TOPIC	CONTENT
Unit 1 : Basic concepts of chemistry and chemical calculations	Importance of Chemistry; Classification of matters; Elements and compounds; Atomic and molecular masses; equivalent mass, empirical and molecular formula; mole concept; stoichiometric calculations; Limiting reagents, redox reactions, competitive electron transfer reactions, oxidation number; types of redox reactions and balancing redox reactions
Unit 2 : Quantum mechanical model of atom	Brief introduction to various atom models; Dual behaviour of matter; Debroglie relation, Heisenberg's uncertainty principle; Quantum mechanical model of atom; Schrödinger equation, Quantum numbers; Atomic orbitals – shapes, energy, Aufbauprinciple, Pauli exclusion principle, Hund's rule; Electronic configuration of atoms, stability of completely filled and half-filled orbitals
Unit 3: Elements and periodic classification	Need for classification of elements; Modern periodic law and periodic table; Nomenclature of elements with atomic numbers greater than 100; Classification of elements based on electronic configurations; Periodic trends in properties - atomic radius, ionic radius, ionisation enthalpy, electron affinity, electronegativity; Periodic trends in chemical properties, periodicity of valence/oxidation states, Anomalous properties of second period elements, Diagonal relationship
Unit 4: Hydrogen and water	Position of hydrogen in the periodic table, isotopes of hydrogen, ortho and para hydrogen; Preparation of hydrogen: laboratory and commercial production; Physical and chemical properties of hydrogen, uses of hydrogen; Hydrides: classification; Physical and chemical properties of water, heavy water; hardness of water and its removal; Hydrogen peroxide: Preparation, structure, physical and chemical properties, uses.
Unit 5 : Alkaline and alkaline earth metals	Alkali metals: General characteristics, chemical properties and uses; general characteristics; physical, chemical properties and uses; compounds of alkali metals: oxides, Hydroxides, halides, salts of oxoacids – general characteristics; Biological importance of sodium and potassium. Alkaline earth metals: general characteristics, physical, chemical properties and uses; compounds of Alkaline earth metals: oxides, hydroxides, halides, salts of oxoacids – general characteristics; important compounds of calcium: quick lime, slake lime, gypsum and plaster of paris; Biological importance of magnesium and calcium.

Unit 6 : Chemical Bonding	Kossel – Lewis approach to chemical bonding; octet rule, ionic bond, covalent bond, coordinate bond; bonding in metals; Bond parameters; resonance; polarity of bonds; Hybridisation – Orbital overlap, σ and π bonds, VSEPR theory, shapes of covalent molecules; Valence bond theory (VBT), Molecular Orbital Theory: Bonding in homonuclear diatomic molecules (H_2, Li_2, B_2, $_{C2}$, $N_2$and O_2) and hetero-nuclear diatomic molecules (CO and NO); Hydrogen bond – criteria, types, and significance.
Unit 7 : Thermodynamics	Introduction to thermodynamic terms, System and surroundings, types and properties of system: processes : reversible, irreversible, adiabatic, isothermal, isobaric, isochoric and cyclic processes; Internal energy and work; First law of thermodynamics; Enthalpy: relationship between ΔH and ΔU; Thermochemical equations; Enthalpy changes for different types of reactions and phase transformations; Measurement of ΔH and ΔU using calorimetry; Hess law of constant heat summation; Lattice enthalpy: Born-Haber cycle; Need for second law of thermodynamics; various statements of second law; Meaning and significance of entropy; Gibbs free energy and its significance; criteria for spontaneity of a process; Relationship between ΔG and equilibrium constant; Third law of thermodynamics (statement only)
Unit 8: Gaseous state	Introduction; Gas laws: Boyle's law, Charles law, Gay Lussac's law, Avogadro law; Ideal gas equation and deviation from ideal behaviour; Compressibility factor; Vanderwaals equation; critical phenomena; Relation between Vander-waals constants and critical constants; diffusion - Grahams diffusion law; Liquefaction of gases – Joule Thomson effect; isotherms of carbon-dioxide.
Unit 9 : Solutions	Types of solutions; expressing Concentration of solutions – mass percentage, volume percentage, parts per million (ppm), mole fraction, molarity, molality and normality; Henrys law, Vapour pressure of liquid solutions; Raoult's law for volatile solutes and non-volatile solutes; ideal and non-ideal solutes; factors responsible for deviation from Raoults law. Colligative properties; Relative lowering of vapour pressure; depression of freezing point; Elevation of boiling point; Osmosis and osmotic pressure; Reverse osmosis and water purification; Abnormal molecular mass: Dissociation and association, Vant Hoff factor.
Unit 10 : Chemical equilibrium	Introduction to physical and chemical equilibria; Law of mass action; Equilibrium constants ($K_p$and K_c); Relation between K_p and K_c; Homogeneous and Heterogeneous

	equilibrium; Applications of equilibrium constants in predicting the extend and the direction of a reaction; Lechatlier's principle – effect of concentration, pressure, temperature, catalyst and inert gas addition; Vant-Hoff equation
Unit 11 : Organic Chemistry – Basic principles and technique	Introduction, Classification and nomenclature of organic compounds; IUPAC rules for naming organic compounds; structural representation; Isomerism – structural isomerism, stereo isomerism: Geometrical and optical isomerism, Detection and estimation of elements (C, H, N, S, X and P) in organic compounds; Purification of organic compounds – sublimation, crystallisation, distillation (fraction, steam and azeotropic), differential extraction, chromatography (absorption, column, thin layer and partition chromatography)
Unit 12 : Organic reactions and their mechanism	Fundamental concepts in organic reaction mechanism; Fission of co-valent bond; Nucleophiles, electrophiles and free radicals; Electron displacements effects in covalent bonds – inductive effect, electrometric effect, resonance effect, hyper conjugation and mesomeric effect; Types of organic reactions: substitution reactions, addition reactions, elimination reactions, oxidation reactions, reduction reactions, molecular rearrangements; Functional group interconversions,
Unit 13 : Hydrocarbons	Introduction, classification of hydro carbons; Preparation and chemical properties of alkanes, alkenes and alkynes; Markovnikov and anti-markovnikov addition reactions and their mechanism; conformers of alkanes; Aromatic hydrocarbons: Aromaticity and Huckel Rule; Structure of benzene; Preparation of benzene; Aromatic electrophilic substitution reactions and mechanism, influence of functional group in mono substituted benzene; toxicity(carcinogenicity)
Unit 14 : Halo-alkanes and haloarenes	Halo-alkanes; nature of C–X bond, classification and nomenclature; preparation from alkanes, alkenes and alcohols; physical properties; chemical properties – nucleophilic substitution reactions, stereo chemical aspects (S_N1, S_N2); Elimination reactions, E1 and E2 mechanisms; organometallic compounds: Introduction, preparation and uses of Grignard reagent; Haloarenes: Preparation of chlorobenzene; Chemical properties of chlorobenzene: nucleophilic and electrophilic substitution reactions, reaction with metals (Wurtz-Fittig and Fittig reactions), Formation of DDT; polyhalogen compounds and uses.
Unit 15 :	Environmental pollution; Types – air, water and soil

Environmental chemistry	pollution; Particulate pollutants, Greenhouse effect and global warming; Acid rain and its effect; Ozone hole; Strategies to control environmental pollutions; Green chemistry