis and treatment of Psoriasis.

6. What appearances in a body removed from the water would justify the opinion that death was due to drowning?

*April 4th.*

1. State the relations of the Pancreas to adjacent structures, and also to the surface of the body. Enumerate the morbid conditions met with in this organ.



2. Describe the symptoms and postmortem appearances of a case of Tubercular Meningitis.

3. Describe a paroxysm of Whooping-Cough, and compare it with an attack of Asthma. How would you treat the latter condition?

4. State what characters of the Urine may be observed in the following diseases:

Acute Pneumonia;  
Acute Gout;  
Acute Atrophy of the Liver;  
Intestinal Obstruction;

and how they may severally be recognised.

5. Describe the causes, symptoms, and treatment of Herpes Zoster.

6. In examining the body of a person 'found dead,' state what signs would enable you to form an estimate of the time which had elapsed since death, and discuss the relative value of the different signs.

*July 4th.*

1. Describe the relations of the Left Bronchus to contiguous structures and to the surface of the body. State the signs and symptoms which would result from its obstruction.

2. Describe the characters, distribution, time of appearance, and duration of the eruptions of:

Measles;  
Rötheln;  
Small-pox;  
Chicken-pox.

3. Describe the pathological conditions that may arise from Suppuration in the Middle Ear, and mention the symptoms which they severally produce.

4. Describe the morbid changes occurring in the Abdominal Viscera which result from long standing disease of the Mitral Valves. Enumerate the symptoms directly referable to such changes, and give the general indications for treatment.

5. Give an account of the symptoms and physical signs on which one should rely for the diagnosis of Acute Intestinal Obstruction. What are the usual causes, and what is the best early treatment of this condition?

6. Describe the symptoms of Acute and Chronic Arsenical Poisoning, the appearances in a fatal case, and



the methods for the detection of the poison in the body of a person who has died from its effects.

*October 10th.*

1. Describe the anatomical relations of the Cæcum and Appendix, and state the chief pathological changes to which they are liable.

2. Describe the symptoms of Acute Rheumatism, and of its complications. Give your treatment under all circumstances.

3. Describe the physical signs, symptoms, and pathology of Pneumothorax. How would you treat such a case?

4. Describe the pathological anatomy of Atrophic Cirrhosis of the Liver, and give the symptoms and treatment of the disease.

5. Describe the symptoms, course, diagnosis, and treatment of Peripheral Neuritis due to alcohol.

6. In the case of a body found suspended by the neck, how would you determine that death had resulted from hanging?

1895.

*January 9th.*

1. Describe the nervous supply of the Larynx, and mention the principal morbid conditions which give rise to Laryngeal Paralysis.

2. State the causes of Acute Bright's Disease, and describe its morbid anatomy, symptoms, course, and treatment.

3. Describe a case of Acute Bronchitis of the smaller tubes, and give its treatment.

4. Describe the symptoms of Intracranial Tumour, and state how you would distinguish a Tumour situated in the Cerebellum from one in the Pons Varolii.

5. Give the pathology, symptoms, prognosis, and treatment of Facial Erysipelas.

6. Describe a case of Strychnine poisoning. How is it to be distinguished from similar conditions? How would you treat such a case?

*April 3rd.*

1. Give the relations of the Stomach to the surface and surrounding parts.



2. Give the ætiology, symptoms, chief complications, and treatment of Influenza.

3. Describe a case of Graves' disease (Exophthalmic Goitre), and discuss its pathology and treatment.

4. Give (1) the symptoms and physical signs of Aortic regurgitation, and (2) describe and explain its effects on the heart and circulation.

5. Give the differential diagnosis of the various kinds of Acute Sorethroat.

6. A person being found dead in a room in which a Charcoal Stove has been burning, how would you determine whether death had probably resulted from the 'fumes' of the Charcoal?

*July 3rd.*

1. Give the course, tributaries, and relations of the Vena Cava Inferior.

2. Give the symptoms, pathology, and treatment of Asiatic Cholera.

3. Give the pathology, symptoms, course, and diagnosis of Malignant Endocarditis.

4. Give the symptoms and treatment of Acute Anterior Polio-myelitis of children (Infantile Paralysis).

5. Describe the life-history of *Tænia Solium*, the symptoms it produces, and the treatment you would employ to get rid of it.

6. Describe a case of acute Phosphorus poisoning, including the treatment and postmortem appearances.

*October 9th.*

1. Describe the course and anatomical relations of the Œsophagus.

2. Give the causes, clinical phenomena, and appropriate treatment of Pyloric Obstruction.

3. Describe the mode of production and the physical signs of Pulmonary Emphysema.

4. Give the symptoms, course, complications, and treatment of Measles. What measures would you adopt to prevent its spread?

5. Describe the onset and course of a severe case of Cerebral Hæmorrhage, involving the most common seat of lesion in the left hemisphere, and terminating in permanent paralysis.

6. What are the symptoms and treatment of poisoning



by Oxalic Acid? Give the postmortem appearances in a fatal case.

1896.

*January 15th.*

1. Describe the anatomical relations of the Kidneys, and their structure as seen with the naked eye.

2. Describe the symptoms, pathology, and treatment of Enteric Fever.

3. Describe and contrast the symptoms of Anterior Polio-myelitis and degeneration of the Pyramidal Tracts in the Spinal Cord, and give the ætiology of each.

4. Enumerate the diseases of the Hairy Scalp in children, and describe in detail a case of Ringworm, and give the treatment.

5. Give the symptoms, physical signs, and treatment of a case of Pleurisy with serous effusion.

6. Describe a case of Acute Mania. What legal formalities must be observed before the patient can be confined in a lunatic asylum?

*April 8th.*

1. Describe the course of the Musculo-spinal Nerve; give the Spinal Roots with which it is connected, and state the symptoms which may arise from its compression in the arm.

2. Describe a case of severe Diabetes Mellitus; mention the complications that may arise, and the modes of death. Give the treatment in detail.

3. Give the symptoms and physical signs of Aneurism of the transverse part of the Arch of the Aorta.

4. Describe the symptoms of Delirium Tremens, the grounds on which a prognosis should be based, and the treatment that should be adopted.

5. Describe a case of Splenic Leucocythæmia. Give the diagnosis, prognosis, and treatment.

6. Give the symptoms and treatment of a case of poisoning by Atropine.

*July 8th.*

1. What are the anatomical relations of the Gall-bladder and the main Bile-ducts? What are the pathological results of their obstruction by Calculi?

2. Describe a case of Acute General Tuberculosis. Discuss the causation and diagnosis of this disease.



3. Describe the physical signs and symptoms of Stenosis of the Mitral Valve, and its effects on the heart and other organs.

4. Describe the symptoms and postmortem appearances of General Paralysis of the Insane, and state how you would treat such a case.

5. Describe the operation of Vaccination, and the normal development of the Vaccine vesicle.

6. Give the symptoms and treatment of a case of poisoning by Aconite or its Alkaloid.

*October 14th.*

1. Describe the course and relations of the Portal Vein, enumerating its tributaries. How is the collateral circulation maintained when the vessel is obstructed?

2. Give an account of the ætiology, pathology, symptoms, physical signs, and treatment of acute Broncho-Pneumonia in a child.

3. What are the common causes of Abductor and of Adductor Paralysis of the Larynx? Describe the symptoms of each form, and the conditions seen with the laryngoscope.

4. Give the morbid anatomy of Tubercular Peritonitis. Describe its clinical varieties, and state how you would treat them.

5. Contrast the clinical characters (including the condition of the Blood) of Chlorosis and Pernicious Anæmia. Give the treatment appropriate to each disease.

6. Give the symptoms and treatment of a case of Oxalic Acid poisoning.

1897.

*January 13th.*

1. Describe the distribution of the main Arteries of the Brain, and mention the morbid changes to which they are liable.

2. Give the symptoms, physical signs, course, and treatment of acute Pericarditis.

3. What are the symptoms of Addison's disease? Discuss its diagnosis and pathology.

4. Give the causes, symptoms, and treatment of Chorea in a child.

5. Give a clinical account of acute Nephritis as met



with in association with Scarlet Fever, and describe fully the appropriate management and treatment of such a case.

6. Describe the symptoms of poisoning by Hydrocyanic Acid, the usual postmortem appearances, and the tests for the poison.

Since April, 1897, two papers have been set in Medicine for candidates under the Five Years' Regulations, *i.e.*, candidates who registered as Medical Students on or after January 1st, 1892; but in the second paper at each examination there is one question (marked \*) which is not to be answered by these candidates. For candidates who registered before January 1st, 1892, only one paper, the second at each examination, is set.

*April 6th.*

PAPER I.

1. Describe Arterial Embolism and its results. Give the symptoms attending its occurrence in the Kidney.

2. Describe the Bacillus Tuberculosis, and the anatomical characters of a Tubercular Ulcer of the Ileum in its various stages.

3. Describe the Therapeutic uses of Arsenic. Mention the preparations you would employ, and state their doses and methods of administration in the diseases in which you would prescribe them.

4. Enumerate the conditions met with in the Dead Body which enable you to infer the period which has elapsed since death took place.

5. State the chief causes of the fouling of the Air in Dwelling-houses. Give the dimensions of a dormitory for six adults, and state the methods you would adopt to ensure a constant supply of fresh air.

*April 7th.*

PAPER II.

1. Give the course and distribution of the left Pneumogastric Nerve and its branches.

2. Describe an attack of typical Angina Pectoris, and the treatment during the paroxysms and in the intervals.

3. Give the causes, symptoms, and pathology of Rickets.

4. Give the period of incubation, symptoms, and treatment of Mumps.



5. Describe the course, symptoms, physical signs, and treatment of Acute Bronchitis in the adult.

\*6. Describe the symptoms and treatment of Asphyxia. Enumerate the gases the inhalation of which may produce it, and their usual sources.

*July 6th.*

PAPER I.

1. Describe the process of Fatty Degeneration in the various tissues of the body.

2. Give an account of the Therapeutic uses of the Alkaline Bromides, to include their doses and the methods of administering them.

3. Describe the chief clinical manifestations of Uræmia, and discuss its pathology and treatment.

4. Describe a case of Acute Melancholia. How would you deal with it?

5. What diseases are known to have been caused by impure water? Enumerate the common sources of contamination met with in domestic water-supplies.

*July 7th.*

PAPER II.

1. Describe the course and relations of the Duodenum.

2. Give the symptoms, physical signs, course, and treatment of Hydatid Tumour of the Liver.

3. Give the symptoms, diagnosis, and treatment of Diphtheria.

4. Describe the symptoms and physical signs of Pulmonary Phthisis in an advanced stage. What are the pathological conditions found in the Lung and other parts of the body?

\*5. Describe the common causes and symptoms of Hemiplegia.

6. What are the signs and conditions found in the dead body and its surroundings which would enable you to say that death had been caused by Lightning?

*October 12th.*

PAPER I.

1. What do you understand by the term *Sclerosis* as applied to Nervous structures? Give an account of this process, and name some examples of diseases associated therewith.



2. What are the therapeutic uses of Belladonna and of Atropine? Mention the preparations you would use, and give their doses and modes of administration.

3. State what you know of the bacteriology of Pleural Effusions. How may the result of a bacteriological examination of the effusion influence prognosis and treatment?

4. Describe the symptoms, and give the most common causes, of a fatal case of Ptomaine poisoning.

5. Describe the chief methods of disinfection of bedding and dwelling-rooms after a case of Infectious Fever.

*October 13th.*

PAPER II.

1. Give the anatomical relations of the Spleen, and the clinical signs of Splenic Enlargement.

2. A patient is admitted to hospital with an obscure pyrexial illness. The fever is of a more or less continued type, and is known to have existed for more than a fortnight. There is undoubted disease of the Mitral Valve. What symptoms arising in the course of the illness would lead you to conclude that the patient was suffering from Infective Endocarditis? What treatment would you adopt?

3. Give the differential diagnosis of the chief forms of Hæmorrhage from the Bowel. What treatment would you adopt in each case?

4. Define Bronchial breathing; Ægophony; Metallic tinkling; Water-hammer pulse; Amphoric breathing. State what are the physical conditions which they indicate.

5. Describe a typical case of Paralysis Agitans, and discuss its diagnosis from other affections associated with tremor.

\*6. What are the symptoms and the appropriate treatment of a case of Carbolic Acid poisoning?

1898.

*January 11th.*

PAPER I.

1. Give an account of the Pathology and Morbid Anatomy of Lobar Pneumonia.

2. What is the mode of action, and what are the



therapeutic uses of Nux Vomica and Strychnine? Mention their preparations, doses, and the modes of administration.

3. Supposing that you are called to a solitary case of Typhoid Fever in a country cottage, state briefly the course that you would pursue:

- (a) To prevent communication of the disease;
- (b) To ascertain the source of the infection.

4. What are the causes of a diminution of the quantity of Urine in acute Bright's Disease? What treatment would you adopt with the object of increasing the quantity?

5. How would you decide whether wounds and bruises on a dead body had been inflicted during life or after death?

*January 12th.*

PAPER II.

1. Give the anatomical relations of the Stomach, and the physical signs of its enlargement.

2. Describe the mode of onset, the course, and the treatment of an ordinary case of Measles. Enumerate the complications and sequelæ of the disease.

3. How far does inspection of the face assist in the diagnosis of:

- (a) Myxœdema;
- (b) Ordinary Hemiplegia;
- (c) Bell's Palsy;
- (d) Bulbar Paralysis?

4. What are the causes of cough in Chronic Pulmonary Tuberculosis (without laryngeal complication)? State what treatment you would employ. Conclude your answer by giving definite instructions, with prescriptions, to a patient.

5. What are the common causes of Profuse Hæmatemesis? Give the differential diagnosis and the treatment appropriate to each form.

\*6. Give the differential diagnosis of Coma from Opium, Alcohol, and Cerebral Hæmorrhage.

*April 12th.*

PAPER I.

1. What alterations in the Blood-corpuscles and in the Hæmoglobin are met with in the following diseases: Chlorosis, Pernicious Anæmia, and Leuchæmia?



2. What means would you adopt to produce Diaphoresis as a remedial agent? State precisely how you would employ them, and in what diseases you would expect them to be of service.

3. Describe briefly a case of Tetany. What are the clinical relations of this disease?

4. What are the diagnostic signs of General Paralysis of the Insane? What legal formalities must be observed before the patient can be confined in a lunatic asylum?

5. In what way does Bacteriology assist in the diagnosis of Typhoid, Pneumonia, and Diphtheria?

*April 13th.*

PAPER II.

1. Give the anatomical relations of the Left Bronchus. How may it become compressed, and what are the symptoms and physical signs which attend its compression?

2. State the causes, and describe the physical signs, of Dilatation of the Heart. Discuss briefly the principles of its treatment.

3. What is the difference between Motor and Sensory Aphasia? In what parts of the Brain would you expect to find lesions corresponding respectively to these symptoms?

\*4. How does Empyema arise? How is it diagnosed? Describe its appropriate treatment.

5. Enumerate the conditions in which Suppuration occurs in the Liver, and state how you would distinguish between them.

6. What are the common modes (including trade processes) in which Lead-poisoning is brought about? Enumerate its chief toxic effects. Give the suitable treatment.



## SURGICAL ANATOMY AND THE PRINCIPLES AND PRACTICE OF SURGERY.

Three hours are allowed for the paper in this subject.

Candidates *must* answer at least *four* (including one of the first two) of the six questions, and are strongly advised to answer all six questions.

Candidates unable to answer four questions must report the fact to the Presiding Examiner, and are not allowed to proceed with their examination.

1890.

*January 17th.*

1. Give the relations of the cervical portion of the Œsophagus. Describe the operation of Œsophagotomy for the removal of a foreign body impacted in that portion of the tube.

2. Describe in order the parts divided in the operation of Castration. Give the origins and distribution of the vessels and nerves involved.

3. Given a case of Retention of Urine, in which a catheter cannot be introduced into the bladder on account of organic stricture. Describe the treatment you would adopt for the immediate and permanent relief of the patient.

4. What are the causes of chronic enlargement of the Tonsils? What secondary results may ensue? What treatment would you adopt?

5. On the third or fourth day after an operation for Strangulated Femoral Hernia, fœcal matter is seen to escape from the wound. Describe the pathological processes by which this result has been brought about, and the treatment you would adopt. How would your prognosis be influenced by the manner in which the lesion occurred?

6. Mention the causes which lead to Abscess in the female breast. Describe the situation, symptoms, and treatment of the various forms of this affection.



*April 11th.*

1. Describe the attachments and relations of the Psoas Magnus. Mention the chief points of surgical interest in connection with this muscle.

2. Describe the structures found in one of the middle Intercostal Spaces, and state in what way the anatomical arrangement has a bearing on the various operations of this region.

3. In what ways may Gangrene be brought about by injury? Give briefly the treatment you would adopt in each case.

4. Give the symptoms and treatment of Chronic Suppuration of the Middle Ear. Mention the complications that may arise with their respective treatment.

5. In what way does an Obstructed differ from a Strangulated Hernia? Give the points of diagnosis between the two forms.

6. What is a Ranula? For what affections may it be mistaken? How would you treat it?

*July 4th.*

1. Describe the attachments and relations of the Palmar Fascia, and give its bearings upon the Surgery of the Hand.

2. Describe the attachments and relations of the left Sterno-cleido-mastoid muscle. Give its Vascular and Nervous supplies.

3. Enumerate the different forms of Iritis. Give the special characters of the Syphilitic variety, with its morbid anatomy and treatment.

4. Describe the swellings which occur in the neighbourhood of the Saphenous opening, and give their differential diagnosis.

5. How do you recognise the presence of a foreign body in the Windpipe? Give your treatment.

6. Describe the disease known as Lupus Vulgaris. Give its pathology and treatment.

*October 17th.*

1. Enumerate in order the structures in relation with the Shoulder-joint. In the Subcoracoid dislocation, what parts are torn through or displaced? What are the new relations of the head of the Humerus?

2. Give the relations of the Lachrymal Sac and Nasal



Duct. State the conditions which may require operative interference in those parts.

3. Describe the symptoms and give the treatment of a crush of the Spinal Cord in the mid-dorsal region.

4. Describe the conditions known as Phimosis and Paraphimosis. Give their causes, possible consequences, and treatment.

5. Describe the varieties of Nævi. Give their diagnosis, pathology, progress, and treatment.

6. What is Talipes Valgus? Give its causes, consequences, and treatment.

1891.

*January 16th.*

1. Describe the anatomy and relations of the Ankle-joint. How are these affected in a dislocation of the foot outwards?

2. Describe the course and give the relations of the Lingual Artery, and the steps of the operation required for its ligation.

3. What are the complications which may ensue within a fortnight after the injury in a case of compound fracture of the middle third of the leg in a young adult? Describe the treatment of each.

4. Give the causes, symptoms, morbid anatomy, and treatment of Boil and Carbuncle.

5. Describe the treatment of a case of Strangulated Inguinal Hernia after operation. State the complications that may arise, and give the treatment of each.

6. Describe the conditions of the hand and forearm two months after the division of the trunk of the Musculo-spiral Nerve, and detail the treatment you would adopt in such a case.

*April 10th.*

1. Describe the Prostate Gland, with its anatomical relations and the bearings of these upon the practice of Surgery.

2. Describe the course, relations, and anastomoses of the deep Epigastric Artery. What are its surgical bearings?

3. Describe the different forms of Fracture of the Lower Jaw. Give the deformities present in each variety, with their appropriate treatment.



4. Describe the causes, symptoms, terminations, and treatment of inflammation of the Internal Saphena Vein.

5. What local and general symptoms would lead you to suspect the presence of a deep Abscess in the Popliteal Space? Describe your treatment of the case.

6. Classify the various forms of Cataract. Describe the course of a case of Senile Cataract from its commencement.

*July 10th.*

1. Describe the articulations of the Metatarsus with the Tarsus. Mention in order the various structures divided in amputation through these joints.

2. Describe the Sacro-sciatic Foramina, enumerating the structures passing through each. State the chief points of surgical interest in connection with them.

3. Give the symptoms, diagnosis, and treatment of a foreign body (iron) impacted in the Cornea. What consequences may follow this injury?

4. Describe a Hunterian Chancre on the Penis. Detail the results for the first six months, both with and without treatment. Sketch your own treatment of such a case.

5. Describe the treatment you would adopt in a case of punctured wound of the Knee-joint. State the complications which may arise, and give their appropriate treatment.

6. Enumerate the various Ulcers met with on the Tongue. Give their distinguishing characteristics, and the treatment of each.

*October 16th.*

1. Describe the attachment and relations of the Iliacus Internus Muscle and of its fascia. Mention the surgical points in connection with them.

2. Give the course and relations of the Posterior Tibial Artery. Describe the operation for tying it at the ankle.

3. Describe a Bedsore. State the ordinary positions in which Bedsores may occur, and give their causes and treatment.

4. In a case of severe compound fracture of the Tibia, describe the conditions which would induce you to endeavour to save the limb. Give in detail the treatment you would adopt with this object in view.

5. Describe the varieties, complications, and treatment of Harelip.



6. Give the symptoms and treatment of Delirium following injury.

1892.

*January 15th.*

1. Give the course and relations of the Ulnar Nerve. Describe the effects of complete division of the nerve immediately above the wrist.

2. Name the muscles attached to the upper third of the Femur. Explain the displacement usually met with in fracture just below the lesser trochanter.

3. Give the pathology of Acute Inflammation of the shaft of the Tibia. Explain the process by which natural separation of the sequestrum takes place.

4. Give the pathology, clinical symptoms, and treatment of Fissure of the Anus.

5. State the causes, symptoms, possible results, and treatment of Acute Intussusception.

6. Enumerate the various causes of Chronic Cystitis. Describe the symptoms, and give the appropriate treatment.

*April 8th.*

1. Give the relations of the Common Carotid Artery in the neck. Describe the operation of tying it, and give the collateral circulation.

2. Give the position, relations, and blood-supply of the Cæcum, with its appendix. Describe the operation you would perform to expose the latter in cases of suppuration.

3. Describe and give the diagnosis between Simple and Malignant Growths of the Bladder (excluding those originating in the prostate), with your treatment.

4. Describe the different degrees of Burn of the surface of the body, and mention the complications attending them. Which mode of treatment do you advise?

5. Describe the varieties of Purulent Ophthalmia, with the appropriate treatment of each.

6. What are the signs of Popliteal Aneurism? Give its diagnosis, and your treatment of such a case in a healthy, middle-aged man.

*July 8th.*

1. Describe the ligaments of the Hip-joint, and their influence in the ordinary forms of dislocation of the Femur.



2. Describe the Broad-ligament of the Uterus. Name the structures contained in it, and give their relations. Enumerate the Cysts found in connection with them.

3. Give the causes of Strabismus, and the treatment of its several forms.

4. Describe a case of Tuberculous disease of the Knee-joint in a child, with the treatment to be adopted in its different stages.

5. What are the signs of Hereditary Syphilis at different ages?

6. Describe the progress of a Bunion from its origin to its worst condition, and give your treatment of such a case in its different stages.

*October 14th.*

1. Give the attachments of the Sartorius and its relations. State the points of surgical interest connected with it.

2. Describe the boundaries of the Axilla, and enumerate its contents. How and where should an Axillary Abscess be opened?

3. Give the pathology, symptoms, treatment, and possible results of Acute Glaucoma.

4. Give the pathology, symptoms, and treatment of Tubercular Testis.

5. Describe the mode of production of Fracture of the Patella by muscular action. Give the symptoms, and describe in detail the treatment you would adopt.

6. Give the causes, pathology, symptoms, and effects of Varicose Veins of the Leg. Under what circumstances would you operate for their radical cure, and what method would you select?

1893.

*January 13th.*

1. Give the relations of the Liver. Describe the methods by which an Hepatic Abscess may be evacuated from the front.

2. Give the course and relations of the Brachial Artery. Describe the operation of ligature of that vessel in the middle of the arm, and state how the Collateral Circulation is carried on.

3. Give the causes, symptoms, and treatment of Retro-pharyngeal Abscess.



4. Describe the Syphilitic affections of the Rectum and Anus in the adult. Give their diagnosis and treatment.

5. To what morbid changes is the Pre-patellar Bursa liable? Give the symptoms, and mention the plan of treatment you would adopt in each condition.

6. Give the symptoms and treatment of a typical case of tuberculous disease of the Hip-joint in an early stage.

*April 7th.*

1. Give the course and relations of the Superficial Femoral Artery. Describe an operation for the ligature of this vessel. How is the circulation in the limb subsequently maintained?

2. Describe the Lachrymal Apparatus, and give a brief account of the operations performed for the various affections of it.

3. Give the pathology, symptoms, and treatment of a case of Acute Traumatic Tetanus.

4. Give the causes of Acute Abscess in the female breast. Describe the symptoms, and give the diagnosis and treatment of this affection.

5. Give the symptoms, diagnosis, and treatment of Fracture of the Pelvis. What are the more frequent complications?

6. Describe the structure of a Sebaceous Cyst of the Scalp. Give the diagnosis and treatment, and mention the complications which may arise in the course of the treatment.

*July 7th.*

1. Describe the Femoral Canal and the Saphenous Opening. Mention the points of Surgical interest in connection with them.

2. Give the relations of the Right Kidney. Enumerate in order the structures met with in exposing the kidney from the loin, and state how they may severally be recognised.

3. State briefly the principal causes of Chronic Suppuration of the Middle Ear. Mention the complications which may be associated with it, and describe the operation for opening the Mastoid Antrum.

4. Mention the varieties of Stricture of the Œsophagus. Describe the symptoms, and give the diagnosis and treatment of the malignant form.



5. Give the signs of Vesical Calculus in a boy, and describe in detail an operation for its removal.

6. Describe a case of Tuberculous Dactylitis; give its origin, course, diagnosis and treatment.

*October 13th.*

1. Give an account of the soft parts in immediate relation with the Elbow-joint. Describe the operation for Excision of the Elbow, and state what structures are divided or disturbed.

2. Describe the External Oblique Muscle of the Abdomen. Mention the various points of Surgical interest in which it is concerned.

3. State the complications which may ensue after the ligature of the Superficial Femoral Artery in its continuity, and give the treatment of each complication.

4. Give the pathology, symptoms, possible complications, and treatment of Chronic Rheumatic Arthritis of the Knee-joint.

5. Describe a case of Congenital Talipes Equino-Varus, and give the treatment to be adopted in the different stages of the affection.

6. Give the causes, diagnosis, and treatment of Acute Urinary Abscess in the Perineum.

1894.

*January 12th.*

1. Describe the soft parts covering the Calvaria (vault of the skull). Give their vascular and nerve-supply. State the situations in which suppuration may occur.

2. Give the boundaries and contents of the Ischio-rectal Fossa. What are the symptoms of an abscess in this situation, and how would you treat it?

3. Give the causes, varieties, symptoms, possible complications, and treatment of Iritis.

4. Bony ankylosis having resulted from a wound of the Knee-joint, describe in detail the pathological processes which have taken place.

5. Enumerate the causes of Cystitis. Give the pathology, diagnosis, and treatment of the Tuberculous form.

6. What are the symptoms, immediate and remote, produced by the lodgment of a foreign body in one of the Bronchi? What treatment would you adopt?



*April 6th.*

1. Describe the Spermatic Cord. Mention the origin, course, and distribution of its vessels and nerves, and the origin, course, and termination of the Vas Deferens. Describe an operation for the radical cure of Varicocele.

2. Give the origin, course, relations, and tributaries of the Internal Jugular Vein, and mention any points of surgical interest in connection with it.

3. Give the symptoms of Shock. What precautions may be taken to guard against it in any proposed operation, and how will you deal with it should it occur?

4. State the pathology, symptoms, and treatment of Phlyctenular Ophthalmia.

5. Give the causes, symptoms, possible complications, and treatment of Pott's Fracture.

6. Give the pathology, symptoms, and treatment of Carbuncle.

*July 6th.*

1. Give the relations of the Descending Colon and the Sigmoid Flexure, with special reference to Lumbar and Inguinal Colotomy. Describe in detail one of these operations.

2. Describe the Male Urethra, and state how traumatic rupture of the Urethra takes place.

3. Describe the symptoms, and give the diagnosis and treatment of a case of traumatic rupture of the Popliteal Artery, without external wound.

4. Give the pathology, diagnosis, and treatment of Inflammation of the Superficial Femoral Vein.

5. What treatment would you adopt in a case of Cut-throat through the Thyro-hyoid Membrane? Mention the immediate and subsequent complications which may arise.

6. Describe the two chief varieties of Chancre. How may they be differentiated, and how should they respectively be treated?

*October 12th.*

1. Give the attachments to the Clavicle of the Muscles and Ligaments connected with that bone, and explain the displacement in the usual form of fracture.

2. Give the course and relations of the External Iliac Artery, and describe an operation for the ligature of this vessel.



3. Describe a case of Fracture of the Spine involving the sixth and seventh Cervical Vertebrae, and state the treatment you would pursue.

4. Give the pathology, symptoms, treatment, and prognosis of Diffuse Interstitial Keratitis.

5. Contrast the course, symptoms, and treatment of Obstruction due to a band constricting the small intestine, with those of Obstruction due to Carcinoma of the upper part of the rectum.

6. What are the causes of the condition known as Surgical Kidney? Describe the pathological changes which take place.

1895.

*January 11th.*

1. Give the relations and branches of the Radial Artery in the forearm. Describe an operation for its ligature in the middle third, and state how the Collateral Circulation is carried on.

2. Describe an operation for Amputation through the middle of the Penis, and enumerate in the order of their position the structures which have to be divided.

3. Describe the fractures met with in the Lower Jaw, and the different modes of treatment.

4. Give the causes, pathology, symptoms and treatment of Internal Hæmorrhoids.

5. What are Adenoid Vegetations of the Naso-Pharynx? To what symptoms and complications do they give rise? and what is the treatment of the disease?

6. Classify the different forms of Cataract. Give the symptoms, diagnosis, and treatment of the senile variety.

*April 5th.*

1. Give the relations of the Right Subclavian Artery, and mention in order the structures divided or exposed in the operation for ligature of the artery in the third part of its course.

2. Describe the anterior and the posterior Annular Ligaments of the Wrist, and name, in order, the structures passing beneath them.

3. What circumstances would influence you in the choice of an Anæsthetic for a surgical operation? What precautions should be taken before, during, and after the administration?



4. What are the results which follow the division of a mixed Spinal Nerve :

- (1) In the nerve itself ;
- (2) In the structures supplied by it ?

5. Give the course, symptoms, possible complications, and treatment of a case of Acute Gonorrhœa in the male.

6. Describe the changes which occur in the Knee-joint in Osteo-Arthritis (Chronic Rheumatic Arthritis). Give the symptoms, treatment, and prognosis.

*July 5th.*

1. Give the attachments and relations of the Pectoralis Minor Muscle, and describe the operation for ligature of the third part of the Axillary Artery.

2. Give the position and relations of the Trachea in the neck, and describe the operation of Tracheotomy.

3. What are the signs which indicate the presence of a Sequestrum in the shaft of a long bone ? How would you treat such a case ?

4. Give the causes, symptoms, and treatment of Lachrymal Abscess.

5. What are the causes of rupture of Voluntary Muscles ? Name the muscles most frequently ruptured. Describe the treatment of an uncomplicated case, and how repair takes place.

6. Give the causes, symptoms, and treatment of Perforating Ulcer of the Foot.

*October 11th.*

1. Give the articulations, and superficial and deep relations of the Parietal Bone. With what parts of the cerebral surface does it correspond ?

2. Give the course and distribution of the External Popliteal Nerve, and describe the results of its complete division.

3. Describe the varieties of Whitlow. Mention the possible complications, and give the treatment.

4. Give the treatment of Retention of Urine due to organic stricture of the urethra.

5. In the case of a sore upon the face, give the differential diagnosis between :

- (a) Epithelioma ;
- (b) Syphilitic Chancre ;
- (c) Malignant Pustule (Charbon).



6. Give the symptoms, complications, and treatment of a case of impaction of a foreign body in the Cornea.

1896.

*January 17th.*

1. Describe the third portion of the Rectum, giving its connections and its vascular and nervous supply. Name the parts divided in the ordinary operation for 'Fistula in Ano.'

2. Give the attachments and relations of the Psoas Muscle, and give also the signs of a Psoas Abscess.

3. Describe the different forms of Nævus. By what methods may they severally be treated?

4. Give the pathology, symptoms, and treatment of Caries of the Tarsus.

5. Give the causes, symptoms, and diagnosis of Sub-coracoid Dislocation of the Humerus, and fully describe one method of reduction.

6. Give the causes, pathology, and treatment of Genu Valgum.

*April 10th.*

1. Describe the Temporo-mandibular Articulation and its relations. What is the common form of Dislocation, and how would you reduce it?

2. Give the attachments and innervation of the Tibialis Posticus Muscle, and describe an operation for the division of its tendon.

3. Give the pathology, signs, and treatment of the different forms of Necrosis of the Vault of the Skull.

4. Mention the varieties, and describe the causes, symptoms, and treatment of 'loose body' in the Knee-joint. (Displacements of the Semilunar Cartilages are not included in the question.)

5. Give the symptoms, diagnosis, possible consequences, and treatment of a penetrating wound of the Sclerotic.

6. Give the causes, symptoms, and consequences of Epididymitis.

*July 10th.*

1. Describe the Palmar Fascia. Give fully the treatment you would adopt in a case of Dupuytren's Contraction.

2. Describe the Rectus Abdominis muscle and its



Sheath, and mention the points of surgical interest in connection with them.

3. Give the causes, diagnosis, and treatment of Suppuration of the Superficial Lymphatic Glands immediately above and below Poupart's Ligament.

4. What are the symptoms of Cancer of the Tongue? How would you distinguish it from other diseases of that organ?

5. What is the cause of Rickets in the young child? Give the symptoms and treatment of the disease.

6. Give the causes, signs, and treatment of Fracture of the Olecranon Process of the Ulna.

*October 16th.*

1. Name the muscles attached to the crest of the Ilium, and give the average extent of their attachments. State in their order the structures met with in the operation of Lumbar Colotomy.

2. Give the position, relations, and arterial supply of the Tonsil. What are the symptoms and treatment of Acute Abscess of the Tonsil?

3. Give the symptoms and treatment of the common forms of fracture of Neck of the Thigh-bone.

4. Give the symptoms, diagnosis, and treatment of Chronic Lobular Inflammation of the Mamma.

5. Give the causes, diagnosis, and treatment of Prolapse of the Anus and Rectum in a child.

6. Give the symptoms and treatment of Chronic Granular Conjunctivitis.

1897.

*January 15th.*

1. Give the course and relations of the Popliteal Artery, and enumerate its branches. What are the symptoms of Aneurism of this Artery?

2. Describe briefly the action, nerve-supply, and mode of attachment to the Thumb of each of its muscles. State how you would treat a recent dislocation at the Metacarpo-phalangeal joint.

3. Give the symptoms, diagnosis, and treatment of early Tuberculous Disease of the Hip-joint in a child.

4. To what conditions may Chronic Purulent Discharge from the Nostrils be due? Give the treatment appropriate to each.



5. What is meant by a Punctured Fracture of the Skull? How would you treat it? What are the immediate and remote dangers of this injury?

6. Give the symptoms and treatment of Impacted Calculus in the male Urethra.

*April 9th.*

1. Give the course and relations of the Right Ureter in the male. What are the symptoms of Impaction of a Calculus in the Ureter?

2. Give the attachments and relations of the Pronator Radii Teres. Explain the influence which the muscle may have upon fractures in the Fore-arm.

3. Describe the symptoms of Acute Suppurative Inflammation of the Knee-joint after a penetrating wound. What treatment would you adopt? What are the possible terminations of such a case?

4. State the clinical and histological characters of a Rodent Ulcer. How may this ulcer be diagnosed from other lesions which resemble it? Give the treatment.

5. Give the causes, symptoms, and treatment of a Fractured Rib. What are the more usual complications?

6. Enumerate the causes of chronic Otorrhœa. Describe the means you would adopt to ascertain the source of the discharge.

*July 9th.*

1. Describe the arrangement of the various Synovial Sheaths of the long Flexor Tendons of the Fingers and Thumb. Give the symptoms and treatment of 'Compound Ganglion.'

2. Describe the Superficial Fascia of the Perinæum and the lower part of the Abdomen, and explain its influence upon the course of Extravasated Urine.

3. Give the causes, symptoms, treatment, and possible complications of Purulent Ophthalmia.

4. What are the swellings in the Scrotum which give an impulse on coughing? How would you distinguish them one from another?

5. Describe the appearances presented after a severe Scald of the Thigh, and give the treatment in the various stages of its progress.

6. How would you diagnose and treat tuberculous disease of the Shoulder-joint?



*October 15th.*

1. Give the position and boundaries of the Inguinal Canal, and describe the operation you would adopt for the radical cure of Inguinal Hernia in the male.

2. Give the origin, course, relations, and branches of the Lingual Artery. Describe an operation for its ligation.

3. Give the diagnosis and treatment of fracture of the Surgical Neck of the Humerus.

4. Describe the usual symptoms of Secondary Syphilis, and give the general and local treatment which you would adopt.

5. How would you investigate, and how treat, a case of Incontinence of Urine in a child?

6. Give the symptoms, treatment, and possible results of Phlebitis of the Internal Saphena Vein, associated with Chronic Ulcer of the Leg.

1898.

*January 14th.*

1. How would you determine on the surface of the Scalp the position of (a) the Fissure of Rolando, and (b) the anterior inferior angle of the Parietal bone? Describe the operation of Trephining.

\* 2. Describe the Fasciæ which envelop the Psoas, Iliacus, and Quadratus Lumborum muscles, and explain how these Fasciæ influence the direction of Spinal Abscess.

3. In what conditions may Iridectomy be required? Describe the operation and the after-treatment.

4. Describe the forms of Sarcoma which primarily affect a long bone. How does the situation of the growth with respect to the bone influence the prognosis and treatment?

5. In a case of Strangulated Inguinal Hernia, what symptoms before operation would suggest that Gangrene of the Bowel had occurred? How would you deal with this condition?

6. Describe the process of repair of a simple Fracture of a long bone.

*April 15th.*

1. Give the origin, course, and distribution of the Obturator Nerve. Mention the conditions in which the



knowledge of the anatomy of this Nerve will aid in diagnosis.

2. At what Joints and by what Muscles are the movements of Inversion and Eversion of the Foot produced? What structures may require division in a case of Congenital Talipes Varus in an infant?

3. Give the pathology, symptoms, and treatment of Aural Polypi and Granulomata.

4. Describe the symptoms produced by a scald of the Larynx in a child. Give the treatment which may be required.

5. Describe the symptoms, differential diagnosis, and treatment of Fracture of the lower end of the Femur. Mention the complications which may possibly occur.

6. Give the symptoms of Acute Infective Osteomyelitis of the Tibia. What would be your treatment in the various stages?



## MIDWIFERY AND DISEASES OF WOMEN.

Three hours are allowed for the paper in this subject.

Candidates unable to answer at least *four* questions must report the fact to the Presiding Examiner, and are not allowed to proceed with their examination.

1890.

*January 16th.*

1. Describe minutely the examination you would make of a recently-delivered After-birth.

2. Enumerate the signs and symptoms of the death of the Fœtus, (*a*) before, (*b*) after quickening.

3. Describe the long, curved Midwifery Forceps, and point out the uses of each part.

4. Discuss the diagnosis and treatment of Parturition complicated by Ovarian Tumours.

5. When the Cervix Uteri protrudes through the Vulva, what are the various causes which give rise to this condition, and how would you distinguish them?

6. A woman, aged fifty-one, was delivered of her tenth child six years ago. Since then the Catamenia were quite normal until nine months ago, when they ceased for three months. For the last six months she has had profuse floodings at irregular intervals. The uterus is rather large, the sound entering three and a half inches. Discuss the diagnosis.

*April 10th.*

1. Describe the anatomy—

(*a*) Naked-eye,

(*b*) Microscopic—

of the Placental site immediately after delivery.

2. Describe the mechanism of Parturition in a Breech-case (including the passage of the head), the sacrum of the child being directed backwards and to the right.

3. Enumerate the difficulties and dangers of the birth of Twins, with their treatment.

4. Give the differential diagnosis of fluctuating swellings rising above the Pubes.



5. State fully what measures should be taken to prevent the occurrence of Puerperal Fever.

6. A married woman, who has not menstruated for three months, after noticing for some days increasing difficulty in micturition, finds herself unable to hold her water. She complains of violent pain in the abdomen, which is swollen to a size equal to that of a uterus in the seventh month of pregnancy. The vagina is occupied by a large, soft, irregular swelling, the os and cervix being high up and to the front, on a level with the top of the symphysis pubis. Discuss the case and its treatment.

*July 3rd.*

1. Give the normal diameters of the brim and outlet of the Pelvis. State how you would measure the Pelvis in a case of suspected contraction.

2. Explain the causes of the separation and expulsion of the Placenta, and describe the management of the third stage of Labour in a normal case.

3. Give the diagnosis and management of a case of Shoulder-presentation, the back of the child being to the front and the head to the right.

4. Enumerate and describe the various Instrumental Methods of extraction of the head after perforation.

5. What tumours may be found within the upper part of the Vaginal Canal? Give their differential diagnosis.

6. A woman aged thirty-five, multipara, confined three months, has a hard fixed mass in the left posterior quarter of the Pelvis. What might it be? and how would you arrive at your diagnosis?

*October 16th.*

1. Describe the mode of development of the Amnion, and its relations at the full term of Pregnancy.

2. Describe the management of Labour when the breech presents with the Sacrum towards the right Sacro-iliac synchondrosis.

3. Give the physical signs of Pregnancy at the Fifth Month.

4. How would you treat the various forms of Post-partum Hæmorrhage?

5. Enumerate the Lymphatic Glands affected in diseases of various parts of the Female Genital Organs.



6. A girl, aged seventeen, complains that she has never had her monthly periods. For two or three years she has noticed periodical pains lasting two or three days. What may be the cause of this condition? and state how you would treat the case.

1891.

*January 15th.*

1. Describe the arrangement and distribution of the Peritoneum and Cellular Tissue in the Pelvis of the non-pregnant adult female.

2. Describe the mechanism of Labour with the face presenting and the chin behind and to the right.

3. What conditions during Labour produce rupture of the Perinæum (*a*) on part of mother, and (*b*) on that of the Fœtus, and what means should be adopted to prevent its occurrence?

4. Enumerate the diseases which cause fixity of the Uterus in the unimpregnated state, and differentiate between them.

5. Describe the clinical course of a case of Gonorrhœa in the female, its diagnosis, and treatment. Enumerate its complications.

6. A patient on the third day after delivery has a severe rigor. State the investigation you would make, the conditions to which it may be due, and the treatment you would adopt in the different circumstances.

*April 9th.*

1. Give the naked-eye characters of the Fallopian Tube, its course and relations.

2. Describe the Mechanism of Labour, with the head presenting and the occiput forward and to the right.

3. What is meant by contraction, retraction, and relaxation of the Uterus? Explain their influence on Labour in its various stages.

4. What are the causes of hæmorrhage from the Uterus occurring after the Menopause? Give their differential diagnosis.

5. Give the symptoms, signs, course, and terminations of a case of Parametritis (Pelvic Cellulitis) occurring on the left side.

6. Describe a case of Phlegmasia dolens.



*July 9th.*

1. Describe the structure (naked-eye and microscopical), relations, direction, and dimensions of the Vagina in an adult Virgin.

2. Describe the changes which normally take place in the Uterus and its contents during the first stage of Labour.

3. Give the signs, symptoms, and treatment of threatened Abortion in the third month of pregnancy.

4. What are the common causes of high temperature on the third day after delivery? How would you distinguish them?

5. State what are the uses of the Uterine Sound, and under what circumstances you would abstain from employing it.

6. In a Multipara, thirty-five years of age, who has not menstruated for three months, the uterus is found enlarged up to the navel. Enumerate the conditions which might give rise to this state, and discuss the differential diagnosis.

*October 15th.*

1. Describe the characters and naked-eye appearances of the Placenta at full term, and give a brief account of its circulation.

2. How would you diagnose a Shoulder Presentation, membranes unruptured, os uteri the size of half a crown? and how would you treat the case?

3. Describe the management of the infant during delivery and the first twenty-four hours of its life, so far as regards the measures for the prevention of Ophthalmia and the treatment of the Funis.

4. How would you treat a case of Convulsions occurring at the seventh month of pregnancy?

5. What effects may follow retention of a piece of membrane in the uterus after delivery at full term? How would you diagnose and treat illness arising from this cause?

6. Give the symptoms, pathology, and treatment of Mucous Polypus of the Uterus.



1892.

*January 14th.*

1. Describe the naked-eye appearance of the Amnion, Chorion, and Decidua at the end of the twelfth week of pregnancy.

2. Give the normal mechanism of the Third (or Placental) Stage of Labour.

3. How would you treat a case of uterine inertia in the Second Stage of Labour, the pelvis being normal in its diameters?

4. Give the diagnosis and treatment of retention of the Menses.

5. Define *Vaginismus* and *Dyspareunia*, and give some of the commonest causes of both.

6. A multipara, aged thirty-seven, had not menstruated for six months. The abdomen was occupied entirely by a fluctuating swelling. The medical attendant tapped it, and withdrew six pints of clear fluid, after which no fluctuation could be detected. Discuss this case as regards diagnosis and treatment.

*April 7th.*

1. Name the diameters of the Foetal Head important from an obstetrical point of view; define the points between which they are measured, and state their average lengths.

2. Describe the mechanism of Parturition in a Breech Presentation, the dorsum of the child directed backwards and to the right.

3. Describe the clinical history of a case of Phlegmasia dolens occurring after Labour.

4. Mention the different methods of artificially dilating the Uterus in the unimpregnated condition, describing in detail the method you prefer. Give the principal indications for this proceeding.

5. What are the causes of Retention of Urine in women? Give the treatment proper to each.

6. A woman, aged thirty-six, was regular up to three months ago. She now has a tumour extending to within an inch of the umbilicus. At times there is a watery, slightly bloodstained discharge. She has no foetal movements, and no sounds can be heard on auscultating the abdominal tumour. Comment on this case as to diagnosis and treatment.



*July 7th.*

1. Give the dimensions and relations of the Bladder in the unimpregnated female.
2. Describe the mechanism of Parturition of a Face Presentation with the chin to the right and behind.
3. State the pathology and treatment of Puerperal Eclampsia.
4. How would you treat a case of central Placenta Prævia at seven months' pregnancy, the os uteri the size of a florin?
5. What are the causes of profuse purulent discharge from the Vagina, and how would you distinguish between them?
6. A multipara, aged thirty-five, made violent expulsive efforts during the third stage of labour, and felt something give way internally. There was a good deal of hæmorrhage. Six months later she sought advice because the hæmorrhage had not ceased since the confinement. In the vagina was found a smooth, pear-shaped tumour projecting from the cervix. Give your diagnosis of the case, and state any further points in the history and present condition that you would require in order to confirm the diagnosis.

*October 13th.*

1. What are the diameters of the Pelvis which are obstetrically important? Define the points between which they are measured, and state their average lengths?
2. Describe the management of a Breech Presentation, when arrested in the second stage, with the sacrum behind and to the left, the mother's pelvis being normal.
3. Describe the process of involution of the Uterus, after delivery at term, as observed clinically. Mention the conditions which may interfere with normal involution.
4. Enumerate the different kinds of Perineal rupture during labour, and their common causes. State the means to be adopted for their avoidance.
5. Describe the mechanism of Vertex Presentation with occiput directed to right sacro-iliac synchondrosis.
6. A woman, aged thirty, thin and pale, has had for many months a persistent aching pain in the situation of the left ovary. The uterus is movable, and to the left of and behind it is a tender body quite movable, and the



shape and size of an ovary. There is no other physical sign of disease. She has had four children, the last twelve months ago, and she is still suckling. Comment on this case, giving your opinion as to the probable nature of the pain and its appropriate treatment.

1893.

*January 12th.*

1. Describe the Umbilical Cord, and give its structure at term.

2. Describe the mechanism of the delivery of the after-coming head, and the management of the various difficulties which may arise in the course of it—the head and pelvis being of average dimensions.

3. Describe the three methods of inducing Premature Labour which you consider best, and the circumstances in which you would adopt each.

4. What is an erosion of the Cervix Uteri? For what condition may it be mistaken, and how would you distinguish between them?

5. What are the chief diseases of the lining membrane of the body of the Uterus, and how would you distinguish them?

6. A woman who believes herself to have completed the sixth month of her pregnancy is seized during the night with severe uterine hæmorrhage. To what causes may the hæmorrhage be due? How is a correct diagnosis to be made? and how should the case be treated?

*April 6th.*

1. Describe the naked-eye appearances of the contents of the Gravid Uterus at the end of the third month of gestation.

2. Describe the causes and preventive treatment of hæmorrhage from the Uterus after the birth of the child.

3. Describe your management of a Face Presentation in the following circumstances: The os uteri is dilated to three-fifths of its full size; the membranes have recently ruptured; the pelvis is normal; the chin is behind and to the right.

4. Describe the mechanism of labour with the feet presenting and the posterior foot in the vagina. The os uteri the size of a crown piece.



5. A patient was delivered six weeks ago. She has for the last four weeks suffered from severe pain in the lower abdomen. Her temperature has for the last week ranged between  $100^{\circ}$  and  $103^{\circ}$ . The belly is swollen and so tender that you can detect nothing more than increased resistance. By vaginal examination you find the cervix in the normal position, and the uterus quite fixed by a hard swelling occupying the posterior half of the pelvis, and dipping down low behind the uterus. Discuss the diagnosis and treatment of this case.

6. A multipara, aged forty-three, whose last confinement was six years ago, has for the last six months suffered from irregular hæmorrhages (having been previously regular); on bimanual examination the uterus feels somewhat enlarged, the infravaginal cervix is apparently healthy. Discuss the case, giving the possible causes of the hæmorrhage and their differential diagnosis.

*July 6th.*

1. Describe fully the relations of the Cervix Uteri in the non-gravid state.

2. What are the various means by which we can be assured of the presence of the living Fœtus at the eighth month of pregnancy?

3. What causes favour the descent of the head by the side of the head? Describe the possible effects of this occurrence on labour, and your treatment of them.

4. What causes mould the Fœtal Head? What are the changes in the shape and appearance of the Head produced by delivery with the face presenting?

5. What conditions lead to protrusion of the cervix of the unimpregnated Uterus at the vulva? How will you distinguish between them?

6. A primipara, aged thirty-two, was confined six years ago. The periods recommenced six months later, and have been regular, but in increased quantity, until two months ago; since then there has been continuous hæmorrhage. On examination the uterus is found retroverted and mobile. Give the diagnosis and treatment.

*October 12th.*

1. Describe the naked-eye characters of the healthy Placenta at full term. State how you would examine the placenta and membranes to see if their expulsion is complete.



2. Describe the mechanism of labour in a Face Presentation with the chin posterior and to the right.

3. State the formation and structure of a fleshy or carneous Mole. What signs and symptoms would lead you to suppose its presence?

4. A patient has behind the cervix uteri a rounded, movable swelling about as large as the normal body of the uterus. What may this be? How would you distinguish between the different swellings having the above characters?

5. What appearances may a stillborn—*i.e.*, seemingly dead—child present? Classify such cases, and give your treatment of each variety. (Possible injuries received during birth are not required.)

6. A non-pregnant woman is suffering from an interstitial or from a submucous Myoma (fibroid tumour). Describe what serious symptoms may arise from the presence or from any change occurring in the structure of such tumours.

1894.

*January 11th.*

1. Describe the changes in the genital organs which take place at the Menopause, and the symptoms which are common while these changes are in progress.

2. How may a child presenting transversely be delivered without artificial aid? State the conditions in which the modes of delivery you mention usually take place.

3. Describe and explain the ill effects that follow premature rupture of the membranes. Mention the circumstances in which you would rupture the membranes, and state why.

4. When the urine of a pregnant woman is found to contain a considerable amount of albumen, how should she be treated? State (but do not give the treatment of) the events which may arise in such a case.

5. What conditions fix the unimpregnated Uterus? How would you distinguish between them?

6. You are called to a patient who, until a few hours ago, believed herself quite well. She then was seized with sudden pains in the lower abdomen and fainted. She ought to have menstruated two weeks ago, but did not. She is very pale; her pulse is very quick and small; her abdomen is slightly distended, but no tumour can be felt



in it; nothing abnormal can be felt per vaginam. State your diagnosis and treatment of this case.

*April 5th.*

1. Describe the naked-eye and microscopical characters of the Mucous Membrane of the adult unimpregnated Uterus in health.

2. Give the diagnosis of a Breech Presentation with the sacrum towards the right sacro-iliac synchondrosis. Describe the mechanism of birth in this position.

3. What is unavoidable Hæmorrhage? How would you distinguish it from accidental Hæmorrhage? State the principles upon which the treatment of unavoidable hæmorrhage is founded.

4. A patient confined two weeks ago has a fluctuating tumour rising out of the pelvis as high as the umbilicus. What may this be? How would you distinguish between the different conditions you mention?

5. What gives rise to Ophthalmia Neonatorum? Describe the means you would adopt to prevent it and to cure it.

6. A married woman, forty-six years of age, multipara, complains that she has had a watery discharge, tinged with blood, for several weeks, previous to which she had missed two ordinary periods. Give a clinical commentary on the diagnosis of this case.

*July 5th.*

1. Describe the relations of the female Bladder, and the changes in them during Labour.

2. Describe the mechanism of Labour with the Vertex presenting, the occiput behind and to the left.

3. What are the early symptoms and signs of Cancer of the Cervix Uteri? What operative treatment would you recommend at its different stages? State the considerations that would guide you in giving such advice. (Operative details are not required.)

4. Describe the diagnosis of Twin pregnancy, and the usual course of labour with Twins. What difficulties special to Twin labour may arise?

5. Describe the characters of the Lochial Discharge in a healthy lying-in. What changes may take place in it in disease?

6. A married woman, aged thirty-five, has been losing blood by the vagina for three weeks, having to use three



or four diapers daily. The bleeding began a fortnight after the date at which menstruation ought to have occurred. The menstrual loss has never been excessive. What may be the cause of such hæmorrhage? What would be the principles of your treatment?

*October 11th.*

1. Describe the normal anatomy of the Fallopian Tube, including the microscopical appearances of a transverse section through its middle part.

2. Describe the mechanism by which the Cervix Uteri is dilated in labour.

3. Describe the methods by which Uterine Fibroids may undergo spontaneous cure.

4. How would you treat the labour of a primipara, in which the foetal head with the occiput behind had been stationary in the pelvic cavity for three hours, the cervix uteri being fully dilated? (The management of the third stage of Labour is not required.)

5. What precautions are important for the prevention of abscess of the breast in the recently delivered woman?

6. A woman, aged thirty-four, delivered three weeks ago, has a hard tender swelling in the left iliac region, with fever. Discuss the nature of the case, and its treatment.

1895.

*January 10th.*

1. How is the Uterus kept in position in the non-gravid state?

2. Describe the mechanism of delivery of the After-coming Head entering with the occiput to the left, the pelvis and soft parts being normal. What causes may delay it?

3. What do you understand by 'Uterine Inertia' and by 'Tonic Contraction of the Uterus'? How would you distinguish between them? What are the dangers special to each condition, and how would you prevent these dangers?

4. Give the clinical history and treatment of a case of Cancer of the body of the Uterus. (Details of operative treatment are not required.)

5. Describe the symptoms and probable course of a case of Insanity beginning a week after delivery, and the principles of treatment.



6. A multipara, aged twenty-five, was delivered a year ago, and has since menstruated regularly till three months ago. For the last fortnight she has complained of pelvic pain. On examination a rounded firm elastic swelling is felt reaching two thirds of the distance between the symphysis pubis and the umbilicus. Douglas's pouch is filled by a fluctuating swelling. Discuss this case.

*April 4th.*

1. Describe the size, relations, and naked-eye appearances on section of the healthy Ovary (*a*) in the unimpregnated condition; (*b*) at the full term of pregnancy.

2. Mention the causes that lead to descent of the Cord in Labour, and your treatment of this condition—in the first stage of Labour (*a*) before, and (*b*) after rupture of membranes, and also in the second stage of Labour.

3. When called to a woman who thinks herself in Labour, what examination would you make, and why? How would you decide whether she was in labour or not?

4. What diseases do you include under the term 'Puerperal Fever'? What measures do you think essential for its prevention?

5. What are the causes which may lead to the formation of an Abscess behind the Uterus? What symptoms and signs would make you think that a Retro-uterine Tumour is an Abscess, and on what principles would you treat it? (Details of treatment are not required.)

6. A woman complains of a 'swelling in her private parts.' On examination, the Labium Majus of one side is seen swelled to three times the size of the other, which is natural. What may the swelling be, and how would you ascertain its nature?

*July 4th.*

1. What constitutes the Pelvic Floor? Give, in detail, the attachments of the muscles and fasciæ which enter into its formation.

2. Describe and explain the movements by which the head passes through a normal pelvis with the vertex presenting in the first position.

3. What is a Flat Pelvis? How would you ascertain that the Pelvis of a primigravida was of this shape (*a*) at three months' pregnancy, (*b*) immediately after delivery?



4. A woman in the third month of pregnancy has severe bleeding from the vagina. How would you ascertain whether or not abortion has occurred, and if it has, whether or not all the ovum has come away?

5. What is a Laminaria Tent? What is it used for? What dangers attend its use? How would you guard against them? In what conditions is its use indicated?

6. A patient has been married a year, and has not menstruated for five months. On abdominal examination a tumour is felt, the larger part of which is to the left of the middle line, reaching from the pelvic brim to the lower ribs. It is rounded, firm, and fluctuating. To the right of this is a rounded tumour, reaching to a little below the level of the umbilicus. The foetal heart is heard over the smaller tumour. By the vagina the cervix uteri is felt to the right of the middle line; but no part of the larger abdominal tumour can be reached by the finger in the vagina. The patient is otherwise in good health. Discuss the diagnosis and treatment of this case.

*October 10th.*

1. Describe the Umbilical Cord, and the arrangement of its vessels.

2. What are the risks to mother and child in a Shoulder Presentation? What principles should guide you in the management of such a case?

3. Describe the process of Lactation. Under what circumstances may it become advisable to suspend the function? How would you do this?

4. How do you ascertain the position and presentation of the *Fœtus in utero* at the end of pregnancy?

5. Mention the various kinds of Hæmorrhage from the generative organs occurring after the Menopause. How would you distinguish between them in a given case?

6. A woman has an Abdominal Tumour extending up to the Umbilicus. How would you ascertain whether it is uterine or not?

1896.

*January 16th.*

1. Describe the arrangement and distribution of the Pelvic Peritoneum and Cellular Tissue.

2. Describe the mechanism of Parturition in a Breech Presentation with the sacrum towards the left sacro-iliac synchondrosis.



3. How would you endeavour to prevent rupture of the Perinæum in Labour? and if it occurred, how would you treat the case?

4. Describe in detail the ordinary routine use of Antiseptics in Midwifery.

5. Enumerate the commonest causes of Menorrhagia, and give the appropriate treatment.

6. The Uterus in a woman aged forty is found by bimanual examination to be enlarged. How would you endeavour to ascertain the cause of such enlargement, pregnancy being excluded?

*April 9th.*

1. Describe the circulation in the Fœtus, and name the changes in it occurring at or soon after birth.

2. Give the mechanism of Labour in a Face Presentation with the chin behind and to the left, and state any deviations from the normal course.

3. What are the causes of Hæmorrhage occurring forty-eight hours after the delivery of the Child? Give the treatment appropriate to each variety.

4. In what cases of Fibroid Tumours of the Uterus is constitutional treatment suitable? Give fully the details of this treatment.

5. How do you decide whether a case of Carcinoma of the Cervix Uteri is a fit one for *radical* treatment by operation? If it is unfit, what *palliative* treatment would you adopt?

6. A married woman, aged thirty, complains that the menstrual periods ceased six months ago, and that she has been feeling ill for six weeks. On examination the uterus is felt rising to within two inches of the umbilicus. Discuss the diagnosis of this case.

*July 9th.*

1. What causes of delay may arise in the course of Parturition in a case of Vertex Presentation, the pelvis and child being of normal size. N.B.—Treatment is not asked.

2. What is your opinion of the Pathology of Phlegmasia Dolens? Describe the clinical course of a typical case. What other varieties of Puerperal Thrombosis occur?

3. Describe a case of Inversion of the Uterus occurring during the third stage of Labour. Give the treatment which you would adopt.



4. A Primigravida has a convulsion when six months pregnant. How would you decide upon the nature of the attack?

5. Describe the appearances presented in the common form of Procidentia Uteri (the cervix protruding through the vulva). Give the conditions which give rise to this, and the changes which the uterus and adjacent parts undergo in the course of the case.

6. What form of Dysmenorrhœa do you consider most common in a virgin about the age of twenty-one? Give in detail the treatment which you would recommend in such cases.

*October 15th.*

1. Describe the Blood-supply of the Pelvic Generative Organs, giving the relations of the principal vessels.

2. Give the mechanism of Labour in a Vertex Presentation, with the occiput backwards and to the right.

3. What are the signs, symptoms, and treatment of a case of Abortion at the third month, when it is (a) Threatened, (b) Inevitable, (c) Incomplete?

4. In a case of Contracted Pelvis having the under-mentioned measurements, what modes of delivery are available at full term, and which of them would you recommend?

Between Spines .....	8 $\frac{3}{4}$ inches.
Between Crests.....	10 $\frac{3}{8}$ „
Ext. Conjugate .....	7 „
Diagonal Conjugate .....	4 „

5. Give the diagnosis and treatment of a case of Subinvolution of the Uterus.

6. Two months after the delivery of a Multipara she was seized with pain in the lower abdomen. Next day there was a tenderness on pressure, the pulse was 90, temperature 97°, and a red vaginal discharge was present. The temperature went up, so that three days later it was 103°, the vaginal loss continued, and on digital examination a rounded swelling about the size of a large orange was felt in Douglas's pouch; the os uteri pointing downwards and forwards. Discuss the diagnosis and treatment of the case.



1897.

*January 14th.*

1. Describe the naked-eye characters of the developing Placenta and Membranes at the end of the third month of pregnancy.

2. Give the ordinary mechanism of delivery of the aftercoming head entering with the occiput behind and to the left. What treatment may be necessary in the interests of the child?

3. Give the details of management directed to the prevention of Puerperal Septicæmia that should be adopted in every case of Labour.

4. Under what conditions may Hæmorrhage occur during the first three months of pregnancy? Give the differential diagnosis. Briefly indicate the treatment in each case.

5. What conditions, excluding those occurring during pregnancy, may give rise to retention of urine in women? Give the treatment appropriate to each.

6. A woman, aged fifty-seven, has had a blood-stained watery discharge for eighteen months. On bimanual examination the uterus is found to be enlarged and mobile. How would you proceed to diagnose the case, and how would you treat the conditions that might be found?

*April 8th.*

1. Describe the Amnion at term. State the chemical composition of the Liquor Amnii and its uses in pregnancy and labour.

2. Give the diagnosis and management of a case of Shoulder Presentation, the pelvis being normal.

3. What forms of Uterine Hæmorrhage peculiar to pregnancy may be met with in the last three months? Give the differential diagnosis and indicate the principles of treatment.

4. State in detail the steps necessary for securing Asepsis in Labour.

5. What symptoms may be produced by a Fibroid Tumour of the Uterus?

6. A multipara, aged forty-one, twelve years married, has had what she calls 'Inflammation of the Bowels' on four occasions, the last twelve months ago. She is now again seized with pain in the lower part of the abdomen, her temperature 102°, pulse 112. On vaginal examination



the uterus is found retroverted and fixed, and there is a hard mass in the right posterior quarter of the pelvis, some thickening felt to the left. Discuss the diagnosis of this case.

*July 8th.*

1. State the lengths of the diameters of the female Pelvis most important from an obstetrical point of view. How would you ascertain them in the living woman?

2. Give the diagnosis and the mechanism of Labour in a case of face presentation, chin backward and to the left.

3. The Urine of a woman six months pregnant contains a large amount of albumen. Discuss the advisability of induction of Labour; what method would you employ for this purpose?

4. At what periods of Lactation does mammary abscess most commonly occur in a nursing woman? Mention its causes and the best means of preventing it.

5. What changes of an urgent nature may occur in an Ovarian Tumour, and how would you recognise them?

6. A woman, aged thirty-five, has suffered much from Menorrhagia and Dysmenorrhœa for several years, and has had a foul vaginal discharge for a week. The temperature has risen to 102°. A tumour is found reaching halfway up to the umbilicus. Discuss the diagnosis of the case.

*October 14th.*

1. Describe the naked-eye appearances of the Hymen and the parts constituting the Vulva in a healthy adult virgin.

2. Describe the method or methods by which the normal Placenta and membranes are separated and expelled.

3. To what points would you give your attention in the selection of a wet-nurse for a recently-born child?

4. Give the diagnosis of Pelvic Hæmatocele. Under what circumstances would you consider surgical interference necessary?

5. A rounded tumour of the size of a hen's egg is felt in the Vaginal Canal, the vagina itself being healthy. Discuss the diagnosis and treatment.

6. A patient, five months pregnant, has a Fibroid, equal in size to a cricket-ball, situated in the posterior and lower segment of the Uterus. What are the difficulties most likely to arise, and how may they be met or averted?



1898.

*January 13th.*

1. Describe the Urethra in the healthy female adult, its length, its direction, its naked-eye structure, and its relations. How is it affected during labour?

2. How would you proceed to examine a case of suspected Pregnancy during the Sixth Month? What signs would you expect to find, and upon which would you chiefly rely in arriving at a diagnosis?

3. What difficulties may occur in the second stage of Labour; the vertex presenting and low in the pelvis?

4. Define as completely as you can the circumstances which justify the induction of Premature Labour, and describe exactly the chief methods of performing it.

5. Give the causes, symptoms, physical signs, and possible results of Cystocele.

6. Mrs. S., aged thirty-four, confined six weeks ago at term, has had two severe floodings, one on the 10th and the other on the 26th day, and has had daily losses since. On examination the uterus was found to be larger than it should have been, and freely movable. Discuss the nature of the case and the treatment you would advise.

*April 14th.*

1. Give the relations and naked-eye appearances of the ligaments of the Uterus.

2. How can delivery be effected in a Brow presentation when it is left to the natural powers?

3. Under what circumstances is it justifiable to empty the Uterus during the early months of Pregnancy before the child is viable? State how you would act to effect this.

4. Give the diagnosis and treatment of a case of Placenta Prævia.

5. What may be the effects of Gonorrhœa in the unimpregnated female?

6. A woman, aged thirty-two, complains of severe pelvic pain. On examination a round smooth swelling, about the size of a billiard-ball, tender to the touch and movable, is felt in the pouch of Douglas. Discuss the diagnosis and treatment of this case.



# EXAMINATIONS FOR THE DIPLOMA OF FELLOW OF THE ROYAL COLLEGE OF SURGEONS.

## FIRST EXAMINATION.

### ANATOMY.

THIS consists of two parts, a written paper and a *vivâ voce*.

In the written paper four questions are set, and the candidate must answer three of them, though it is much better if he can answer all four.

Three hours are allowed for the paper.

In the *vivâ voce* examination in Anatomy the candidate is examined for *twenty* minutes.

This examination has the same *objective* character as that of the Conjoint Board, its design being principally to elicit the candidate's personal knowledge of anatomical objects and facts. Hence the common form of question, 'What's this or that muscle, artery, or nerve?' But, unlike the examination for the membership, the candidate, as a more advanced student, or as a member, is far more frequently required to *demonstrate* by pointing out and naming the structures presented to view, or perhaps to *describe* the parts seen in an anatomical preparation or a recent dissection. Sometimes, in explanation of statements made, *reasons* are asked. Of this threefold mode of testing the candidate's knowledge, the latter seems to offer the chief difficulty.

The examination series comprises : 1. Regional dissection in the recent subject, and elaborately prepared parts in spirit under flat glass covers, which are removed as occasion requires for examination. 2. Visceral preparations, some injected and displayed in like manner. 3. Developmental anatomy—*e.g.*, of the foetus, ossification of the bones (see pages 37 to 44).

The nature of the anatomical objects submitted for examination, and of the questions proposed, may be gathered from the following summary :

Base of the skull, showing the foramina, nerves, and vessels transmitted, isolated by coloured rods; point out



and name the several structures thus indicated. What is this bone?—the palate bone. The right or left, and why? Name its processes and foramina. Point out the situation of the sphenopalatine ganglion. In the skull, point out the course of the palatine nerves, and of the vidian nerve. Lateral section of the orbit, showing eyeball, muscles, nerves; sphenoid and temporal bones continuous, showing facial nerve. Point out the lenticular ganglion: name its connections with nerves; the nerves supplying the muscles of the eyeball. Select the bones of the internal ear, and describe their relative position and connections. Describe the structure of the Eustachian tube. What are its functions? Describe the distribution of the auditory nerve. Parotid region: describe the relations of the parotid gland, superficial and deep, and show where the duct enters the mouth. Side-view of the muscles of the face and neck in the triangular spaces: point out and name the muscles seen. Another preparation, showing also vessels and nerves: what is this or that part seen? Occipital region, showing recti and oblique muscles, nerves and vessels: name the parts. Constrictors of the pharynx: describe their origin and junction in the pharynx. Vertical section of the pharynx posteriorly, showing its openings anteriorly, laterally, and inferiorly: point out and name them. Section of nose and mouth: name the parts seen. Larynx, showing intrinsic muscles: name them. Anatomy of the axilla; the bend of the elbow; the forearm; the palm of the hand; severally subjected to examination. Form a collection of small bones, pick out the bones of the carpus, name them severally, and place them in relative position. Anatomy of Scarpa's triangle in the thigh; the popliteal space; the leg; the sole of the foot; severally subjected to examination. Is this a male or female sacrum, and why? What anatomical mark of distinction is there common to all dorsal vertebræ, which exist in no other vertebræ? When the abdominal muscles suddenly contract, what action is there on the testes, and why?

Vertical antero-posterior section of the head through the longitudinal sinus, enclosing the encephalon: point out and name the parts seen. Base of the brain: point out the (apparent) origins of the cranial nerves, naming them from before backwards. What parts are supplied by these nerves—*e.g.*, by the third and seventh? Specify the muscles supplied by the facial. Section of a portion



of the vertebral canal, enclosing the cord and spinal nerves: what region does the portion belong to, and why? Lateral section of the thorax, enclosing heart and lungs, etc.: point out the origin, course, and distribution of the phrenic nerve. Anterior view of the thoracic organs, vessels, and nerves: name the parts seen. The diaphragm, showing its upper surface, and circumferential attachments: point out and name the apertures, and the structures passing through them. What shape does the diaphragm assume in inspiration and expiration, respectively? What causes air to enter the lungs? What is the pressure of the atmosphere on the square inch? Pyloric orifice of the stomach, opened duodenum, with gall-bladder, and pancreas: name these structures, describe their relative position and relations to surrounding parts. Section of the kidney injected: point out the renal vessels and ureter as seen at the hilus, and their relative position. Side-view of the pelvis, and intrapelvic organs: describe the parts seen.

The average range of this practical examination in Anatomy is exhibited by the course of examination with reference to two candidates:

Candidate 1: (1) Dorsal vertebra. How many centres of ossification? The age of their appearance? When do they unite? (2) Scaphoid bone. Its position in the foot? Its articulations? (3) What are the kinds of movable joints? (4) Section of Penis. Point out the parts seen. (5) The Urethra. What is its length? Its divisions, and their relative length? (6) Liver. Its weight? Its lobes; ligaments; and parts uncovered by peritoneum? The course of the umbilical vein? The size of the portal vein in fœtus? (7) The Encephalon. Its weight? (8) Section of Head and Cervical Vertebrae. Point out various parts. The length of Eustachian tube; the length of osseous and cartilaginous portions? Name the articulations of Sphenoid bone. *Recent Dissections:* (9) Scapula detached from behind, showing axillary and brachial artery, with brachial plexus of nerves, and branches, as thus seen. Point out the parts, and name their relations. What muscles are attached to the scapula? How is the brachial plexus formed? What are the branches above the clavicle? The relation of the rhomboid nerve to the subclavius muscle? (10) Obturator nerve and artery. Their branches? What are the origins of the abductor muscles? Whence the branches of nerve



supplied to them; to the pyriformis, the gemelli, the obturators, and the quadratus femoris?

Candidate 2: (1) Base of the Skull. Point out the foramen ovale; what passes through it? What are the boundaries of the spheno-maxillary fossa? How many foramina open into it? Name them. What is this?—the spheno-palatine foramen. What passes through it? What passes through the posterior palatine canal? Name the branches from Meckel's ganglion. (2) Clavicle. Point out the attachments of muscles. Is the clavicle constant in Mammalia? What modifications are found in Birds? Why is the clavicle not found in Ruminants? (3) Internal pterygoid muscle, and its relations. What two nerves pass over the upper border of this muscle? What nerve passes through it? (4) Otic ganglion. Whence its sensory roots? The origin of its motor roots? (5) Jacobson's nerve; its origin and course? Where does the nerve enter the tympanum? What are the three branches of distribution? What are the three branches of communication? (6) What muscles are attached to the ridges of the occipital bone? The attachment of the splenius to spine? The origin of the sub-occipital nerve; and the muscles supplied by it? The origin of the glosso-pharyngeal nerve; and the muscles supplied by it? What nerve supplies the stylo-glossus muscle? (7) Name the boundaries of the ischio-rectal fossa. What nerves and blood-vessels are found in the fossa? (8) Spinal column. Its curves, and their extent? How are the curves produced? The cause of the lateral curve? Why do the laminæ in the dorsal region overlap? What are the movements of the spinal column in its different regions? What is the direction of the articular processes in different regions? (9) *Recent* dissection of dorsal muscles. Point out the origin and insertion of erector spinæ, and the muscles continuing it upwards to the neck. The origin and insertion of the levatores costarum?

#### PHYSIOLOGY.

The examination consists of a written paper and a *vivâ voce*.

The written paper contains four questions, and of these the candidate must answer at least three, though he is strongly urged to answer them all.

Three hours are allowed.



The *vivâ voce* examination lasts *twenty* minutes.

The nature of the examination may be seen from the questions indicated with reference to the following subjects: *Urine* — average specific gravity, quantity in twenty-four hours; urea, formula of chemical composition, qualitative and quantitative; with what inorganic compound is urea isomeric? how to determine the quantity of in urine; excretion of urea, as affected by nitrogenous and non-nitrogenous food, or by exercise; uric acid, its composition, forms of crystal. *Milk*—composition of; changes it undergoes in stomach; cause of coagulation of casein; source of lactic acid; conversion of casein into peptones; what change of peptone in liver? what is glycogen? *Bread*—its proximate constituents; gluten, its composition; fermentation of dough; changes starch undergoes. *Eye*—the layers of the retina? Rods, length and diameter of; structure of a rod. Cones, structure; difference from a rod. *Ear*—how is sound conveyed to the sensorium? Action of ossicula in transmission; cause of intensity; cause of pitch. *Epiglottis*—its structure; mucous membrane, its epithelium and glands; function of epiglottis. *Velum palati*—its structure and functions. *Eustachian tube* — structure and openings, function of; state of during deglutition; what muscle opens the pharyngeal aperture? *Membrana tympani*—shape of; what muscle acts upon this membrane? the use of tension; action of stapedius muscle; peculiarities of the joint between the malleus and incus?

### HISTOLOGY.

A series of highly useful mounted specimens are submitted to examination under the microscope by each candidate. They comprise principally textural anatomy, and the minute structure of some important organs (see pages 44 and 45). A candidate having recognised any specimen, would be asked questions of a physiological character pertaining thereto. For example: blood-corpuscles gave rise to questions as to their relative proportion in the blood; the salts of the blood; the kind and quantity of gases present; the difference between arterial and venous blood; the changes produced by respiration, and the source of carbonic acid in the blood. In like manner, the minute structure of the kidney led to questions respecting its functions as an excreting organ.



The average character of this practical examination is shown with regard to *four* candidates, as follows :

Candidate 1: *Four microscopic specimens*, relating to tissues or organs, having been recognised, questions arise from each kind of specimen submitted for examination. The candidate is afterwards examined upon other *preparations*, as relating to physiology. (1) Kidney. What is the secretory element? What part of the epithelium? Describe method of injecting a kidney. How could you experimentally reduce blood-pressure in this organ? (2) Presbyopia. What is it? How would you detect presbyopia in a person reading a book? What distance of vision would be evidence of presbyopia? (3) Describe the structure of the lens. The arrangement of the fibres. (4) Retina. Which layer of the retina is affected by light? Where are the cones most abundant? The situation of the yellow spot? Structure of retina at this spot? (5) Milk. What are its constituents? Are they formed in the gland? What is casein?

Candidate 2: Four specimens under the microscope. Then—(1) Eye. Structure of the cornea? Structure of the conjunctiva? What is the use of the iris? Show with chalk on board how rays of light falling on the lens produce an image on the retina. What is spherical aberration? What changes take place in the eyeball in looking at a near object? Are the eyes turned in any particular direction? Explain Hering's theory of colour vision. (2) Ossification of cartilage. What changes take place in the cells; and in the intercellular substance? How does the shaft of a long bone grow in thickness? how in length? (3) Urine. Name its constituents. What is the pigment matter derived from? What is the urea derived from? How to estimate the quantity of urea excreted in twenty-four hours? Is more urea excreted in a child or in an adult of equal weight? (4) Elastic tissue; its structure? What is the function of the vocal cords? How is the voice produced? How is its pitch regulated? What muscles tighten the cords? (5) Heart. Point out the auriculo-ventricular openings. Indicate the openings of the coronary arteries.

Candidate 3: Four specimens under the microscope. Then—(1) What is the chemical reaction of contents in the small intestine? What, in the large intestine? What, in the stomach? Structure of mucous membrane in small intestine? In large intestine? The function of the



solitary follicles? (2) Spinal cord. What are its functions? Give experimental proof. What nerve-centres are there in the cord? Is there a micturition centre? Give the experimental proof. (3) Heart. Point out its cavities. How are the coronary arteries supplied with blood? What is the position of the semilunar valves in contraction of the ventricles? Structure of the tricuspid valve? Structure of muscular fibres of the heart. The position of the nucleus in the cell. Why are the fibres striated? What determines whether muscular fibres are striated? Period of time in contraction of auricles? In contraction of ventricles? Give experimental proof. What is a cardiograph? How to use it? What is a sphygmograph? Trace with chalk on board a normal pulse-wave. What is the predicrotic wave? How are the several elements of a pulse-wave produced? The causes of cardiac impulse? (4) Yellow-elastic tissue. Where found in the human body? (5) Structure of cartilage in the bronchial tubes?

Candidate 4: Four specimens under microscope. Then—(1) Spinal cord. Draw on board a section of the cord. What is the position of the anterior horns to the surface? What that of the posterior horns? The relation of nerve-roots to the horns? Where is the ganglion on the posterior root? Structure of the ganglion. Indicate afferent and efferent fibres. The relation of afferent fibres to cells? Show the course of reflex action. Give an example of reflex action. Is sensation ever combined with reflex motion? Give an example of reflex motion without sensation. If the cord were destroyed, would intestinal movement continue? Are there any ganglia in connection with the intestine, for producing reflex action? (2) Urine. Its chemical reaction in man? In herbivora? The constituents of urine? Composition of urea? Quantity eliminated in twenty-four hours? (3) Section of eyeball, transverse. Name the structures divided. (4) What are the characters of hæmoglobin? (5) Ovum. Its size in woman? How is the mesoblast formed?



## SECOND EXAMINATION.

This examination consists of five parts, a written paper, a clinical examination, surgical anatomy, operative surgery, and surgical pathology.

(a) The *written* paper. Four hours are allowed, and four questions are set, *all* of which must be answered.

(b) The clinical examination is in two parts ; in the first part the candidate is required to examine two patients, for each of which twenty minutes is allowed, and to make rough notes of the cases in a book provided for the purpose.

After examining the patients, the candidate will be required to write out the result of his examination and to give in each case: 1. Short history and description. 2. Diagnosis. 3. Brief pathology. 4. Prognosis. 5. Treatment.

Forty minutes will be allowed for writing reports on the cases.

The candidates should be careful to note the number of each patient he examines and insert the patient's number on the book in which he writes his report.

In the second part of the clinical examination the candidate has twenty minutes *vivâ voce* on cases.

The kind of cases submitted for examination is further indicated by the following series, on *one occasion* :

1. Femoral hernia, in male, right side, size of large melon ; apparently enterocele, reducible, of thirty years' duration. 2. Double syphilitic sarcocele, fistulous opening in each ; commencement of swelling a year and a half ago, and twelve years since primary disease. 3. Caries of right elbow-joint, in boy, eight years of age ; fistulous opening above inner condyle of humerus, disease of eight months' duration, not of traumatic origin. 4. Multiple sarcomata, of small size, on scalp, near axilla, and one on tongue, ulcerated ; disease of ten weeks, in a man aged forty-nine. 5. Palatal tumour, size of an egg, firm consistence ; on incision seemed cartilaginous or gristly ; some dark bloody fluid escaped. Disease commenced, or was first noticed, four months ago, with sore throat, and then pain in right temporo-maxillary articulation ; the patient felt a small, hard lump in the adjoining portion of



the hard palate, behind the velum; the tumour, at first insensitve, is now tender. 6. Teno-synovitis, chronic, in palm and above wrist of right hand, in a young man. Disease of six months' duration, and no history of injury. 7. Teno-synovitis, chronic, of extensor tendons, in the lower third of the left arm. Swelling, in that situation at the back of the arm, is considerable, somewhat œdematous, but scarcely painful, and attended with weakness in using the hand. Is consequent on a sprain of the wrist twelve years since, and a rheumatic attack four years ago. 8. Epithelioma, near outer angle of orbit. Commenced as a small, red, flat lump; painless until lately. Fourteen months' duration, in a man aged sixty-two. 9. Tumour, apparently lymphoma, principally axillary and subpectoral, partly supra-clavicular, in a man aged sixty-four. Is firm, somewhat elastic, no marked lobulation, no discoloration of integument, and not painful. Duration, five months. 10. Chronic bursitis, forming a tumour over tuberosity of ischium, on both sides. Each tumour is about the size of an orange, generally firm, with harder nodules in its substance, and enlarging slowly for the last nine years, the patient being a man aged thirty-nine. 11. Hydro-sarcocele, on the left side, the size of a cocoanut; vaginal sac much thickened. Consequent on orchitis, eighteen months ago, from injury to the testicle, on horseback. 12. Multiple lipoma, subcutaneous; tumours, from size of a chestnut to a small orange, flattened, and slightly lobulated or branched, and scattered over both arms; with adipose formation, beneath the integument, around both thighs. The tumours first appeared, in the former parts, about twenty years since; and in the latter situation, five years afterwards. The patient, a man, aged forty-nine. 13. Elephantiasis of scrotum; the tumour is smooth, and of bluish or livid colour, and extends down to the knees. There is an ulcerated cavity below. The penis is entirely concealed in the mass; but the margin of the prepuce appears, and is beset with warts. The growth began in the fundus of the scrotum, which became thickened soon after a kick on that part; this injury dating back eighteen years. The man is now forty-eight. By suspension, and compression, with Martin's bandage, the mass has gradually been much reduced, being three inches less in length and circumference.

On another occasion, the series of cases *included* :

1. Exostosis, of globular shape, situated just below the



head of the humerus, anteriorly ; under cover of the great pectoral muscle. The osseous growth was of two years' standing ; and it arose from a fall against a post, striking the shoulder just where the lump had formed. It occurred in a boy, aged fifteen ; and he first noticed the lump six months after the injury. 2. Badly united fracture of radius and ulna ; angular displacement, with pronation. 3. Inguinal hernia, just presenting at external abdominal ring. 4. Rupture of the biceps muscle in the arm ; from having been nipped between two pieces of wood. Union, with a furrow, seen especially when the muscle is contracted. Hand-drop, from paralysis of extensors of fingers. 5. Sarcoma, nodulated, firm tumour, over the parotid gland. Portions of the growth have undergone softening. Occasionally subject to sharp, stinging pain. The tumour is recurrent to a primary growth, which was removed four years ago, and had then been of twelve years' duration, but was not painful. 6. Anastomotic aneurism of orbit, with great projection of the eyeball. The tumour presenting under the upper eyelid is soft, compressible, and thrilling. The other eyeball is somewhat prominent. Apparent origin from injury, by a wheel having passed over the head twenty-eight years ago, causing protrusion of the eyeball. 7. Pelvic abscess on the left side, with a general fulness of the gluteal region on the same side. Obscure fluctuation can be felt deeply over the sacro-sciatic notch on to-and-fro palpation of the tumour in iliac fossa. No disease of spine. 8. Fracture of radius, about an inch above the wrist, with dislocation of the head of the ulna inwards ; coupled with fracture of the ulna in about middle of the arm. The radio-ulnar injury occurred thirteen years ago, from fall on the hand ; the ulnar fracture a year and a half ago, from direct violence. Both fractures have united, and the dislocation is unreduced. 9. Voluntary movement of the trochanter, outwards and forwards, on both sides. A jerking displacement in this direction is produced, apparently by the action of the gluteus medius muscle, the man standing up, with his feet together. 10. Congenital cyst in the neck of a boy.

On a third occasion, the cases submitted to examination included :

1. Irreducible inguinal hernia, of ten years' duration ; in a woman, aged forty-seven years. 2. Scirrhus of the mamma, with retracted nipple, and sero-sanguineous discharge ; in a woman, aged thirty-seven. 3. Sarcoma of



the cheek, cutaneous outgrowth; arising apparently from the sting of a gnat; eight months; in a woman, aged twenty-three. 4. Lateral curvature of the spine; resulting from empyema on the left side, discharging through an opening in the second intercostal space, close to the sternum, and consequent collapse of the left half of the thorax. 5. Dermoid cyst in the neck of a woman, aged twenty-five; eight years' growth. 6. Sarcoma of the soft palate, extending from a sarcomatous polypus in the left nostril; one month's growth, after removal, one year ago, by operation through the side of the nose; in a man, aged fifty-two. 7. Abscess of testis. 8. Talipes-varus, double, congenital; in a young man. 9. Congenital hydrocele. 10. Syphilitic ulcer on the leg; four months' standing; primary disease, four years ago; patient aged twenty-six. 11. Orchitis, affecting an undescended testis, in the inguinal canal. 12. Infantile paralysis of the right upper extremity, and involving the pectoral muscles; a man, aged fifty-seven. 13. Sarcoma of the upper jaw; recurrent after incomplete operation; four months' duration; previous disease, eight months; in a woman, forty-five years old. 14. Scirrhus of breast, involving the integument; two years; a woman, sixty-six years of age.

The following Cases and series of Questions will illustrate the general nature of this examination. Of four cases, two were well marked by their positive signs, the other two being a test of diagnosis, principally in virtue of their negative signs as compared with other forms of disease or injury.

1. Disease of the hip-joint, without dislocation, in a boy. The candidate, having examined this case, was asked: What is its nature? Point out the signs. What is the state of the joint? In what stage is the disease? How would the articular cartilage disappear? Might the acetabulum be affected? What kind of ankylosis will probably ensue? Why more probably fibrous? What dislocation does this disease of the hip-joint resemble? In morbus coxæ, does dislocation ever ensue? Are any of the viscera likely to be affected? What organs? What is your prognosis in the present case? What treatment? If excision, mark the situation and length of the lines of incision. What vessels or nerves might be wounded in the transverse cut? 2. Sinus-openings, discharging just above the fold of the groin; the thigh is drawn up, but



not inverted ; the hip-joint is freely movable, and without pain ; the patient a man of middle age, with marked hectic. Is this disease of the hip-joint ? You say it is—why so ? If not, why not ? 3. Injury of hip-joint, in a man, aged sixty. There is some pain in the joint when moved, and inability to raise the limb from the bed ; but there is no shortening or eversion, and no crepitation can be felt in the joint, nor is there any discoloration about the hip or in the groin, although it should be remembered this might have disappeared, some time having elapsed since the accident. Is this a fracture of the neck of the femur ? If not, why not ? What treatment ? If a fracture, how long would you keep the patient in bed at this age ? 4. Secondary syphilis. Copper-coloured, scaly eruption, in a young man. Name the eruption. What appearances are characteristic ? What treatment ?

#### OPERATIVE SURGERY.

Subjects are provided, and instruments laid out on adjoining tables. Two examiners are engaged with each candidate. An operation having been named by the acting examiner, the candidate is requested to select the instruments, and to place the part in position ; he is also to ask for an assistant, when necessary, and direct him what to do—*e.g.*, as to the holding of a limb in position for amputation, or the compression of a main artery. During the operation a question may be put occasionally by the examiner, with reference to the steps or course of the procedure, and in amputations, respecting the arteries to be ligatured. Lastly, to indicate the dressing of the wound. A second operation is then to be performed in like manner. *Two operations* are the required number for each candidate ; a third is sometimes required, when either of the two has not proved satisfactory. There is no specified period for the examination of each candidate.

The following operations may be taken as illustrative of the requirements in this portion of the practical examination : they comprise, principally, amputations, excisions, and the ligature of arteries. Usually, of the two operations required of each candidate, one is an amputation or excision, the other the ligature of an artery. Owing to the number of candidates, a large series of operations may be performed on the *same occasion* ; and, as any one candidate is, therefore, liable to be called upon for any



two of such operations, they may be mentioned almost indiscriminately: — (1) Amputation of the great-toe; (2) At tarso-metatarsal articulation; (3) Amputation of finger, at either phalanx; (4) At metacarpo phalangeal articulation; (5) Amputation of thumb, at carpo-metacarpal articulation; (6) Ligature of radial artery, in lower third; (7) In upper third; (8) Ligature of ulnar artery, in lower third; (9) In upper third; (10) Excision of elbow; (11) Ligature of common carotid; (12) Amputation at wrist-joint; (13) Ligature of subclavian, in outer third; (14) Amputation of forearm; (15) Ligature of innominate; (16) Amputation of arm; (17) Ligature of axillary artery, below pectoral muscle; (18) Ligature of brachial, in lower half; (19) Amputation at shoulder-joint; (20) Trephining; (21) Tracheotomy; (22) Ligature of external iliac; (23) Amputation at tarso-metatarsal articulations; (24) Chopart's amputation, mid-tarsal; (25) Ligature of superficial femoral, in Scarpa's triangle; (26) In Hunter's canal; (27) Syme's amputation at ankle-joint; (28) Ligature of dorsalis pedis; (29) Ligature of anterior tibial, in upper half; (30) Teale's amputation of leg, in lower half; (31) Amputation below the knee; (32) Ligature of posterior tibial, at ankle; (33) Ligature of posterior tibial, in calf; (34) Amputation at knee-joint; (35) Ligature of popliteal; (36) Excision of knee; (37) Amputation of thigh, in middle third; (38) Excision of hip-joint; (39) Incision for femoral hernia; (40) Incision for inguinal hernia; (41) Sounding for stone in the bladder.

#### SURGICAL ANATOMY.

This portion of the practical examination is conducted by *vivâ-voce* questions, and lasts a quarter of an hour.

The parts, and the questions with reference thereto, are fully exemplified by the examination of four candidates.

Candidate 1: Ligature of the external iliac artery. Point out and name the parts seen in dividing the abdominal wall, to reach the vessel. Demonstrate the boundaries of the inguinal canal. What structures are divided to expose the canal? How is the external abdominal ring formed, and what are its boundaries? What is the internal ring, and show it?

Candidate 2: Parts exposed in Chopart's amputation, including the vessels divided in the flap. Indicate and



name them. Parts seen in excision of the hip-joint. Point out the lachrymal sac, and pass a probe down the nasal duct. Indicate where the facial artery crosses the lower jaw.

Candidate 3: An amputating-knife transfixed through the middle of the thigh just in front of the femur. Name the parts transfixed. Is the femoral artery included? What nerves would be found in the anterior flap made by transfixion in this part of the thigh—middle third? Knee-joint opened anteriorly, by transverse incision. Indicate the several parts exposed. Is the articular surface higher on the inner or outer condyle of the femur? In the posterior or articular surface of the patella, which portion is broader, corresponding to the outer or the inner condyle? Is the synovial sac higher on the outer or the inner side? Point out the attachments of the crucial ligaments. What is the shape of the inter-articular cartilages? what their difference? Indicate the attachment of these cartilages. In relation to crural hernia, what is the deep arch? Indicate the boundaries of the crural ring. What occasional relation may the deep epigastric artery have to the ring?

Candidate 4: Tracheotomy; name the parts divided. Mark (with chalk) the course of the internal mammary artery in the thorax and abdomen. Mark the position of the heart in relation to the thoracic parietes. Indicate the spot for paracentesis thoracis. A penetrating wound, in the third intercostal space, just to the right of the sternum; what artery would be wounded? In fracture of the olecranon, what is the altered appearance of the elbow, when examined before the supervention of swelling? Mark the course of the musculo-spiral nerve. Indicate the situation of the pronator quadratus muscle. What vessels and nerves supply it?

On another *occasion*, the examination comprised the following subjects, and took the course indicated by these questions.

Candidate 1: Side of the knee, externally, exposing fascia, muscles, and external popliteal nerve. What is the ilio-tibial band? Point out the course of the external popliteal nerve. What are the relations of the popliteal artery, vein, and internal popliteal nerve? Scarpa's triangle in the thigh; and the inguinal region. Point out the ilio-hypogastric nerve. Poupart's ligament, its attachments, and those of the internal oblique and trans-



versalis muscles. Cremaster muscle—how formed? Conjoined tendon—its insertion. Internal abdominal ring—why not a defined aperture? Cribriform fascia—what is it? What passes through it? Point out Hey's ligament. What is the fascia propria?

Candidate 2: Section of arm, just below the shoulder-joint. Point out the parts seen. Describe the distribution of all the branches of the brachial plexus. Ligature of the temporal artery. Relations of the vessel. Section of the neck, below axis, showing muscles, vessels (injected), nerves, larynx, and tongue. What is the course of the internal maxillary artery? The attachments of superior pharyngeal constrictor? Origin and insertion of the rectus capitis anticus major. Point out pneumogastric nerve; also the superior ganglion of the sympathetic.

Candidate 3: Transverse incision across the palm of the hand; point out the radial artery, and its course in the palm. Muscles of the thumb; what are supplied by the median nerve? Ligature of the subclavian, in the outer third; point out the parts seen in relation to the artery. Axilla, integument removed; name the parts as exposed by the course of dissection. Which intercostal nerve gives off the intercosto-humeral nerve? The source of the subscapular nerves.

Candidate 4: Amputation at the hip-joint; point out the parts seen. What parts are in contact with the capsule of the joint? Section of leg, middle of the calf, injected; name the parts as seen. Anterior and posterior triangles of the neck; the sterno-mastoid muscle being removed; name various parts exposed. Front of forearm, integument removed; point out the cutaneous nerves and the superficial veins. Trace the relations of the radial artery.

On another *occasion* of examination, dissections on the subject comprised the following series, besides the usual preparations: (1) Bend of the elbow; (2) Back of the forearm, lower two-thirds; (3) Arm, front, from elbow to the wrist; (4) Leg, posterior, lower third; (5) Popliteal space; (6) Axilla; (7) Sole of the foot; (8) Foot, dorsal surface; (9) Forearm, front, lower third; (10) Thigh, upper two-thirds; (11) Neck, both triangles; (12) Inguinal canal; (13) Thigh, anterior aspect to the knee-joint; (14) Abdominal cavity, showing relative position of the viscera; (15) Arm, anterior aspect, lower third; and



upper third of forearm; (16) Leg, anterior aspect, from the knee to the ankle.

### SURGICAL PATHOLOGY AND SURGERY.

This is a *vivâ-voce*, and is held at the Royal College of Surgeons.

Four tables are placed, and two examiners at each, with osseous specimens, comprising diseased joints and bones, and spirit-preparations of other parts. The candidate passes a *quarter* of an *hour* at each of two tables, making *half* an *hour's* oral or *vivâ-voce* examination.

The questions are principally and primarily objective; a specimen of diseased joint, for example, being handed to the candidate as the starting-point for questions respecting its pathology and surgery. *Senior* candidates are not unfrequently asked, in the first instance, what *cases* they may have seen more particularly in their practice, as fractures or dislocations, and the object for examination is then selected accordingly.

The nature of this examination will be sufficiently exemplified by the following series of questions submitted to two candidates :

Candidate 1: What is this osseous specimen? A fracture of the neck of the femur. Why so? Was the fracture extracapsular or intracapsular? Is it impacted? Was there any injury to the great trochanter? What age probably was the patient? Mention the signs of extracapsular fracture. Also those of impacted fracture. The treatment of these conditions. What is this? A fracture of the neck of the humerus. What would the signs be? The treatment? Compound dislocation of the elbow-joint and its treatment. Chronic cystitis: what are its symptoms, and the condition of urine? What is the cause of its alkalinity? What are the elements of carbonate of ammonia? The treatment? Enlarged prostate: give the symptoms; the treatment for retention; the kind of catheter; how to teach the patient to use it. Glaucoma: what are its symptoms? The diagnosis of acute and chronic glaucoma; treatment, by what operation? Describe iridectomy. Describe the appearances in the human eye as shown by the ophthalmoscope in health and disease. Describe Syme's operation at the ankle-joint. Also Pirogoff's. What conditions are relatively favourable for one amputation rather than the



other? Are there any objections to Pirogoff's operation? What is this osseous specimen? Rheumatic arthritis of the hip-joint. What are the characteristic appearances? What the signs? The treatment? What are the distinctive morbid appearances of tuberculous disease of the joint? At what age probably would it occur? What is this specimen? The scapula showing the glenoid cavity of an old dislocation. What are the various specific forms of iritis? The characteristic appearances of rheumatic iritis? Its treatment?

Same Candidate, Second Table: Spina bifida—what is it? What are the contents of the sac? How ascertained? Usual seat in the spinal column? The prognosis of this malformation? In what condition may life be prolonged for an indefinite period? What are the causes of death? What is encephalocele? Its situations? Its diagnosis from congenital cystic tumour; and from malignant tumour? The prognosis? What treatment in spina bifida? in encephalocele? Specimen of ankylosis of upper cervical vertebræ; what changes have taken place? The probable constitutional condition? What tuberculous osseous affections are liable to occur? What chemical changes take place in tuberculous osteitis? The nature of a 'strumous' node? Syphilitic osteitis; its characters? Rheumatoid ossific deposit; its characters? Fracture of the skull; what are the modes of repair?

Candidate 2: Colles's fracture; what is this specimen? What is the displacement? The varieties of this fracture? The usual signs? The signs when impacted? Treatment? What should be the position of the hand? The best form of splint? What loss of movement often remains after union? Hernia cerebri; name the lesions in this condition. Inter-cranial suppuration; the usual period after injury to the head? Its symptoms? State of the wound when present? The situations of intra-cranial suppuration? What are the pathological changes leading to sub-cranial suppuration? The character of Pott's puffy tumour of the scalp? Senile gangrene; its premonitory symptoms? What are the pathological changes in the arteries of the leg? The appearances of this gangrene? Its usual extent? How is the gangrenous part limited, and separated? Why no hæmorrhage in the process of disjunction? Treatment, local measures; would amputation be justifiable? Constitutional measures; dietetic and medicinal?



Same Candidate, Second Table: Fracture of the base of the skull; how was this probably caused? Situations of fracture in the base? What are its signs? The diagnostic significance of escape of sub-arachnoid fluid from the ear? What would be the prognosis in such case? The causes of death? What is the physiological cause of death from injury to the medulla oblongata or the cord, between the origin of the pneumogastric and phrenic nerves? Fracture of the femur in upper or middle third of the shaft; is there ever union without any shortening? If not, why not? Is the fracture ever transverse? If both limbs are of equal length by measurement, would that be absolute proof of there being no shortening? What is this specimen? Caries of tarsus. Why caries? Give your definition of caries. The usual seat in the osseous texture? State some typical examples of caries. Tuberculous testis; a section showing deposit. The usual seat of deposit? Is it inter-tubular or intra-tubular? Acute glaucoma; what are its symptoms? Its duration before blindness? Describe the operation of iridectomy. What after-treatment?

In conclusion, I would offer the following general remarks with regard to the Fellowship examination:

Respecting the *written* examination, the qualities of a good paper, whether anatomical or surgical, may be gathered from those which I have carefully perused. Each element of any question should be answered, and in successive order; but nothing foreign to the question introduced. Conciseness and brevity are valuable qualities, and especially as enabling the candidate to answer all the questions, instead of the modicum number, and with due allotment of space to each, in the time allowed for examination. In the surgical paper by *senior* Members, some reference to the candidate's own experience of cases may not unreasonably be expected, just briefly stated by way of illustration. Some evidence also of more special reading than could perhaps be gathered from a general text-book on Surgery would indicate that higher and larger range of thought and aspiration which should distinguish a Fellow of the College. References, therefore, to standard authorities on Pathology and Surgery, and to their original observations, can scarcely fail to be acceptable.

In the *practical* examinations, operations on the dead subject are only an undress rehearsal, as it were, of the



representative procedures on the living body, as *surgical* operations. Due allowance therefore must be made for the different, and in some respects unfavourable, circumstances in which candidates are placed at the College. Moreover, the want of an adequate supply of subjects in the schools restricts the opportunities for practice even on the dead body. These, and perhaps other reasons, combine to render the Operations at the College the least satisfactory part of the whole course of Examination.



DIPLOMA OF FELLOW :  
EXAMINATION PAPERS.

FIRST EXAMINATION.

ANATOMY.

Three hours are allowed for the paper on this subject.  
At least *three* of the four questions *must* be answered.

1890.

*May 9th.*

1. Give an account of the Second Lumbar Vertebra and its mode of development. Describe the ligaments attached to it, and enumerate the structures with which it is in relation.

2. Give attachments, nervous supply, relations and actions of the following Muscles :

Coraco-Brachialis ;  
Adductor Pollicis Pedis ;  
Obturator Internus.

3. Describe the Right Pleura, and mention, in their respective relations, the parts in contact with it.

4. Describe the nervous supply of the Mucous Membrane lining the Nasal Fossæ. ✓

*November 7th.*

1. Give the course, distribution, and anastomoses of the following Arteries :

Peroneal ;  
Musculo-Phrenic ;  
Posterior Circumflex.

2. Describe the development of the Ovary. State the relative position of the Structures which lie between the layers of the Broad Ligament of the Uterus, and mention the part with which each corresponds in the male.

3. Enumerate the Soft Parts in contact with the Sphenoid Bone, and give the exact relations to the Bone of each of the structures named.

4. Describe the dissection necessary to expose the



Adductor Pollicis (Transversus) from the Dorsum of the Hand.

1891.

*May 15th.*

1. Describe the attachments and relations of the following Muscles :

Supinator Brevis ;  
Quadratus Femoris.

2. Describe the Right Auricle, and indicate its relations to the other parts of the Heart. Give an account of the development of the Right Auricle and of the Veins opening into it in the adult.

3. Describe the course, relations, and distribution of the following Nerves :

Right Recurrent Laryngeal ;  
Twelfth Dorsal ;  
External Plantar.

4. Describe the Occipito-Atlantal Joints and their ligaments. Classify the Muscles acting on these Joints, and state how the movements are limited. ✓

*November 13th.*

1. Describe fully the tributaries of the Internal Iliac Vein.

2. Describe the articulations connecting the Ribs and Vertebrae. Mention the joints which deviate from the general type of arrangement. Give the relations of the first Costo-vertebral Articulations.

3. Describe the Arytenoid Cartilage and the Muscles attached to it, with their actions and nerve-supply. Give an account of the development of the Larynx. ✓

4. Describe the tendons of insertion of the Extensor Communis Digitorum, from their entrance into the sheath in the posterior annular ligament to their termination, together with the various structures which unite with them in the hand.

1892.

*May 6th.*

1. Describe the Mastoid portion of the Temporal Bone ; trace the changes occurring in the course of its development, and mention in their exact relation the soft parts in contact with it.



2. Give the course and relations of the following structures :

Left Bronchus ;  
Common Bile-duct ;  
Vas Deferens ;  
Ureter in the Female.

3. Describe the Deep Fascia of the Thigh, including its bony attachments, and the extent of the supplemental fibres derived from tendinous insertion.

4. Describe the Gangliated Cord of the Sympathetic in the Thorax, with its branches and connections.

*November 11th.*

1. Describe the origin, course, and distribution of the Arteries which supply the Brain. Trace the course of the Cerebral Veins as far as their termination in the Sinuses. ✓

2. Describe the Greater and Lesser Sacro - Sciatic Ligaments, giving their attachments to bone, their continuity with neighbouring structures and their immediate relations.

3. Describe the cutaneous branches of the following Nerves :

Musculo-spiral ;  
Ulnar ;  
Anterior Crural.

4. Describe the Duodenum, giving the exact relations of its various parts and the disposition of the Peritoneum to them. Trace the development of the Stomach and Duodenum. (*No account of structural or minute anatomy required.*)

1893.

*May 12th.*

1. Describe and give the attachments and relations of the following interarticular Cartilages :

Temporo-maxillary ;  
Sterno-clavicular ;  
Semilunar of Knee.

2. Describe the Pancreas and its exact relation to the Peritoneum and surrounding structures.

3. Describe the following Muscles, and give their relations :

Obliquus Superior Oculi ;  
Obturator Externus ;  
Extensor Secundi Internodii Pollicis.



4. Describe the nervous supply of the mucous membrane of the Mouth and Pharynx, indicating the exact area supplied by each nerve.

*November 10th.*

1. Describe the Atlas. State precisely the relative position of the structures in contact with it.

2. What are the special structural modifications in Man which subserve the maintenance of the erect position?

3. Describe the course and relations of the Trachea and Bronchi, including their ramifications in the Lungs. Give an account of the development of the Trachea.

4. Describe the following structures and give their relations:

The Adductor Magnus Muscle;  
The Posterior Interosseous Artery;  
The Pudic Nerve.

1894.

*May 11th.*

1. Give a general account of the outline and construction of the bony and cartilaginous Thorax, and mention the features characteristic of the Thorax in Man.

2. Describe the Triangular Ligament of the Pelvis in the two sexes. Explain its mode of formation, and state the exact relation to it of the surrounding parts.

3. Give a full account of the following Muscles:

Scalenus Anticus;  
Obturator Internus;  
Flexor Accessorius.

4. If the Aorta be obliterated opposite to the Ductus Arteriosus, enumerate the channels by which Blood would reach the parts below.

*November 9th.*

1. Write a full account of the Curves of the Spinal Column, including their uses. Describe the movements which take place in the different regions.

2. Describe the course and relations of the Inferior Vena Cava. Enumerate its branches, and give an account of its development.

3. Describe the Muscles attached to the Cricoid and Arytenoid Cartilages, together with their actions. Give



the steps by which you would expose them, the Larynx having been removed from the body.

4. Give the superficial origin, course, distribution and communications of the Glosso-Pharyngeal Nerve.

1895.

*May 10th.*

1. Write an account of that part of the Base of the Skull bounded in front by a line drawn immediately in front of the bases of the Pterygoid processes, and behind by one passing through the apices of the Mastoid processes.

2. Describe the Arches of the Foot, and give an account of the Structures by which they are maintained. Explain how Weight is transmitted through them to the ground.

3. Write an account of the Thyroid body, including its development.

4. State precisely the distribution of the Cutaneous Nerves of the Upper Extremity.

*November 8th.*

1. Describe the last Rib and its variations. Enumerate the ligaments and muscles attached to it, and give the nerve-supply of the latter.

2. Give the steps of the dissection by which you would expose the outer surface of the Genio-hyo-glossus. Describe accurately the relative position of the structures met with in the course of the dissection.

3. Write an account of the Blood-supply and Membranes of the Spinal Cord. Explain how the latter is suspended and protected in its canal.

4. Describe the anatomy of the lower part of the Rectum from the middle of the Sacrum to the tip of the Coccyx. Give an account of its development.

1896.

*May 8th.*

1. Describe the Seventh Cervical Vertebra, including its development. Summarise the points in which it differs from the third. Enumerate the muscles attached to it, with their nerve-supply.

2. Write an account of the Posterior, Lateral, and Crucial Ligaments of the Knee. Explain how they influence the various movements of the Joint.



3. Describe the Broad Ligament of the Uterus, with all its contents. Give an account of the different vestigial structures, mentioning their homologues in the male.

4. Describe the relative position of all the structures which must be removed in order to expose the anterior surface of the Trachea in the whole of its course.

*November 13th.*

1. Describe the nasal septum, including its development, ossification, and the vestigial structures connected with it.

2. Describe, in their relative positions, the structures met with in the dissection necessary to expose the anterior aspect of the Right Subclavian Artery.

3. Write an account of the Fissure of Rolando, and the Fissure of Sylvius, together with the Convolutions that bound them. Give their Blood-supply, and their relations to the Skull.

4. Describe the mode of insertion of the Tendons of the Index-Finger, including its metacarpal bone.

1897.

*May 7th.*

1. Describe the Pubic portion of the Innominate Bone in the Male and Female, together with its development. State what part it plays in the Mechanism of the Pelvis.

2. Describe the relations of the structures which lie between the skin and the deep fascia in the Lower Extremity.

3. Give the topographical anatomy of the Liver. Write an account of its development.

4. Write an account of the origin, course, distribution and anastomoses of the Superior Intercostal Vessels.

*November 12th.*

1. Describe the Tympanic Cavity and its Antrum as seen in a dry preparation. An account of the chief relations is expected here, but not one of the Ossicles or Tympanic Membranes.

2. Describe the attachments and actions of the Sterno-Hyoid, Sterno-Thyroid, and Omo-Hyoid. Give the primary source and course of the nerves which supply them.

3. Give the course, relations, and blood-supply of the Ureter in the male and female.



4. Write an account of the Deep Fascia of the Upper Extremity below a line drawn across the limb at the lower level of the Axilla.

1898.

*May 13th.*

1. Give an account of the development, ossification, and uses of the Scapula and Clavicle. Contrast the Shoulder-girdle of Man with that of Birds and Ruminants.

2. Describe, in detail, the muscles, aponeurosis, vessels, and nerves of the Pharynx.

3. Write an account of the Cæcum and Vermiform Appendix, including their development.

4. Give precisely the course, relations, and anastomoses of the Internal and External Circumflex Arteries.

#### PHYSIOLOGY.

Three hours are allowed for the paper in this subject. At least *three* of the four questions *must* be answered.

1890.

*May 9th.*

1. What are the changes which Fat undergoes in the Alimentary Canal preparatory to Absorption? By what means are these changes brought about?

2. Discuss the origin of the Urates and Inorganic Salts found in the Urine.

3. Write a detailed account of the Nervous Mechanism of Respiration.

4. Describe the development of the Placenta. What functions are ascribed to it, and on what evidence?

*November 7th.*

1. Give an account of the phenomena which accompany sudden variations in the amount of Blood in the Vessels. What do you know of the life-history of a Red Blood-Corpuscle?

2. Describe the minute structure of a Thoracic Ganglion of the Sympathetic Chain, and the way in which it is connected with other parts of the nervous system, both central and peripheral.

3. What are the Chemical Products formed by a Muscle in action? How are they eliminated from the body? What is the immediate source of muscle-energy?



4. Describe the development of the Primitive Alimentary Canal, and enumerate, without description, the parts derived from it.

1891.

*May 15th.*

1. Review the more important theories concerning the mode of secretion of Urine. Give your reasons for adopting or excluding those you support or reject.

2. Describe in detail the structure of the gray matter of the Spinal Cord. Give a theory of co-ordinate reflex action, and support it by facts resting on experimental evidence.

3. Describe the structure and development of the refractive media of the Eye. Explain the production of a distinct image on the retina.

4. What are the relative proportions of the gases found in Arterial and Venous Blood? What are their relationships to the various constituents of the Blood? How can these relationships be demonstrated?

*November 13th.*

1. Describe the mode of secretion of the Mammary Gland. Enumerate the organic constituents of Milk. Give the method of separating each. Discuss their relation to allied chemical bodies.

2. Give an account of the more important experiments illustrating the influence of the nervous system upon the Arterial Pressure in the different parts of the body.

3. Describe briefly the ultimate distribution of the Auditory Nerve. Discuss the experimental and other evidence upon which our knowledge of its functions is based.

4. Describe the glands of the stomach. What are the characteristics of the various constituents of the Gastric Juice? Give in detail their effect upon Food-stuffs. Illustrate your statements by a description of experiments.

1892.

*May 6th.*

1. Describe the sources and method of regulation of the Heat of the Animal Body. What is the meaning of the common terms 'cold' and 'warm' blooded? Give



an account of some experiments used to determine the amount of heat lost by an animal in a given time.

2. State concisely what is known of Hæmoglobin; its origin, compounds, derivatives, and the homologous substances found in the animal kingdom.

3. Describe the minute structure and the development of the Adrenals. What theories have been advanced as to their functions? State the evidence upon which our knowledge of this subject is based.

4. Write a brief summary of the various methods by which the functions of the white columns of the Spinal Cord have been investigated. What is our present knowledge of the paths of conduction in those columns?

*November 11th.*

1. What are the experimental data which lead us to believe: (1) That certain constituents of the Urine are formed outside the Kidney? (2) That different Urinary constituents are secreted in different parts of the Urinary tubules?

2. What phenomena accompany fatigue in Striated Muscle? How have they been studied in an excised Skeletal Muscle?

3. Describe the nerve-endings in the Cornea, Skin, Subcutaneous Tissue, and Striated Muscle; and the methods by which they may be demonstrated in each case.

4. What temporary variations in volume may occur in the Spleen, a Kidney, and a Limb? How are they caused, and how have they been studied?

1893.

*May 11th.*

1. Describe the various appearances which have been observed in a serous Salivary Gland. By what methods may they be demonstrated?

2. What are the Chemical and Microscopical characters of the fluid found (*a*) in the Lacteal Vessels; (*b*) in a Lymphatic Vessel from the leg; and (*c*) in the Sub-arachnoid Space? Discuss the views held as to the origin of Lymph, quoting experimental evidence in support of your statements.

3. Discuss the Physiology of Hemipopia; and trace the



course of nerve-impulses resulting from stimulation of the right Retina by light to the cortical centre.

4. Describe the development of the Allantois. What functions does it perform in foetal life, and what permanent structures are formed from it?

*November 9th.*

1. Give the experimental evidence proving the existence of vaso-constrictor and vaso-dilator Nerve-fibres. Trace the course of the vaso-motor nerves to the Kidney, and describe any change of structure which these nerves undergo between the Spinal Cord and their terminations.

2. What is the chemical composition of Muscle? and by what methods can its chemical components be separated? Compare its value as a food with that of wheaten flour.

3. Describe the development of the Mammalian Heart.

4. Describe the various forms of Nerve-cells met with in Man in—

The Spinal Cord;  
The Spinal Ganglia;  
The Cerebellum.

How are these cells related to Afferent and Efferent Nerve-fibres? By what Histological methods have these relations been demonstrated?

1894.

*May 10th.*

1. How has our present knowledge of Cerebral Localization been arrived at? Indicate by means of diagrams the position of the chief cortical centres.

2. Give the chemical characters, tests for, and mode of preparing Glycogen. State the causes which lead to variations in its amount in the Liver and Muscle. What is its use in the animal economy?

3. Describe the minute structure and functions of the Iris. By what nerves is it supplied, and what experiments have been performed in order to account for variations in the size of the Pupil?

4. What is the nature of Secretion? Illustrate your reply by reference to what is known of the phenomena accompanying secretion in the Kidney, Sweat Glands, and Mammary Gland.



*November 8th.*

1. Discuss the chemistry of Blood-clotting, and contrast it with allied phenomena observed in other animal substances.

2. Describe the principal experiments by which the position and physiological relations of the vaso-motor centre have been determined. What effects are produced by :

Faradization of the peripheral end of the divided Vagus below the origin of the Superior Laryngeal Nerve ?

Similar stimulation of the central end of the divided Depressor Nerve ?

Stimulation of the central end of the divided Sciatic Nerve ?

3. Describe the minute structure of the Urinary Bladder, and explain the Physiology of Micturition. What are the physical and chemical changes that Urine undergoes when freely exposed to the air ?

4. Describe a Graafian Follicle and the manner in which it is developed. What changes occur in the Ovum previous to Fertilization ?

1895.

*May 9th.*

1. What variations in (a) pressure and (b) velocity does blood undergo in making a complete circuit of the vascular system ? Explain how those variations are brought about, citing experimental evidence in support of the statements you make.

2. Describe Gastric Proteolysis, naming the several chemical substances successively produced during the process. State how you would separate each substance, and give its characteristic reactions.

3. What is Electrotonus ? Explain in detail how it is produced. By what method would you demonstrate the electrotonic variation of the excitability of a nerve ?

4. Describe (a) the development of the eyeball, and (b) the minute structure of the two outermost layers of the Retina.

*November 7th.*

1. What effects follow complete removal of :

The Pancreas ;

One Kidney ;

Both Kidneys ?



What explanations have been offered of the results which follow in each case?

2. Describe the Pulse-wave and the methods of investigating it. How may its length and velocity be determined? What are the chief causes by which it is modified? Explain the manner in which they act.

3. Give a Diet Scale for a healthy man, and state the manner and form in which its chief constituents are excreted. How must the diet be varied, and how are the excreta modified when laborious work is done?

4. Suppose a Cerebro-spinal Nerve (*e.g.*, the Sciatic) to be divided. State:

The Physiological effects;

The subsequent Histological changes in the Nerve itself.

How are nerve-fibres developed, and how are they regenerated?

1896.

*May 7th.*

1. What is the composition of Human Bile? Give an account of the probable origin and destiny of its several constituents, giving the evidence on which your statements are based. Describe the mode of origin and minute structure of the Bile-duct.

2. Compare the physiological properties of Smooth, Cardiac, and Skeletal Muscles. How do nerves terminate in skeletal muscle, and by what histological methods have they been demonstrated?

3. How would you estimate the amount of heat given off by a Mammal? How and where is Heat produced in the body? How is it lost? and how is the temperature regulated?

4. Describe the minute structure and arrangement of a Uriniferous Tubule from its origin to its termination including the blood-vessels in relation with it. State the function of its several parts, giving evidence in support of your statements.

*November 12th.*

1. Give an account of the structure of the Gastric Mucous Membrane, and of the functions of its several parts.

2. What experimental evidence is there to show that Nerve-fibres are not subject to fatigue, whereas the Nerve-centres and Peripheral Mechanisms are subject to fatigue?



3. Discuss the formation of Urea in the body.
4. Describe the chief Spinal Paths by which Afferent impulses reach the Cerebrum and Cerebellum respectively, commenting on the probable nature of the impulses transmitted. By what methods have the tracts in question been determined?

1897.

*May 6th.*

1. Describe the structure and functions of the Semi-circular Canals in a Bird or Mammal, giving the experimental evidence on which your statements are based.
2. Describe the structure and action of the Mitral and Aortic Valves. Give the exact relations of the Heart-sounds to the other events in the Cardiac Cycle, and state the experiments by means of which this relationship has been established.
3. What experimental evidence is there that the chief oxidative changes of the body occur in the tissues?
4. Describe the minute structure of a Sympathetic Nerve-ganglion. What experimental methods have been used to determine the relations of the Nerve-fibres to the Nerve-cells in, *e.g.*, the Superior Cervical Sympathetic Ganglion?

*November 11th.*

1. Describe the minute structure of a lobule of the Mammary Gland, and the changes which it undergoes during secretion.
2. Describe fully the changes which Starch undergoes in the Alimentary Canal, and the manner in which its products are absorbed.
3. How may the output of the Heart be determined experimentally? How is the work done by the Heart affected by variations (1) in the tonus of the small arteries, (2) in the amount of circulating fluid?
4. Describe the structure of the Spinal Cord as seen in a transverse section in the mid-cervical region. What methods have been used for the mapping out of tracts in the white matter? What is the evidence showing that the various tracts have different functions?



1898.

*May 12th.*

1. In what ways may experimental Glycosuria be established? Discuss its immediate causation in each case.

2. How would you prove the existence of a Respiratory Centre? Enumerate the Nerves which modify the activity of the centre, and state the effects they produce.

3. Describe the minute structure of the Retina in its various parts. What changes have been observed to occur in the Retina when light falls upon it?

4. Describe the changes which are produced in the Blood and in the circulatory mechanism by Asphyxia.

## SECOND EXAMINATION.

## PATHOLOGY, THERAPEUTICS AND SURGERY.

Four hours are allowed for the paper in this subject. All four questions *must* be answered.

1890.

*May 26th.*

1. Describe in detail the various modes of origin of the so-called 'loose cartilage' in the Knee-joint, the clinical history of such a case, and its appropriate treatment.

2. How may the presence of Stone in the Kidney be diagnosed? Describe in detail the method you would adopt for the exposure and exploration of the Kidney for Stone. Describe the operations that may be required.

3. Describe the pathological process which results in Dupuytren's contraction of the fingers. How would you treat such a case?

4. Describe in detail the various forms of solid growths that may affect the Upper Jaw. Give their differential diagnosis. ✓

*November 17th.*

1. What are the causes of Thrombus in an Artery? Enumerate its dangers. Describe the treatment you would adopt in a case of Thrombus affecting the Brachial Artery.



2. Describe in detail the surgical treatment you would adopt in Empyema, and state how such treatment would be modified by the various complications which may attend or follow the operation.

3. Enumerate the various conditions (excluding those of the mouth and pharynx) which may produce Dysphagia. Give the differential diagnosis of these conditions.

4. Describe the causes, course, and treatment of sympathetic Ophthalmia.

1891.

*May 18th.*

1. Describe the diseases of the Thyroid Gland, with the appropriate treatment of each.

2. Give the pathology, symptoms, differential diagnosis, and treatment of disease of the Sacro-iliac Joint.

3. Describe a case of Otitis Media Purulenta, with its complications.

4. Under what circumstances may Perforating Ulcers of the Foot occur? Explain their pathology and treatment.

*November 18th.*

1. Give the pathology, diagnosis and treatment of Cystic Tumours of the Neck, excluding those connected with the Thyroid Gland.

2. Give the clinical history, symptoms and diagnosis of a case of inflammation of the Cæcal Appendix. Describe in detail your treatment of the case; give the indications for operative treatment, and the operation you would perform.

3. Enumerate the different directions in which the Astragalus may be dislocated from all its articulations, and describe the signs of each. What treatment would you adopt under varying circumstances?

4. Discuss the relative advantages of Supra-pubic and Perineal Cystotomy, and enumerate the conditions under which you would perform one or the other operation.

1892.

*May 16th.*

1. Under what circumstances may the symptoms persist after the reduction, or apparent reduction, by



Taxis of a Strangulated Inguinal Hernia? Give the diagnosis and treatment of each condition.

2. Describe a case of Rabies in Man (Hydrophobia), and state the treatment you would adopt. Upon what grounds is Pasteur's treatment based? How is it carried out, and what are the results claimed for it?

3. Under what circumstances would you deem it advisable to remove the Eyeball? Give the details of the operation you would perform.

4. Enumerate the causes which may give rise to paralysis of the Facial Nerve. Point out the diagnostic features of each.

*November 21st.*

1. Give the differential diagnosis and treatment of the swellings which may occur beneath the Gluteus Maximus.

2. State the pathology, diagnosis, and treatment of diseases affecting the extremities of the Long Bones in Children, excluding new growths.

3. Give the diagnosis, and discuss the treatment, of a Calculus in the Gall-bladder or Bile-ducts.

4. Describe the changes which may follow a traumatic communication between an Artery and a Vein in a limb. Give the symptoms, and discuss the treatment of such a condition.

1893.

*May 22nd.*

1. Give the causes, symptoms and treatment of the various forms of Torticollis.

2. Discuss the influences of Diabetes and Albuminuria in Operative Surgery.

3. Give the pathology and symptoms of the various forms of Cystic Tumour of the Ovary and Broad Ligament.

4. Give the pathology, differential diagnosis, and treatment of Chronic Enlargements of the Lymphatic Glands. ✓

*November 20th.*

1. Describe the immediate and remote complications which may follow Tracheotomy, and give the treatment of each.

2. Explain the occurrence of Umbilical Hernia in the infant and in the adult. Describe the symptoms of Obstructed and of Strangulated Umbilical Hernia in the adult, and discuss the treatment.



3. Give the pathology, diagnosis and treatment of Cold Abscess.

4. Discuss the pathology, and give the symptoms and treatment of Septic Thrombosis of the Lateral Sinus.

1894.

*May 21st.*

1. Give the symptoms, diagnosis, possible complications and treatment of tuberculous disease of the Atlas and Axis.

2. What is the most frequent cause of Convergent Strabismus in children? How would you determine the nature and the extent of the defect, and how would you treat it?

3. Discuss the diagnosis between Tuberculosis, Syphilis, Osteo-arthritis, and Charcot's disease of the Knee-joint.

4. Give the pathology of Senile Enlargement of the Prostate Gland. Describe the immediate and remote consequences which may result from this condition.

*November 19th.*

1. Upon what causes (excluding Fracture) may shortening and lengthening of the lower limb depend? Give the differential diagnosis.

2. Discuss the causes of persistent closure of the Jaws, and give the treatment. ✓

3. Describe the various forms of Ulceration in the Rectum, with their causes, pathology, and treatment.

4. Give the pathology, symptoms, treatment, and prognosis of Adeno-Sarcoma of the Breast.

1895.

*May 20th.*

1. Enumerate the complications which may be associated with imperfect descent of the Testicle, and give their diagnosis and treatment.

2. Give the causes of Scoliosis, and describe the structural changes which result from this condition. Give the treatment of the early stage of an uncomplicated case of Scoliosis in a young adult.

3. Give the diagnosis and treatment of the conditions which may lead to protrusion of the Eyeball.

4. What spontaneous changes may occur in Hydatid



Cysts? Discuss the methods of surgical treatment which have been adopted for Intra-abdominal Hydatid Cysts, and give your reasons for selecting the one you would employ.

*November 18th.*

1. Give the diagnosis, treatment, and consequences of traumatic separation of the lower Epiphysis of the Radius.
2. Discuss the causation and morbid anatomy of the various forms of Cystic enlargement of the Kidney. What symptoms may be caused by, and what treatment would you adopt for, each form?
3. What is Actinomyces? Give the pathology, diagnosis and treatment of this disease.
4. Discuss the pathology, and give the symptoms and treatment of congenital dislocation of the Hip-joint.

1896.

*May 25th.*

1. Give the causes, pathology, symptoms, and treatment of Thrombosis of the main artery of a limb.
2. Discuss the etiology, diagnosis, pathology, and treatment of Acute Tetanus.
3. Give the causes, symptoms, diagnosis, and treatment of disease of the Sacro-iliac Articulation.
4. What may be the causes of Hæmaturia of Vesical origin? Give the differential diagnosis and the treatment. (Details of operative treatment are not required.)

*November 23rd.*

1. Give the pathology, diagnosis and treatment of growths in the Naso-pharynx (exclusive of Adenoids).
2. Give an account of the various ways in which the Long Bones may be affected by Hereditary Syphilis.
3. Give the pathology, diagnosis and treatment of Sub-diaphragmatic Abscess.
4. To what causes may the persistence of the symptoms of Strangulation be due after apparent reduction of an Inguinal Hernia? Give the treatment you would adopt.

1897.

*May 24th.*

1. You are called to a man who has become insensible after a recent fall upon his head. Describe the investiga-



tion you would make in order to decide whether any operation is advisable; and if an operation be decided upon, give its nature and locality.

2. Give the diagnostic characters of the Malignant Tumours of the Lower Jaw. ✓

3. Give the diagnosis and treatment of a Traumatic Rupture of the Intestine.

4. Give the varieties, symptoms, and treatment of Subastragaloid Dislocation.

*November 22nd.*

1. Give the pathology, diagnosis, and treatment of Submaxillary Cellulitis (Angina Ludovici). ✓

2. What pulsating tumours may occur in the Buttock? Give their differential diagnosis, and describe the treatment of each.

3. Give the pathology and treatment of Tuberculous disease as it affects the Kidney, Ureter and Bladder, respectively.

4. Describe the immediate and remote changes produced by Rickets in a long bone such as the Tibia, and give the treatment you would adopt.

1898.

*May 23rd.*

1. What conditions may lead to 'Spontaneous Fracture' of the Femur? Give the differential diagnosis and the treatment in each case.

2. Discuss the diagnosis and treatment of Aneurism of the Innominate Artery.

3. Describe the Varieties and the Pathology of Dermoid Cysts. State any special points which may arise in connection with their treatment.

4. Describe the symptoms and treatment of Abscess of the Brain, the result of Middle-ear Disease, and trace the anatomical course of the secondary infection.





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