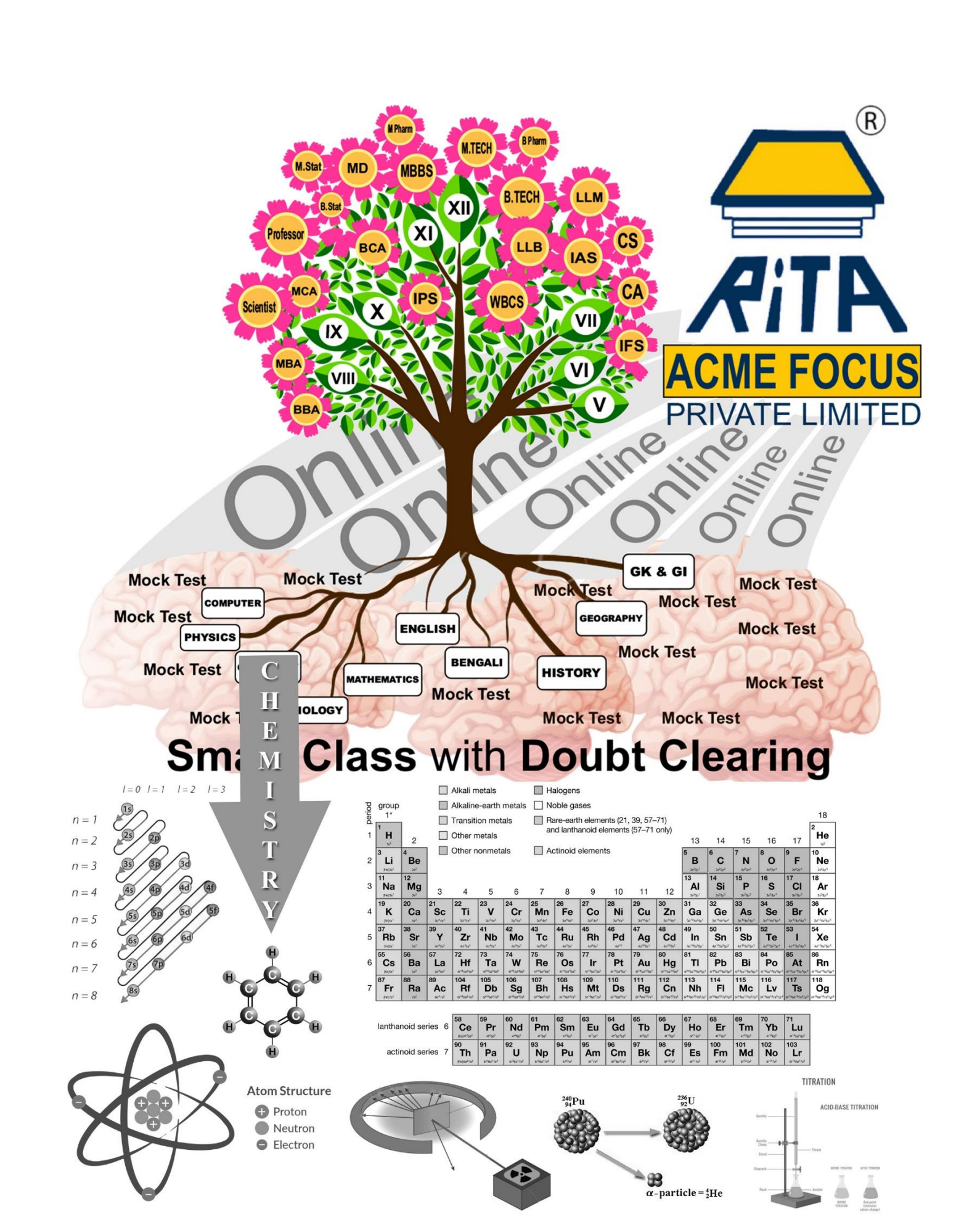

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CHEMISTRY

Our body is one type of chemical reactor where millions and millions of chemical reactions are occurring. If we can know the chemistry of the different biochemical reactions occurring in our body, then we can find out the root cause of any disease. A student having Ph.D. in Chemistry or Chemical Engineering can make his or her career in the following fields such as Biochemistry, Research and Development, Pharmaceutical Industry, Oil and Refinery Industry, Paint and Polymer Industry, Food Industry, Beverage Industry etc. RITA ACME FOCUS [RAF] helps the students to clear the concept of each and every sub-topic of any chapter through Mock Test and smart Doubt Clearing Class. The mock paper is designed by highly educated faculties and it will cover the all the sub-topics of any chapter. The Mock Test and Doubt Clearing Class programs enhance the knowledge on Chemistry, increase the confidence and ultimately a student can excel in any exam.

SYLLABUS

Class V

Chemistry: (A) Ecology**,** Environmental Problems**,** Pollution**,** Natural Resources**,** What Can Be Done?

(B) Importance of Soil How Is Soil Formed? Soil Erosion; Soil Conservation.

(C) Accidents, First Aid, Fire, Igneous rocks

(D) Sedimentary Rocks, Metamorphic Rocks, Wealth from Rocks.

(E) The Atmosphere; What Is in The Atmosphere; The Atmosphere Protects Life; What Does Air Contain? Air Occupies Space; Air Has Weight

(F) Impurities in Water; Removing Insoluble Impurities; Removing Soluble Impurities; Drinking Water.

(G) Solid

(H) Liquid

(I) Gas.

Class VI

(A) Introduction of chemistry, Alchemy, importance of chemistry, dark side of chemistry, Name of the scientists and their important discoveries. Important common laboratory apparatus, their description and uses. Precautions to be taken in a chemistry laboratory.

(B) Definition of fiber, types of fiber, animal and plant fiber, what are fibers made up of, yarn, cotton, ginning, spinning, weaving, knitting, types of fabric, natural and synthetic fibers, evolution of clothing.

(C) Introduction of matter and types of matter. Composition of matter, characteristics of matter, definition of atom and molecules, differences between atom and molecule, Intermolecular space and intermolecular force of attraction, states of matter and their properties.

(D) Brownian movement and diffusion. Effect of heat on matter, Interconversion of states of matter, Terms related to interconversion of states of matter, expansion of matter, Types of change, physical and chemical changes.
(E) Classification of matter, pure and impure substances, element, metals and their properties, examples with exceptions, nonmetals and their properties, examples with exceptions. Metalloid and their examples. Differentiations between metal and nonmetal. Idea of noble gases. Important symbols of elements and their Latin names. Idea of periodic table.

(F) Examples of monoatomic, diatomic and triatomic elements, Compounds, formulae of some important compounds and name of the constituent elements present in it, uses of different elements and compounds on the basis of their properties. Mixture and their types, examples of different types of mixtures.

(G) Characteristics of mixture, difference between compound and mixture, difference between water and air. Separation techniques of mixtures. Hand picking, sieving, magnetic separation, sublimation, sedimentation and decantation, loading, filtration, evaporation, crystallization and distillation.

(H) Composition of air, properties of air, confirmatory evidence that air is a mixture not a compound, study of components of air, Uses of the components of air, combustion, respiration, Balance of gases in nature, conditions necessary for rusting, air pollution and their harmful effects.

(I) Water - a compound, occurrence of water, sources of water, Interconversion of states of water, importance of water, importance of anomalous expansion of water, potable water, characteristics of drinking water, water-borne diseases, sterilization, purification of water. Household methods to get safe drinking water, water a universal solvent, solute, solvent and solution. Saturated, unsaturated and supersaturated solution. Need to conserve water. Water pollution, the 3 R policy, pollutants, rain water harvesting, pollutants, causes of water pollution, flood and drought.

Class VII
(A) Definition of fiber, types of fiber, animal and plant fiber, what are fibers made up of, yarn, cotton, ginning, spinning, weaving, knitting, types of fabric, natural and synthetic fibers, evolution of clothing, kinds of silk yarn and silk fabrics, uses of silk, wool, sources of wool, processing of raw wool, quality of wool, uses of wool.

(B) Introduction of matter and types of matter. Composition of matter, characteristics of matter, definition of atom and molecules, differences between atom and molecule, Intermolecular space and intermolecular force of attraction, states of matter and their properties.
Brownian movement and diffusion. Effect of heat on matter, Interconversion of states of matter, Terms related to interconversion of states of matter, expansion of matter, Types of change, physical and chemical changes. Importance of chemical changes, crystallization.

(C) Atomic structure, proton, neutron, electron and their discovery, Dalton's atomic theory and demerits of the theory, Thomson's atomic model, plum pudding model, Rutherford's atomic model, limitations, isotope, isobar, isotone, Bohr's atomic theory, Limitations. Atomic structures of some element.

(D) Classification of matter, pure and impure substances, element, metals and their properties, examples with exceptions, nonmetals and their properties, examples with exceptions. Metalloid and their examples. Differentiations between metal and nonmetal. Idea of noble gases. Important symbols of elements and their Latin names. Idea of periodic table. Valency, variable valency, compound radical, ions, chemical equations and balancing.

(E) Examples of monoatomic, diatomic and triatomic elements, Compounds, formulae of some important compounds and name of the constituent elements present in it, uses of different elements and compounds on the basis of their properties. Mixture and their types, examples of different types of mixtures.

(F) Characteristics of mixture, difference between compound and mixture, difference between water and air. Separation techniques of mixtures. Hand picking, sieving, magnetic separation, sublimation, sedimentation and decantation, loading, filtration, evaporation, crystallization and distillation.

(G) Acid, sources of organic acids, mineral acids, bases, alkalis, Indicators, natural and synthetic indicators, neutralization reactions, indigestion, neutralizations in everyday life.

(H) Composition of air, properties of air, confirmatory evidence that air is a mixture not a compound, study of components of air, uses of the components of air, combustion, respiration, Balance of gases in nature, conditions necessary for rusting, corrosion, preventing corrosions, air pollution and their harmful effects.

(I) Water: A compound, occurrence of water, sources of water, Interconversion of states of water, importance of water, importance of anomalous expansion of water, potable water, characteristics of drinking water, water-borne diseases, sterilization, purification of water. Household methods to get safe drinking water, water -a universal solvent, solute, solvent and solution. Saturated, unsaturated and supersaturated solution. Need to conserve water. Water pollution, the 3 R policy, pollutants, rain water harvesting, pollutants, causes of water pollution, flood and drought. Water table, forests, economic uses of forests, deforestation and afforestation. Toes of waste, sewage and harmful effect of sewage, sewage treatment, management of waste.

Class VIII

(A) Main postulates of kinetic molecular theory of matter, law of conservation of mass, explanation of the change of states of matter on the basis of antiparticle space and intermolecular force of attraction, collision. Combustion and the conditions of combustion, types of combustion, inflammable substance, controlling fire, fire extinguisher, flame and its

types, fuel and its type, some commonly used fuels, harmful by-products of combustion of fuels.

(B) Revise the topic physical and chemical changes, its classification and examples, Wood, fossil fuels, coal, types of coal, destructive distillation of coal, uses of coal, petroleum, petroleum extraction and refining, petrochemicals, natural gas and conservation of fuels.

(C) Revision of element, compound and mixture, separation of components of mixture, emphasis on the principle of separation, Metals, physical and chemical properties of metal, activity series of metals, corrosion, uses of metals, non-metals, physical and chemical properties of nonmetal, uses of nonmetals.

(D) Fundamental sub atomic particles present in an atom, proton, electron, neutron, nucleus and the Extra nuclear part, atomic and mass number. Synthetic fibers, polymer, preparation, properties and uses of rayon, nylon, polyester and acrylic, plastic and its types, plastic pollution, how to counter plastic pollution?
(E) Symbols of elements, formulae of compounds, chemical equation, law of conservation of mass, balancing chemical equations, information gathered from chemical equation and its limitation, catalyst.

(F) Types of chemical reaction, reactivity series, exothermic and endothermic reactions, neutralization reaction, decomposition reaction to form oxides, classification of oxides and their reactions.

(G) Preparation of hydrogen from water - electrolysis, preparation of hydrogen in laboratory, choice of dilute acids, Bosch's process, properties and uses of hydrogen, oxidation and reduction, preference of zinc as metal to be used.

(H) Dissolution of salts in water, solutions, suspensions, colloids,
Water of crystallization, anhydrous substance, hygroscopic substances, universal solvent, reaction of metals with hot water, cold water and steam, hard water, soft water, methods of softening hard water, disadvantages of hard water, removing the hardness of water by boiling it or treating it with washing soda.

(I) Allotropes of carbon, crystalline and amorphous form of carbon, uses of diamond, graphite, coke, coal, shoot, laboratory preparation of carbon di oxide and its physical and chemical properties, reaction with lime water, properties and uses of carbon mono oxide, emphasis on use as reducing agent in the extraction of iron, harmful properties of carbon mono oxide - asphyxia.

Class IX

(A) The Language of Chemistry. (1) Symbol of an element; valency; formulae of radicals and formulae of compounds, and Matter Surrounding us.

(B) (2) Chemical Changes and Reactions. ... (Chemical Changes, Characteristics of chemical reactions, Types of Chemical Change or Chemical Reactions, Energy Change in Chemical Reaction); (3) Water. ... (Physical Properties of water, water as a universal solvent, solution, mixture, saturated unsaturated solution, solubility, crystals and crystallization, Hydrated and anhydrous substances, Drying and dehydrating agents, soft and hard water).

(C) 4) Atomic Structure- (Definition of an element, definition of an atom, discovery of electrons, protons, neutrons, Boars atomic model, atomic number, valence electrons, isotopes isobars isotones, electrovalent bond covalent bond co-ordinate bond.

(D) (5) Chemical bonding. ...
(E) (6) The Periodic Table. ... Study of the First Element – The Language of Chemistry. (i) Symbol of an element; valency; formulae of radicals and formulae of compounds. ... Chemical Changes and Reactions.
(F) (7) Water.
(G) (8) Atomic Structure and Chemical bonding.
(H) Hydrogen.
(I) (10) Study of Gas Laws.

Class X

(A) Periodic Properties and variations of Properties – Physical and Chemical; 1. Periodic properties and their variations in groups and periods. Definitions and trends of the following periodic properties in groups and periods should be studied: atomic size, metallic character non-metallic character, ionization potential, electron affinity electronegativity. 2. Periodicity on the basis of atomic number for elements. The study of the u5 periodic table up to. Period 3 (students are to be exposed to the complete modern periodic table but no questions will be asked on elements beyond period 3 – Argon); Periodicity and other related properties to be explained on the basis of nuclear charge and shells (not orbitals). (Special reference to the alkali metals and halogen groups).

(B) Chemical Bonding - Electrovalent, covalent and co-ordinate bonding, structures of various compounds, Electron dot structure.
(a) Electrovalent bonding: Electron dot structure of Electrovalent compounds NaCl, MgCl2, CaO. Characteristic properties of electrovalent compounds – state of existence, melting and boiling points, conductivity (heat and electricity), dissociation in solution and in the molten state to be linked with electrolysis.
(b) Covalent Bonding: Electron dot structure of covalent molecules on the basis of duplet and octet of electrons (example: hydrogen, chlorine, nitrogen, ammonia, tetrachloride, methane. Polar Covalent compounds – based on difference in electronegativity: Examples – HCl and H2O including structures. Characteristic properties of Covalent compounds – state of existence,

melting and boiling points, conductivity (heat and electricity), ionisation in solution. Comparison of Electrovalent and Covalent compounds.

(C) (c) Coordinate Bonding: Definition - The lone pair effect of the oxygen atom of the water molecule and the nitrogen atom of the ammonia molecule to explain the formation of H3O+ and OH- ions in water and NH4+ Ion. The meaning of lone pair; the formation of hydronium ion and ammonium ion must be explained with the help of electron dot diagrams. 3. Study of Acids, Bases and Salts - (i) Simple definitions in terms of the molecules and their characteristic properties.
(ii) Ions present in mineral acids, alkalis and salts and their solutions; use of litmus and pH paper to test for acidity and alkalinity. Examples with equation for the ionisation/dissociation of ions of acids, bases and salts. Acids form hydronium ions (only positive ions) which turn blue litmus red, alkalis form hydroxyl ions (only negative ions) with water which turns red litmus blue. Salts are formed by partial or complete replacement of the hydrogen ion of an acid by a metal. (To be explained with suitable examples). Introduction to pH scale to test for acidity, neutrality and alkalinity by using pH paper or Universal indicator.
(iii) Definition of salt; types of salts. Types of salts: normal salts, acid salt, basic salt, definition and examples. (iv) Action of dilute acids on salts. Decomposition of hydrogen carbonates, carbonates, sulphites and sulphides by appropriate acids with heating if necessary. (Relevant laboratory work must be done). (v) Methods of preparation of Normal salts with relevant equations. (Details of apparatus or procedures not required). Methods included are: Direct combination; Displacement; Precipitation (double decomposition); Neutralization of insoluble base; Neutralization of an alkali (titration); The action of dilute acids on carbonates and bi-carbonates.

(D) 4. Analytical Chemistry: (i) Action of Ammonium Hydroxide and Sodium Hydroxide on gf solution of salts: the color of salt and its solution; formation and color of hydroxide precipitated for solutions of salts of Ca, Fe, Cu, Zn and Pb; special action of ammonium hydroxide on solutions of copper salt and sodium hydroxide on ammonium salts; On the solution of salts: Colour of salt and its solution. Action on the addition of sodium hydroxide to a solution of Ca, Fe, Cu, Zn, and Pb salts drop by drop in excess. Formation and colour of the hydroxide precipitated are to be highlighted with the help of equations. Action on the addition of Ammonium Hydroxide to the solution of Ca, Fe, Cu, Zn, and Pb salts drop by drop in excess. The formation and colour of the hydroxide precipitated are to be highlighted with the help of equations.
Special action of Ammonium Hydroxide on solutions of copper salts and sodium hydroxide on ammonium salts; (ii) Action of alkalis (NaOH, KOH) on certain metals, their oxides and hydroxides. The metals must include aluminum, zinc and lead, their oxides and hydroxides, which react with caustic alkalis (NaOH, KOH), showing the amphoteric nature of these substances.

(E) 5. Mole Concept and Stoichiometry: (i) Gay Lussa's Law of Combining Volumes; Avogadro's Law. Idea of mole – a number just as a dozen, a gross (Avogadro's number). Avogadro's Law - statement and explanation. Gay Lussa's Law of Combining Volumes. – Statement and explanation. Understanding molar volume- "the mass of 22.4 liters of any gas at S.T.P. is equal

to its molar mass". (Questions will not be set on formal proof but may be taught for clear understanding). Simple calculations based on the molar volume and Gay Lussa's law. (ii) Refer to the atomicity of hydrogen, oxygen, nitrogen and chlorine (proof not required). The explanation can be given using equations for the formation of HCl, NH3, and NO; (iii) Vapor Density and its relation to relative molecular mass: Molecular mass = 2vapour density (formal proof not required); Deduction of simple (empirical) and molecular formula from: (a) the percentage composition of a compound; (b) the masses of combining elements.

(F) (iv) Mole and its relation to mass: Relating mole and atomic mass; arriving at gram atomic mass and then gram atom; atomic mass is a number dealing with one atom; gram atomic mass is the mass of one mole of atoms. Relating mole and molecular mass arriving at gram molecular mass and gram molecule: molecular mass is a number dealing with a molecule, gram molecular mass is the mass of one mole of molecules. Simple calculations based on relation of mole to mass, volume and Avogadro's number; (v) Simple calculations based on chemical equations. Related to weight and/or volumes of both reactants and products; 6. Electrolysis: (i) Electrolytes and non-electrolytes. Definitions and examples; (ii) Substances containing molecules only, ions only, both molecules and ions. Substances containing molecules only ions only, both molecules and ions. Examples; relating their composition with their behavior as strong and weak electrolytes as well as non-electrolytes; (iii) Definition and explanation of electrolysis, electrolyte, electrode, anode, cathode, anion, cation, oxidation and reduction (on the basis of loss and gain of electrons); (iv)An elementary study of the migration of ions, with reference to the factors influencing selective discharge of ions (reference should be made to the activity series as indicating the tendency of metals, e.g. Na, Mg, Fe, Cu, to form ions) illustrated by the electrolysis of: Molten lead bromide - acidified water with platinum electrodes Aqueous copper; (v) sulphate with copper electrodes; electron transfer at the electrodes. The above electrolytic processes can be studied in terms of electrolyte used, electrodes used, ionization reaction, anode reaction, cathode reaction, use of selective discharge theory, wherever applicable; (vi) Applications of electrolysis. Electroplating with nickel and silver, choice of electrolyte for electroplating; Electro refining of copper; Reasons and conditions for electroplating; names of the electrolytes and the electrodes used should be given. Equations for the reactions at the electrodes should be given for electroplating, refining of copper.

(G) 7. Metallurgy: (i) Occurrence of metals in nature - Mineral and ore - Meaning only; Common ores of iron, aluminum and zinc; (ii) Stages involved in the extraction of metals - (a) Dressing of the ore – hydrolytic method, magnetic separation, froth flotation method, (b) Conversion of concentrated ore to its oxide- roasting and calcination (definition, examples with equations), (c) Reduction of metallic oxides- some can be reduced by hydrogen, (I) carbon and carbon monoxide (e.g. copper oxide, lead (II) oxide, iron (III) oxide and zinc oxide) and some cannot (e.g. Al2O3, MgO) - refer to activity series). Active metals by electrolysis e.g. sodium, potassium and calcium. (reference only). Equations with conditions should be given, (d) Electro refining – reference only, (iii) Extraction of Aluminum: (a) Chemical method for purifying bauxite by using NaOH – Baeyer's Process, (b) Electrolytic extraction – Hall Herold's process: Structure of electrolytic cell - the various components as part of the electrolyte, electrodes and electrode reactions. Description of the changes occurring, purpose of the substances used and the main

reactions with their equations, (iv) Alloys – composition and uses. Stainless steel, duralumin, brass, bronze, fuse metal / solder;
8. Study of Compounds: (A). Hydrogen Chloride Hydrogen chloride: preparation of hydrogen chloride from sodium chloride; refer to the density and solubility of hydrogen chloride (fountain experiment); reaction with ammonia; acidic properties of its solution. Preparation of hydrogen chloride from sodium chloride; the laboratory method of preparation can be learnt in terms of reactants, product, condition, equation, diagram or setting of the apparatus, procedure, observation, precaution, collection of the gas and identification.

(H) Simple experiment to show the density of the gas (Hydrogen Chloride): heavier than air, Solubility of hydrogen chloride (fountain experiment); setting of the apparatus, procedure, observation, inference. Method of preparation of hydrochloric acid by dissolving the gas in water- the special arrangement and the mechanism by which the back suction is avoided should be learnt. Reaction with ammonia, Acidic properties of its solution - reaction with metals, their oxides, hydroxides and carbonates to give their chlorides; decomposition of carbonates, hydrogen carbonates, sulphides, sulphites. Precipitation reactions with silver nitrate solution and lead nitrate solution. (B). Ammonia: its laboratory preparation from ammonium chloride and collection; ammonia from nitrides like Mg3N2 and AlN and ammonium salts. (I) Manufacture by Haber's Process; density and solubility of ammonia (fountain experiment); aqueous solution of ammonia; its reactions with hydrogen chloride and with hot copper (II) oxide and chlorine; the burning of ammonia in oxygen; uses of ammonia. Laboratory preparation from ammonium chloride and collection; (the preparation to be studied in terms of, setting of the apparatus and diagram, procedure, observation, collection and identification); Ammonia from nitrides like Mg3N2 and AlN using warm water. Ammonia from ammonium salts using alkalies. The reactions to be studied in terms of reactants, products, conditions and equations. Manufacture by Haber's Process. Density and solubility of ammonia (fountain experiment). The burning of ammonia in oxygen. The catalytic oxidation of ammonia (with conditions and reaction) Its reactions with hydrogen chloride and with hot copper (III) oxide and chlorine (both chlorine in excess and ammonia in excess). All these reactions may be studied in terms of reactants, products, conditions, equations and observations.

(I) Aqueous solution of ammonia: reaction with sulphuric acid, nitric acid, hydrochloric acid and solutions of iron, (II) chloride, iron, (III) sulphate, lead nitrate, zinc nitrate and copper sulphate. Uses of ammonia - manufacture of fertilizers, explosives, nitric acid, refrigerant gas (Chlorofluorocarbon – and its suitable alternatives which are non-ozone depleting), and cleansing agents. (C). Nitric Acid Nitric Acid: one laboratory method of preparation of nitric acid from potassium nitrate or sodium nitrate. Large-scale preparation. Nitric acid as an oxidizing agent. Laboratory preparation of nitric acid from potassium nitrate or sodium nitrate; the laboratory method to be studied in terms of reactants, products, conditions, equations, setting up of apparatus, diagram, precautions, collection and identification.
Manufacture of Nitric acid by Ostwald's process (Only equations with conditions where applicable). As an oxidizing agent: its reaction with copper, carbon, Sulphur. (D). Sulphuric Acid: Large scale preparation, its behavior as an acid when dilute, as an oxidizing agent when concentrated - oxidation of carbon and Sulphur; as a dehydrating agent - dehydration of sugar and copper (II) sulphate crystals; its non-volatile nature. (Manufacture by Contact Process

Equations with conditions where applicable). Its behavior as an acid when dilute - reaction with metal, metal oxide, metal hydroxide, metal carbonate, metal bicarbonate, metal sulphite, metal supplied. Concentrated sulphuric acid as an oxidizing agent - the oxidation of carbon and Sulphur. Concentrated sulphuric acid as a dehydrating agent- (a) the dehydration of sugar (b) Copper (II) sulphate crystals. Non-volatile nature of sulphuric acid - reaction with sodium or potassium chloride and sodium or potassium nitrate.

9. Organic Chemistry: (i) Introduction to Organic compounds; Unique nature of Carbon atom – tetra valency, catenation. Formation of single, double and triple bonds, straight chain, branched chain, cyclic compounds (only benzene); (ii) Structure and Isomerism. Structure of compounds with single, double and triple bonds. Structural formulae of hydrocarbons. Structural formula must be given for: alkanes, alkenes, alkynes up to 5 carbon atoms. Isomerism – structural (chain, position); (iii) Homologous series – characteristics with examples. Alkane, alkene, alkyne series and their gradation in properties and the relationship with the molecular mass or molecular formula. (iv) Simple nomenclature. Simple nomenclature of the hydrocarbons with simple functional groups – (double bond, triple bond, alcoholic, aldehydes, carboxylic group) longest chain rule and smallest number for functional groups rule – trivial and IUPAC names (compounds with only one functional group); (v) Hydrocarbons: alkanes, alkenes, alkynes. Alkanes - general formula; methane (greenhouse gas) and ethane - methods of preparation from sodium ethanoate (sodium acetate), sodium propionate (sodium propionate), from iodomethane (methyl iodide) and bromoethane (ethyl bromide). Complete combustion of methane and ethane, reaction of methane and ethane with chlorine through substitution. Alkenes – (unsaturated hydrocarbons with a double bond); ethene as an example. Methods of preparation of ethene by dehydrate halogenation reaction and dehydration reactions,

(vi) Alkynes - (unsaturated hydrocarbons with a triple bond); ethane as an example of alkyne; Methods of preparation from calcium carbide and 1,2 dibromoethane ethylene dibromide). Only main properties, particularly addition products with hydrogen and halogen namely Cl2, Br2 and I2 pertaining to alkenes and alkynes. Uses of methane, ethane, ethene, and ethyne, (vii) Alcohols: ethanol – preparation, properties and uses, Preparation of ethanol by hydrolysis of alkyl halide. Properties – Physical: Nature, Solubility, Density, Boiling Points. Chemical: Combustion, action with sodium, ester formation with acetic acid, dehydration with conc. Sulphuric acid to prepare ethene, Denatured and spurious alcohol, Important uses of Ethanol, (viii) Carboxylic acids (aliphatic - monocarboxylic acid): Acetic acid – properties and uses of acetic acid; Structure of acetic acid. Properties of Acetic Acid: Physical properties – odor (vinegar), glacial acetic acid (effect of sufficient cooling to produce icelike crystals). Chemical properties – action with litmus, alkalis and alcohol (idea of esterification); Uses of acetic acid.

Class XI

(A) Some Basic Concepts of Chemistry: Matter and its nature, Dalton's atomic theory: Concept of atom, molecule, element, and compound: Laws of chemical combination; Atomic and molecular masses, mole concept, molar mass, percentage composition, empirical and molecular formulae: Chemical equations and stoichiometry.

(B) Atomic Structure: Nature of electromagnetic radiation, photoelectric effect; Spectrum of the hydrogen atom. Bohr model of a hydrogen atom - its postulates, derivation of the relations for the energy of the electron and radii of the different orbits, limitations of Bohr's

model; Dual nature of matter, de Broglie's relationship. Heisenberg's uncertainty principle. Elementary ideas of quantum mechanics, quantum mechanics, the quantum mechanical model of the atom, and its important features. Concept of atomic orbitals as one-electron wave functions: Variation of, and 2 with r for 1s and 2s orbitals; various, quantum numbers (principal, angular momentum, and magnetic quantum numbers) and their significance; shapes of s, p, and d - orbitals, electron spin, and spin quantum number: Rules for filling electrons in orbitals – Aufbau principle. Pauli's exclusion principle and Hund's rule, electronic configuration of elements, and extra stability of half-filled and completely filled orbitals.

(C) CLASSIFICATION OF ELEMENTS AND PERIODICITY IN PROPERTIES:
Modem periodic law and present form of the periodic table, s, p. d and f block elements, periodic trends in properties of elements atomic and ionic radii, ionization enthalpy, electron gain enthalpy, valence, oxidation states, and chemical reactivity.

(D) CHEMICAL BONDING - Kossel-Lewis approach to chemical bond formation, the concept of ionic and covalent bonds. Ionic Bonding: Formation of ionic bonds, factors affecting the formation of ionic bonds; calculationof lattice enthalpy.
Covalent Bonding: Concept of electronegativity. Fajan's rule, dipole moment: Valence Shell Electron Pair Repulsion (VSEPR) theory and shapes of simple molecules. Quantum mechanical approach to covalent bonding: Valence bond theory - its important features, the concept of hybridization involving s, p, and d orbitals; Resonance. Molecular Orbital Theory - Its important features. LCAOs, types of molecular orbitals (bonding, antibonding), sigma and pi-bonds, molecular orbital electronic configurations of mononuclear diatomic molecules, the concept of bond order, bond length, and bond energy. Elementary idea of metallic bonding. Hydrogen bonding and its applications;

(E) CHEMICAL THERMODYNAMICS: Fundamentals of thermodynamics: System and surroundings, extensive and intensive properties, state functions, Entropy, types of processes. The first law of thermodynamics - Concept of work, heat internal energy and enthalpy, heat capacity, molar heat capacity; Hess's law of constant heat summation; Enthalpies of bond 9.

Dissociation, combustion, formation, atomization, sublimation, phase transition,hydration, ionization, and solution. The second law of thermodynamics - Spontaneity of processes; S of the universe and G of the system as criteria for spontaneity. **Δ**G (Standard Gibbs energy change) and equilibrium constant.

(F) EQUILIBRIUM: Meaning of equilibrium is the concept of dynamic equilibrium. Equilibria involving physical processes: Solid-liquid, liquid-gas - gas and solid-gas equilibria, Henry's law. General characteristics of equilibrium involving physical processes. Equilibrium involving chemical processes: Law of chemical equilibrium, equilibrium constants (Kp and Kc) and theirsignificance, the significance of ΔG and ΔG in chemical equilibrium, factors affecting equilibrium concentration, pressure, temperature, the effect of catalyst; Le Hotelier's principle; Ionic equilibrium: Weak and strong electrolytes, ionization of electrolytes, variousconcepts of acids and bases (Arrhenius. Bronzed - Lowry and Lewis) and their ionization, acid-base equilibria (including multistage ionization) and ionization constants, ionization of water.pH scale, common ion effect, hydrolysis of salts and pH of their solutions, the solubility of sparingly soluble salts and solubility products, and buffer solutions.

(G) REDOX REACTIONS: Electronic concepts of oxidation and reduction, redox reactions, oxidation number, rules for assigning oxidation number, and balancing of redox reactions.

(H) P- BLOCK ELEMENTS: Group -13 to Group 14 Elements, General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across theperiods and down the groups; unique behavior of the first element in each group.

(I) SOME BASIC PRINCIPLES OF ORGANIC CHEMISTRY: Tetravalency of carbon: Shapes of simple molecules - hybridization (s and p): Classification of organic compounds based on functional groups: and those containing halogens, oxygen, nitrogen, and Sulphur; Homologous series: Isomerism - structural and stereoisomerism. Nomenclature (Trivial and IUPAC): Covalent bond fission - Homolytic and heterolytic: free radicals, carbocation's, and carbanions; stability of carbocation's and free radicals, electrophiles, and nucleophiles. Electronic displacement in a covalent bond - Inductive effect, electrometric effect, resonance, and hyper conjugation. Common types of organic reactions - Substitution, addition, elimination, and rearrangement.

(J) HYDROCARBONS: Classification, isomerism, IUPAC nomenclature, general methods of preparation, properties, and reactions; Alkanes - Conformations: Sawhorse and Newman projections (of ethane): Mechanism of halogenation of alkanes; Alkenes - Geometrical isomerism: Mechanism of electrophilic addition: addition of hydrogen, halogens, water, hydrogen halides (Markownikoffs and peroxide effect): Ozonolysis and polymerization; Alkynes - Acidic character: Addition of hydrogen, halogens, water, and hydrogen halides: Polymerization; Aromatic hydrocarbons - Nomenclature, benzene - structure and aromaticity: Mechanism of electrophilic substitution: halogenation, nitration; Frieda-Craft's alkylation and acylation, directive influence of the functional group in mono- substituted benzene.

Class: XII

(A) SOLUTIONS: Different methods for expressing the concentration of solution - molality, molarity, mole fraction, percentage (by volume and mass both), the vapor pressure of solutions and Raoult's Law - Ideal and non-ideal solutions, vapor pressure - composition, plotsfor ideal and non- ideal solutions; Colligative properties of dilute solutions - a relative lowering of vapor pressure, depression of freezing point, the elevation of boiling point and osmotic pressure; Determination of molecular mass using colligative properties; Abnormal value of molar mass, Van's Hoff factor and its significance;

(B) Electrochemistry: Electrolytic and metallic conduction, conductance in electrolytic solutions, molar conductivities and their variation with concentration: Kohlrausch's law and its applications; Electrochemical cells - Electrolytic and Galvanic cells, different types of electrodes, electrode potentials including standard electrode potential, half-cell and cell reactions, emf of a Galvanic cell and its measurement: Nernst equation and its applications; Relationship between cell potential andGibbs' energy change: Dry cell and lead accumulator; Fuel cells.

(C) CHEMICAL KINETICS: Rate of a chemical reaction, factors affecting the rate of reactions: concentration, temperature, pressure, and catalyst; elementary and complex reactions,order and molecularity of reactions, rate law, rate constant and its units, differential and integral forms of zero and first-order reactions, their characteristics and half-lives, the effect of temperature on the rate of reactions, Arrhenius theory, activation energy and its calculation, collision theory of bimolecular gaseous reactions (no derivation).

(D) CO-ORDINATION COMPOUNDS: Introduction to coordination compounds. Werner's theory; ligands, coordination number, denticity. chelation; IUPAC nomenclature of mononuclear co-ordination compounds, isomerism; Bonding-Valence bond approach and basic ideas of Crystal field theory, colour and magnetic properties; Importance of co- ordination compounds (in qualitative analysis, extraction of metals, and in biological systems).

(E) D - and F- BLOCK ELEMENTS :Transition Elements General introduction, electronic configuration, occurrence and characteristics, general trends in properties of the first-row transition elements - physical properties, ionization enthalpy, oxidation states, atomic radii, colour, catalytic behavior, magnetic properties, complex formation, interstitial compounds, alloy formation; Preparation, properties, and uses of $K_2Cr_2O_7$, and $KMnO_4$. Inner Transition Elements Lanthanides - Electronic configuration, oxidation states, and lanthanide contraction. Actinides - Electronic configuration and oxidation states.

(F) P- BLOCK ELEMENTS: Group-15 to Group 18Elements; General Introduction: Electronic configuration and general trends in physical and chemical properties of elements across theperiods and down the groups; unique behavior of the first element in each group.

(G) ORGANIC COMPOUNDS CONTAINING HALOGENS (Halo Alkane Halo Arene): General methods of preparation, properties, and reactions; Nature of C-X bond; Mechanisms of substitution reactions. Uses; Environmental effects of chloroform, iodoform frons, and DDT.

(H) ALCOHOLS, PHENOLS, AND ETHERS: Alcohols: Identification of primary, secondary, and tertiary alcohols: mechanism of dehydration.

Phenols: Acidic nature, electrophilic substitution reactions: halogenation. nitration and sulphonation. Reimer - Thiemann reaction.
Ethers: Structure, IUPAC Nomenclature, Physical Properties & Chemical Properties.

(I) Aldehyde and Ketones: Nature of carbonyl group; Nucleophilic addition to >C=O group, relative reactivity's of aldehydes and ketones; Important reactions such as - Nucleophilic addition reactions (addition of HCN. NH_3, and its derivatives), Grignard reagent; oxidation: reduction (Wolf Kushner and Clemens); the acidity of -hydrogen. aldol condensation, Cannizzaro reaction. Halo form reaction, Chemical tests to distinguish between aldehydes and Ketones. Carboxylic Acids; Acidic strength and factors affecting it.

(J) ORGANIC COMPOUNDS CONTAINING NITROGEN: General methods of preparation. Properties, reactions, and uses. Amines - Nomenclature, classification structure, basic character, and identification of primary, secondary, and tertiary amines and their basic character; Diazonium Salts: Importance in synthetic organic chemistry.

(K) BIOMOLECULES: General introduction and importance of biomolecules; **CARBOHYDRATES** - Classification; aldoses and ketoses: monosaccharides (glucose and fructose) and constituent monosaccharides of oligosaccharides (sucrose, lactose, and maltose); **PROTEINS** - Elementary Idea of amino acids, peptide bond, polypeptides. Proteins:primary, secondary, tertiary, and quaternary structure (qualitative idea only), denaturation of proteins, enzymes; **VITAMINS** – Classification and functions. **NUCLEIC ACIDS** – Chemical constitution of DNA and RNA. Biological functions of nucleic acids.
Hormones (General introduction).

(L) PRINCIPLES RELATED TO PRACTICAL CHEMISTRY:

Detection of extra elements (Nitrogen, Sulphur, halogens) in organic compounds; Detection of the following functional groups; hydroxyl (alcoholic and phenolic), carbonyl (aldehyde and ketones) carboxyl, and amino groups in organic compounds.

• The chemistry involved in the preparation of the following: Inorganic compounds; Mohr's salt, potash alum. 13 Organic compounds: Acetanilide, p-nitro acetanilide, aniline yellow, iodoform.

• The chemistry involved in the titrimetric exercises – Acids, bases, and the use of indicators, oxalic-acid vs $KMnO_4$, Mohr's salt vs $KMnO_4$

• Chemical principles involved in the qualitative salt analysis: Cations –

Pb^{2+}, Cu^{2+}, Al^{3+}, Fe^{3+}, Zn^{2+}, Ni^{2+}, Ca^{2+}, Ba^{2+}, Mg^{2+}, NH_4^+

Anions- CO_3^{2-}, S^{2-}, SO_3^{2-}, NO_3^-, NO_2^-, Cl^-, Br^-, I^- (Insoluble salts excluded).

34Chemical principlesinvolved in the following experiments: 1. Enthalpy of solution of $CuSO_4$.

2. Enthalpy of neutralization of strong acid and strong base.
3. Preparation of lyophilic and lyophobic sols.
4. Kinetic study of the reaction of iodide ions with hydrogen peroxide at room temperature.