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# SYLLABUS

OF

# COURSE OF LECTURES

ON

# CHEMISTRY

AS DELIVERED BY

## JAMES S. BRAZIER, F.C.S.,

PROFESSOR OF CHEMISTRY

IN THE

UNIVERSITY OF ABERDEEN.

\* . cidare. Varieties of Attraction — Gravitation — Cohesion — Adhesion — Chemical Force.

Physical States of Matter — Solids — Liquids — Gases.

HEAT. — Sources of Heat — General Effects of Heat — Expansion of Solids — Expansion of Gases — Thermometers — Principle of Graduating a Thermometer — Pyrometers — Correction of Gases for Temperature — Conduction of Heat.

FLUIDS. — Filtration — Solution

— Crystallization — Water Chemically
combined — Hydrates — Water of
Crystallization — Diffusion of Liquids —
Dialysis — Crystalloids — Colloids.

Specific Gravity — Maximum Densitypoint of Water — The Hydrometer.

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Disappearance of Heat during Liquefaction — Freezing Mixtures — Disappearance of Heat during formation of Vapour — Fusing Points.

Principles of Chemical Nomenclature

— General Arrangement of the Elements —

OXYGEN—Priestley's Discovery of Oxygen

— Usual methods adopted for its Isolation

— Properties of Oxygen.

THE ATMOSPHERE. — Lavoisier's Discovery of Oxygen in the Atmosphere — NITROGEN — How usually Isolated — Its Properties — The Constant proportion of Oxygen in Air, expressed by Weight and by Volume — Methods for ascertaining the proportion of Oxygen in Air — Proportion of Aqueous Vapour in the Air — Proportion of Carbonic Acid in the Air — Ozone.

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Properties of Gregory.

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Weight of the Air — The Barometer — Correction of Gases for pressure — Ebullition — Influence of Pressure on Boiling Points — Evaporation — Correction of Gases for Moisture — Dew Point — Hygrometers.

HYDROGEN — Usual methods adopted for its Isolation — Properties of Hydrogen — WATER — Composition of Water — Synthesis of Water — Eudiometry — Hydrogen Di-Oxide.

CARBON — Varieties of Carbon —
Preparation and Properties of Carbon —
CARBONIC ACID (Anhydride) — Sources
of Carbonic Acid — Properties of Carbonic
Acid — Synthesis of Carbonic Anhydride
— Liquefaction and Solidification of Gases
— Spheroidal State produced by Heat —

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CARBONIC OXIDE — Preparation and Properties of Carbonic Oxide OXALIC ACID — Its Composition and Decomposition.

HYDRO-CARBONS — Light Carburetted Hydrogen (Marsh Gas) — Occurrences, Preparation and Properties of Marsh Gas — Heavy Carburetted Hydrogen (Olefiant Gas) — Dutch Liquid — Occurrences, Preparation and Properties of Olefiant Gas.

Manufacture of COAL GAS—Structure of Flame — Ignition — Combustion — Theory of the Blow-pipe — Oxy-hydrogen jet — Principle of the Safety Lamp.

The Compounds of Nitrogen with Oxygen — NITRIC ACID — Its Occurrences, modes of Preparation, and

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Properties — Hydrates of Nitric Acid — Nitric Anhydride — Common Impurities in the Acid — Nitrates — Tests.

NITROUS OXIDE — Preparation and Properties of Nitrous Oxide — NITRIC OXIDE — Preparation and Properties of Nitric Oxide — NITROUS ACID — Nitrites — PEROXIDE OF NITROGEN.

Compounds of Hydrogen with Nitrogen

— AMMONIA — Solution of Ammonia.

SULPHUR — Sources of Sulphur — Various forms of Sulphur — SULPHUROUS ACID (Anhydride) — Preparation and Properties of Sulphurous Acid — OIL OF VITRIOL — Sources of Oil of Vitriol — HYDROGEN SULPHIDE (Hydro-Sulphuric Acid)

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(Sulphuretted Hydrogen) — Preparation and Properties of Hydrogen Sulphide — Sulphides — Sulphurets.

CARBON DI-SULPHIDE (Bi-Sulphide of Carbon) — Its Preparation.

Composition, and Properties.

SALT — Varieties of Salt — Sources and Preparation of Salt — HYDRO-CHLORIC ACID (Spirit of Salt) — Preparation and Properties of Hydro-chloric Acid — CHLORINE — Tests of Hydrochloric Acid — Its Preparation and Properties — BROMINE — Hydrobromic Acid — IODINE — Hydrodic Acid — FLUORINE — Hydrofluoric Acid.

METALS — General remarks on the Metals — POTASSIUM — Tartar

Potassic Carbonate — Potassic Hydrate
 (Caustic Potash) — Preparation of
 Potassium — SODIUM — Sodic Carbonate — Sodic Hydrate (Caustic Soda) —
 Preparation of Sodium — Characters of the Salts of Potassium and Sodium.

Chemical Distinction of Bodies into Elements and Compounds — Differences between Physical and Chemical Properties Varieties of Attraction — Characters of Chemical Attraction — Laws of Chemical Combination -- Law of Definite Proportions — Law of Multiple Proportions — Law of Equivalent Proportions History of Observations tending to support these Laws — Combining Proportions - Equivalents - Atoms -Constant Proportion in Compound Bodies — (Molecular Weight) — Law of Volumes Symbolic Notation.

Compounds of Sulphur with Oxygen —
NORDHAUSEN SULPHURIC ACID
— SULPHURIC ANHYDRIDE —
SULPHURIC ACID — Theory of its
Formation — Process of its Manufacture
— Hydrates of Sulphuric Acid — Impurities in Sulphuric Acid — Properties
of Sulphuric Acid — Sulphates — Tests
for Sulphur, Sulphides, and Sulphates.

(SELENIUM - TELLURIUM.)

Compounds of Chlorine with Oxygen

— CHLORATES — Potassic Chlorate

— Barytic Chlorate — Chloric Acid —

Per-Chlorates — Potassic Per-Chlorate —

Per-Chloric Acid — Per-Oxide of Chlorine

— Chlorites — Chlorous Acid — Chlorous

Anhydride — HYPO-CHLORITES —

Hypo-Chlorous Acid — Hypo-Chlorous

Anhydride — Bleaching Compounds —

Euchlorine — Aqua Regia.

STREET, STREET, STREET,

BROMINE — Sources — Method for Separating Bromine — Properties of Bromine — Bromides — Potassium Bromide.

IODINE — Sources — Method for
Separating Iodine — Properties of Iodine
Iodides — Potassium Iodide — Iodic
Acid.

FLUORINE — Fluorides — Hydrofluoric Acid.

SILICON — Silica (Silicic Anhydride)

— Hydrates of Silica — Silicates —

Etching of Glass — Fluoride of Silicon —

Hydro-fluo-silicic Acid.

BORON — Boracic Acid — Borates
— Borax.

AMMONIA — General Sources of Ammonia — Preparation of Ammoniacal Gas — Solution of Ammonia — The Ammonium Theory — Isomerism — Isomorphism — Ammonic Sulphate — Ammonic Chloride (Sal-Ammoniac) — Ammonic Carbonates — Ammonic Nitrate — Ammonic Nitrite — Ammonic Sulphide — Characters of the Salts of Ammonia.

phorus — The Separation of Phosphorus

— Allotropic Modifications of Phosphorus — Oxides of Phosphorus — Phosphoric Anhydride — The Phosphoric Acids

— Ortho-Phosphoric (Tri-basic Phosphoric)

Acid — Bone Phosphate — Super-phosphate of Lime — Magnesian Phosphates —

Common Phosphates of Soda — Microcosmic Salt — Pyrophosphoric Acid —

Pyrophosphates of Soda — Metaphosphoric

Acid — Metaphosphate of Soda — Tests of the Phosphoric Acids — Phosphorous Anhydride — Phosphorous Acid — Hypophosphorous Acid — Hypophosphites — Phosphuretted Hydrogen.

Metals resumed. POTASSIUM —
Potassic Chloride — Potassic Carbonate
— Hydro-potassic Carbonate — Potassic
Sulphate — Hydro-potassic Sulphate —
Potassic Nitrate — Nitre Plantations —
Gunpowder.

Process of its Manufacture — Hydro-Sodic Carbonate — Sodic Sulphate — Hydro-Sodic Sulphate — Sodic Sulphite — Sodic Hypo-Sulphite — Sodic Nitrate — Sodic Chloride.

BARIUM — Baryta — Baric Hydrate

— Baric Di-Oxide — Baric Sulphate —
Baric Sulphide — Baric Chloride — Baric
Nitrate — Baric Carbonate — Characters
of the Salts of Barium.

STRONTIUM — Strontia — Strontic Sulphate — Strontic Sulphide — Strontic Chloride — Strontic Nitrate — Strontic Carbonate — Characters of the Salts of Strontium.

CALCIUM — Lime (Quick Lime) — Calcic Hydrate (Slaked Lime) — Calcic Sulphate (Plaster of Paris) — Calcic Nitrate — Calcic Chloride — Calcic Carbonate (Chalk)(Marble) — Characters of the Salts of Calcium.

SPECTRUM ANALYSIS.

WATERS

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ALUMINUM — Alumina — Alumina
Hydrate — Alum — Mordants — DyeingClays — Porcelain — Glass — Ultramarine — Reduction of Aluminum —
Aluminic Chloride — Cryolite — Characters
of the Salts of Aluminum,

GLUCINUM — YTTRIUM — ERBIUM — ZIRCONIUM — CERIUM — LANTHANUM — DIDYMIUM.

MAGNESIUM — Extraction of the Metal — Magnesia — Magnesic Chloride — Magnesic Sulphate — Magnesic Carbonates — Characters of the Salts of Magnesium.

ZINC — Extraction of the Metal — Zincic Oxide — Zincic Sulphide (Blende) — Zincic Chloride — Zincic Sulphate — Zincic Carbonates — Characters of the Salts of Zinc.

CADMIUM — Cadmium Oxide — Cadmium Sulphate — Characters of the Salts of Cadmium.

Clay Iron Stone — Theory of the Blast
Furnace — Cast Iron — Wrought Iron —
Preparation of Pure Iron — Rusting of
Iron — Passive Condition of Iron —
Ferrous Oxide — Ferric Oxide — Magnetic
Oxide of Iron — Ferrous Sulphide —
Ferric Di-Sulphide — Ferrous Sulphate —
Ferric Sulphate — Ferrous Chloride —
Ferric Chloride — Ferrous Carbonate —
Characters of the Salts of Iron.

URANIUM - NICKEL - COBALT.

MANGANESE — Oxides of Manganese — Manganese Chloride — Manganese Sulphate — Manganic Acid

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Manganates — Permanganic Acid —
 Permanganates — Characters of the Salts of Manganese.

CHROMIUM — Chrome Iron Stone

— Chromates — Chromic Anhydride —

Chromic Acid — Chromic Oxide —

Chrome Alum — Chloro-Chromic Acid —

Characters of the Salts of Chromium.

LEAD — Extraction of Lead — Separation of Silver from Lead by Cupellation — Pattinson's process for extracting Silver from Lead — Action of Water on Lead — Plumbic Oxide (Litharge) — Red Oxide of Lead (Minium) — Plumbic Di-Oxide — Plumbic Sulphide (Galena) — Plumbic Nitrate — Plumbic Acetate — Plumbic Sulphate — Plumbic Carbonate (White Lead) — Characters of the Salts of Lead.

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#### THALLIUM - INDIUM.

SILVER — Extraction of Silver by Amalgamation — Silvering process — Sub-Oxide of Silver — Argentic Oxide — Argentic Chloride — Argentic Nitrate — Characters of the Salts of Silver.

MERCURY — Mercurous Oxide
(Black Oxide of Mercury) — Mercuric
Oxide (Red Oxide of Mercury) — Mercurous
Sulphide — Mercuric Sulphide (Cinnabar)
(Vermillion) — Mercurous Chloride (Calomel) — Mercuric Chloride (Corrosive
Sublimate) — Nitrates of Mercury —
Sulphates of Mercury — Action of Ammonia
on Corrosive Sublimate (Mercuramine) —
Iodides of Mercury — Characters of the
Salts of Mercury.

COPPER — Copper Smelting — Cupreous Oxide (Sub-Oxide of Copper) —

Cupric Oxide — Sulphides of Copper (Copper Pyrites) — Carbonates of Copper — Cupric Chloride — Cupric Nitrate — Cupric Sulphate — Characters of the Salts of Copper.

BISMUTH — Bismuth Oxide — Bismuth Sulphide — Bismuth Chloride — Characters of the Salts of Bismuth — Alloys.

CADMIUM — Cadmium Oxide — Cadmium Sulphate — Characters of the Salts of Cadmium.

PLATINUM — Properties of Platinum — Platinic Chloride — Characters of the Salts of Platinum.

GOLD — Extraction of Gold — Characters of the Salts of Gold.

PALLADIUM — RHODIUM — RUTHENIUM — OSMIUM — IRIDIUM.

Metal — Stannous Oxide (Protoxide of Tin) — Stannic Oxide (Binoxide of Tin) — Meta-Stannic Acid — Stannic Acid — Stannates — Stannous Chloride (Proto-Chloride of Tin) — Stannic Chloride (Bi-Chloride of Tin) — Sulphides of Tin — Characters of the Salts of Tin.

ANTIMONY — Process for Extracting the Metal — Antimonious Oxide (Oxide of Antimony) — Antimonic Acid — Sulphides of Antimony — Chlorides of Antimony — Antimoniuretted Hydrogen — Tartar Emetic — Characters of the Compounds of Antimony.

ARSENIC — Separation of Arsenic from other Metals — Arsenicus Acid

(Arsenites) — Arsenic Acid (Arseniates) — Sulphides of Arsenic (Realgar)(Orpiment) — Arseniuretted Hydrogen — Other Compounds of Arsenic — Characters of the Compounds of Arsenic — Search for Arsenic by Reinsch's Test; Marsh's Test; Clark's Test.

TUNGSTEN - TUNGSTIC ACID - TUNGSTATE OF SODA.

TITANIUM — MOLYBDENUM — THORINUM — NIOBIUM — TANTALUM — VANADIUM.

Products of Destructive Distillation —
Products of Distillation of Coal — Coal
Tar — Benzol — Toluol — and their
Homologues — Nitro Benzol — NitroToluol — Aniline (Phenylamine) — Rosaniline (Magenta) — Leucaniline —
Crysaniline — Carbolic Acid — Naphthalin
— Action of Nitric Acid on Naphthalin —

Action of Chlorine on Naphthalin —
Paraffin — Products of Distillation of
Wood — Wood-Spirit (Pyroxylic Spirit)
Pyroligneous Acid.

The Saccharine or Amylaceous Group Lignin — Cellulose — Vegetable Parchment — Cotton — Gun-Cotton — Starch — Oxalic Acid — Dextrin — Glucose — Grape Sugar — Fruit Sugar — Cane Sugar — Sugar of Milk — Tests of Sugar - Different Varieties of Fermentation — Alcoholic Fermentation — Fermentation of Bread — Almond Fermentation — Mustard Fermentation — Alcohol — Aldehyd — Acetic Acid — Ether — The Homologous Series (The Ethyl, Methyl, and Amyl Series) - Monatomic Alcohols — Diatomic Alcohols — Triatomic Alcohols — Glycerin — Compound Ethers.

Artificial and Natural Organic Bases.

Ultimate Analysis of Organic Bodies.

Calculation of Empirical Formulæ.

The Cyanogen Group — Prussian Blue — Mercuric Cyanide — Cyanogen — Ferro-Cyanides — Potassic Ferro-Cyanide (Prussiate of Potash) — Hydro-Ferro-Cyanic Acid — Potassic Cyanide — Hydro-Cyanic Acid — Ferri-Cyanides (Red Prussiate of Potash) — Hydro-Ferri-Cyanic Acid — Sulpho-Cyanides — Platino-Cyanides — Nitro-Prussides — Cyanates — Cyanuric Acid — Fulminic Acid.

Urea — Artificial and Natural Sources
— Uric Acid — Products of the Decomposition of Uric Acid — Alloxan — Alloxantin — Murexid.

Ultimate training of transmic passes.

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Store Cyanide Cyanide - Catage Store

Canide (Principle of Bolash) - Hydro

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## PRACTICAL CHEMISTRY.

### ANALYTICAL GROUPING & TESTING.

### INORGANIC.

METALS — Sodium — Potassium — Ammonium — Magnesium — Barium — Strontium — Calcium — Zinc — Manganese — Cobalt — Nickel — Iron — Aluminum — Chromium — Lead — Silver — Mercury — Bismuth — Copper — Cadmium — Platinum — Gold — Tin — Antimony — Arsenic.

ACIDS — Hydro-Sulphuric — Sulphuric — Sulphurous — Hypo-Sulphurous — Nitric — Carbonic — Hydro-Chloric — Hydro-Bromic — Hydro-Gromic — Hydro-Fluoric — Phosphoric — Chromic — Chloric — Boracic — Silicic.

### ORGANIC.

ACIDS — Acetic — Citric — Tartaric — Oxalic — Gallic — Tannic — Hydrocyanic — Uric — Meconic.

BASES — Strychnia — Brucia — Morphia — Quinia.

Calculi - Normal and Abnormal Urine.

Contract - Characterist - All Contractions