

optics: wave front and Huygens' principle, reflection and refraction of plane wave at a plane surface using wave fronts. Proofs of laws of reflection and refraction using Huygen's principle. Interferences, Young's double slit experiment and expression for fringe width, coherent sources and sustained interference of light. Diffraction due to a single slit, width of central maximum. Resolving power of microscopes and astronomical telescopes, Polarisation, plane polarized light; Brewster's law, uses of plane polarized light and Polaroid's.

UNIT 17: DUAL NATURE OF MATTER AND RADIATION

(Marks: 02)

Dual nature of radiation. Photoelectric effect, Hertz and Lenard's observations; Einstein's photoelectric equation; particle nature of light. Matter waves-wave nature of particle, de Broglie relation. Davission-Germer experiment.

UNIT 18: ATOMS AND NUCLEI

(Marks: 03)

Alpha-particle scattering experiment; Rutherford's model of atom; Bohr's model of atom, energy levels, hydrogen spectrum, continuous & characteristics of X-rays, Composition and size of nucleus, atomic masses, isotopes, isobars; isotones. Radioactivity-alpha, beta and gamma particles/rays and their properties; radioactive decay law. Mass-energy relation, mass defect; binding energy per nucleon and its variation with mass number, nuclear fission and fusion.

UNIT 19: ELECTRONIC DEVICES

(Marks: 04)

Quantitative ideas on Energy bands in solids, conductors, insulators and semiconductors. Semiconductors; Semiconductor diode: I-V characteristics in forward and reverse bias; diode as a rectifier; I-V characteristics of LED, photodiode, solar cell and Zener diode; Zener diode as a voltage regulator. Junction transistor and its action, characteristics of a transistor; transistor as an amplifier (common emitter configuration) and oscillator. Logic gates (OR, AND, NOT) concept of NAND and NOR gates. Transistor as a switch.

UNIT 20: COMMUNICATION SYSTEM

(Marks: 02)

Basic elements of communication system (block diagram only), Bandwidth of signals (speech, TV and digital data); Bandwidth of Transmission medium, Propagation of electromagnetic waves in the atmosphere, sky and space wave propagation. Need for modulation: Production and detection of an amplitude modulated wave.

Total Marks = 60

CHEMISTRY

UNIT 1: CHEMICAL ARITHMETIC & ATOMIC STRUCTURE

(Marks: 03)

Laws of chemical combination, Mole concept (numericals) Percentage composition, Chemical reactions, Stoichiometry and calculations based on stoichiometry.

Atomic structure:- Bohr's model of Hydrogen atom, Quantum numbers, Pauli's exclusion principle, Hund's rule and Aufbau principle. Heisenberg's uncertainty principle, de-Broglie wave equation and its significance, electronic configurations of atoms.

UNIT 2: CHEMICAL EQUILIBRIUM**(Marks: 04)**

Law of mass action, Le-Chatelier's principle, and its application to physical and chemical equilibria. Ionisation of weak electrolytes (Ostwald's dilution law), equilibrium constant, Acids and bases: Acid base equilibria. Bronsted-Lowry and Lewis concept, of acids and bases. Ionic product of water. pH and pOH scales, pK_a & pK_b values, Solubility product, Buffer solutions Common ion effect, Hydrolysis of salts

UNIT 3: CHEMICAL KINETICS**(Marks: 02)**

Rate of chemical reaction, Average and instantaneous rate, Factors effecting rate of reaction, Order and molecularity of reaction, Integrated rate equation and Half-life period (for zero and first order) reaction, Activation energy and Arrhenius equation.

UNIT 4: SOLUTIONS**(Marks: 02)**

Vapour pressure, Raoult's law, Ideal and Non-ideal solutions, Colligative properties. Determination of molecular mass of non-volatile solutes through colligative properties. Abnormal molecular masses and Van't Hoff Factor, expression of concentration of solutions.

UNIT 5: CHEMICAL THERMODYNAMICS**(Marks: 04)**

Energy changes taking place during chemical reactions, Internal Energy and Enthalpy changes, Enthalpy of combustion, Solution and Neutralization, and formation and hydration.

Hess's Law (Numerical problems) Laws of thermodynamics-first, second & third, Concepts of Entropy and Free energy, Spontaneity of a chemical reaction.

UNIT 6: REDOX REACTIONS AND ELECTROCHEMISTRY**(Marks: 03)**

Dependence of electrode and cell potential on concentration (Nernst Equation), Electrode potential as a criteria for product formation in electrolysis. E.M.F. of Galvanic cell, Relationship between free energy change and E.M.F. of a cell. Definition and units of Equivalent, Molar and Specific conductivity.

UNIT 7: SOLID STATE & STATES OF MATTER**(Marks: 04)**

Boyle's Law, Charles's law, Dalton's law of partial pressure, Graham's law of diffusion of gases, Avogadro law.

Causes of deviation from ideal behaviour, ideal gas equation and nature of 'R', Vander Waal's equation, surface tension and viscosity of liquids.

Crystalline and amorphous solids, Crystal lattice, Crystal types, Packing efficiency, calculation of density of unit cell, Number of atoms per unit cell in a cubic cell. Co-ordination number, Stoichiometric defects: Schottky, Frenkel and interstitial.

Properties of solids: Electrical, Magnetic & Dielectric.

UNIT 8: SURFACE CHEMISTRY**(Marks: 02)**

Freundlich Adsorption isotherm, preparation of colloidal solutions by physical and chemical method. Electrical properties (cataphoresis, electroosmosis, coagulation and protective colloids) Homogeneous and Heterogeneous Catalysis.

UNIT 9: PERIODIC PROPERTIES**(Marks: 02)**

Classification of elements as s, p, d, and f block elements. Variation of Ionization energy, Electron affinity, Electronegativity, Atomic and Ionic radii along the period and down the group in the periodic table.

UNIT 10: CHEMICAL BONDING AND MOLECULAR STRUCTURE**(Marks: 04)**

Types of chemical bonds, Ionic & covalent bonds, Bond parameters, Quantum theory of covalent bond, pi and sigma bonds, Hybridization involving s, p and d-orbitals, Dipole moments and hydrogen bond.

VSEPR: Shapes of simple molecules (H_2O , NH_3 , SO_2 , CO_2 , PCl_3 , PCl_5 , ClF_3 , BF_3 , SF_4 , XeF_2 , XeF_4).

Molecular orbital theory: Energy Levels and M.O. diagrams of H_2 , H_2^+ , He_2 , O_2^+ , O_2^{1-} , O_2^{2-} & F_2 .

Bond order and its significance.

UNIT 11: CHEMISTRY OF REPRESENTATIVE ELEMENTS**(Marks: 04)**

S and P Block Elements: Electron configuration, Oxidation states and trends in various properties like ionization energy, electron affinity, atomic radii, electronegativity and diagonal relationship.

Alkali metals: Hydration of ions, action with ammonia, flame colouration, solubility of hydroxides, carbonates and sulphates.

Alkaline Earth Metals: Solubility of carbonates, hydroxides and sulphates.

Boron Family: Structure of halides, relative acid strength of trihalides of boron.

Carbon family: Hydrides and oxides.

Nitrogen family: Oxides of Nitrogen and Phosphorous, reducing nature, basic strength and boiling points of their halides.

Oxygen family: volatility, thermal stability, acid character, reducing character and bond angles of their hydrides, oxyacids of sulphur.

Halogen family: Bond energy, colour and oxidizing power, boiling point, acid strength and dipole moment, thermal stability, reducing power of hydrides, relative acidity and oxidizing power of oxyacids of halogens.

UNIT 12: TRANSITION ELEMENTS INCLUDING LANTHANOIDES**(Marks: 02)**

Electron configuration, Oxidation states, Colour, and Magnetic properties of transition elements.

Oxides of Vanadium, Chromium and Manganese Alloys of Copper, Silver and Iron.

Metallurgy of Iron, Copper and Zinc.

UNIT 13: CO-ORDINATION CHEMISTRY**(Marks: 04)**

Introduction, Ligands, Co-ordination Number, IUPAC Nomenclature.

Bonding theories: Werner's, VBT and CFT.

Isomerism in Co-ordination compounds (Ionization, Linkage, Hydrate, Geometrical and Optical).

Applications of Co-ordination complexes in Biology, Medicine and Analytical Chemistry.

UNIT 14: NOMENCLATURE AND BASIC CONCEPTS IN ORGANIC CHEMISTRY (Marks: 03)

Nomenclature of organic compounds (monofunctional and polyfunctional groups), inductive, electromeric resonance and hyperconjugation effects, reaction intermediates, carbocations, carbanions and free radicals with their general stability order, types of organic reactions (addition, substitution, elimination and redox reactions), aromaticity on the basis of Huckel rule. Ortho, meta and para directing groups., electro & nucleophiles.

UNIT 15: HYDROCARBONS**(Marks: 03)**

Structural isomerism in alkanes, alkenes, alkynes and arenes, stereoisomerism: geometrical and optical isomerism, chirality, origin of chirality, specific rotation, racemisation and resolution, conformations in ethane and cyclohexane, relative configuration (D,L-Nomenclature), absolute (R and S system of nomenclature).

UNIT 16: ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUP-I**(Marks: 02)**

Haloalkanes, haloarenes, alcohols and phenols: General methods of preparation and properties. Chloroform and Iodoform.

UNIT 17: ORGANIC CHEMISTRY BASED ON FUNCTION GROUP-II**(Marks: 03)**

Ethers, Aldehydes, Ketones, Monocarboxylic acids: General methods of preparation and properties. Derivatives of monocarboxylic acids like acid halides, acid anhydrides acid amides and esters.

Acidic motive of carboxylic acids

UNIT 18: ORGANIC CHEMISTRY BASED ON FUNCTIONAL GROUP-III**(Marks: 03)**

Cyanides, Isocyanides, Nitrocompounds and Amines: General methods of preparation and properties. Relative basic character of amines.

UNIT 19: MOLECULES OF LIFE**(Marks: 03)**

Carbohydrates: Definition, Classification, Mutarotation, Structure of Amino-acids, Peptides and Proteins (Molish and ninhydrin tests). Classification and uses of vitamins. Chemicals in medicine and health care, Dyes and drugs. Chemical reactions in atmosphere, ozone depletion and its effects. Acid rain, Green House effect & Global warming.

UNIT 20: POLYMERS**(Marks: 03)**

Introduction, Classification, Methods of Polymerisation (Addition, Condensation, Free Radical, Cationic & Anionic).

Natural & Synthetic Polymers: Polythene, Nylon, Polyster, Bakelite and Rubber.

Biodegradable and Non-Biodegradable Polymers.

Total Marks = 60**MATHEMATICS****UNIT 1: SETS, RELATIONS AND FUNCTIONS****(Marks: 06)**

Sets and their representation, finite and infinite sets, empty set subsets, subset of real numbers especially intervals, power set, universal set. Venn diagram, union and intersection of sets. Difference of sets, Compliment of a set. Ordered pairs, Cartesian product of sets, number of elements in the Cartesian product of two finite sets.