

# Chemistry

## Unit I: Solid State

Classification of Solids Based on Different Binding Forces: Molecular, Ionic Covalent, and Metallic Solids, Amorphous and Crystalline Solids (Elementary Idea), Unit Cell in Two Dimensional and Three-Dimensional Lattices, Calculation of Density of Unit Cell, Packing In Solids, Packing Efficiency, Voids, Number of Atoms per Unit Cell in a Cubic Unit Cell, Point Defects, Electrical and Magnetic Properties, Band Theory of Metals, Conductors, Semiconductors and Insulators and N and P-Type Semiconductors

## Unit II: Solutions

Types of Solutions, Expression of Concentration of Solutions of Solids in Liquids, the Solubility of Gases in Liquids, Solid Solutions, Colligative Properties: The Relative Lowering of Vapour Pressure, Raoult's Law, Elevation of b.p., Depression of Freezing Point, Osmotic Pressure, Determination of Molecular Masses Using Colligative Properties, Abnormal Molecular Mass, Vant Hoff Factor

## Unit III: Electrochemistry

Redox Reactions; Conductance in Electrolytic Solutions, Specific and Molar Conductivity Variations of Conductivity With Concentration; Kohlrausch's Law; Electrolysis and Laws of Electrolysis (Elementary Idea), Dry Cell: Electrolytic Cells and Galvanic Cells; Lead Accumulator, Emf of a Cell, Standard Electrode Potential, Nernst Equation and Its Application to Chemical Cells. Relation Between Gibbs Energy Change and Emf of a Cell, Fuel Cells; Corrosion

## Unit IV: Chemical Kinetics

Rate of a Reaction (Average and Instantaneous), Factors Affecting Rates of Reaction: Concentration, Temperature, Catalyst; Order and Molecularity of a Reaction; Rate Law and Specific Rate Constant, Integrated Rate Equations, and Half-Life (Only for Zero and First-Order Reactions); Concept of Collision Theory (Elementary Idea, No Mathematical Treatment). Activation Energy, Arrhenius Equation

## Unit V: Surface Chemistry

Adsorption – Physisorption and Chemisorption; Factors Affecting Adsorption of Gases on Solids; Catalysis: Homogenous and Heterogeneous, Activity and Selectivity: Enzyme Catalysis; Colloidal State: The Distinction Between True Solutions, Colloids, and Suspensions; Lyophilic, Lyophobic Multimolecular and Macromolecular Colloids; Properties of Colloids; Tyndall Effect, Brownian Movement, Electrophoresis, Coagulation; Emulsions – Types of Emulsions

## Unit VI: General Principles and Processes of Isolation of Elements

Principles and Methods of Extraction – Concentration, Oxidation, Reduction Electrolytic Method, and Refining; Occurrence and Principles of Extraction of Aluminum, Copper, Zinc, and Iron

## Unit VII: p-Block Elements

Group 15 Elements: General Introduction, Electronic Configuration, Occurrence, Oxidation States, Trends in Physical and Chemical Properties; Nitrogen – Preparation, Properties, and Uses; Compounds of Nitrogen: Preparation and Properties of Ammonia and Nitric Acid, Oxides of Nitrogen (Structure Only); Phosphorous-Allotropic Forms; Compounds of Phosphorous: Preparation and Properties of Phosphine, Halides ( $\text{PCl}_3$ ,  $\text{PCl}_5$ ) and Oxoacids (Elementary Idea Only)

**Group 16 Elements:** General Introduction, Electronic Configuration, Oxidation States, Occurrence, Trends in Physical and Chemical Properties; Dioxygen: Preparation, Properties, and Uses; Classification of Oxides; Ozone. Sulphur – Allotropic Forms; Compounds of Sulphur: Preparation, Properties, and Uses of Sulphur Dioxide; Sulphuric Acid: Industrial Process of Manufacture, Properties and Uses, Oxoacids of Sulphur (Structures Only)

**Group 17 Elements:** General Introduction, Electronic Configuration, Oxidation States, Occurrence, Trends in Physical and Chemical Properties; Compounds of Halogens: Preparation, Properties and Uses of Chlorine and Hydrochloric Acid, Interhalogen Compounds, Oxoacids of Halogens (Structures Only)

Group 18 Elements: General Introduction, Electronic Configuration, Occurrence, Trends in Physical and Chemical Properties, Uses

## Unit VIII: d and f Block Elements

General Introduction, Electronic Configuration, Occurrence and Characteristics of Transition Metals, General Trends in Properties of the First-Row Transition Metals – Metallic Character, Ionization Enthalpy, Oxidation States, Ionic Radii, Colour, Catalytic Property, Magnetic Properties, Interstitial Compounds, Alloy Formation. Preparation and Properties of  $\text{K}_2\text{Cr}_2\text{O}_7$  and  $\text{KMnO}_4$

**Lanthanoids** – Electronic Configuration, Oxidation States, Chemical Reactivity, and Lanthanoid Contraction and Its Consequences

**Actinoids** – Electronic Configuration, Oxidation States, and Comparison With Lanthanoids

## Unit IX Coordination Compounds

**Coordination Compounds:** Introduction, Ligands, Coordination Number, Colour, Magnetic Properties and Shapes, IUPAC Nomenclature of Mononuclear Coordination Compounds, Bonding, Werner's Theory VBT, CFT; Isomerism (Structural and Stereo) Importance of Coordination Compounds (In Qualitative Analysis, Extraction of Metals and Biological Systems).

## Unit X: Haloalkanes and Haloarenes

**Haloalkanes:** Nomenclature, Nature of C-X Bond, Physical and Chemical Properties, Mechanism of Substitution Reactions, Optical Rotation

**Haloarenes:** Nature of C-X bond, Substitution Reactions (Directive Influence of Halogen for Monosubstituted Compounds Only)

Uses and Environmental Effects of Dichloromethane, Trichloromethane, Tetrachloromethane, Iodoform, Freons, DDT

## Unit XI: Alcohols, Phenols, and Ethers

**Alcohols:** Nomenclature, Methods of Preparation, Physical and Chemical Properties (Of Primary Alcohols Only); Identification of Primary, Secondary, and Tertiary Alcohols; Mechanism of Dehydration, Uses, With Special Reference to Methanol and Ethanol

**Phenols:** Nomenclature, Methods of Preparation, Physical and Chemical Properties, Acidic Nature of Phenol, Electrophilic Substitution Reactions, Uses of Phenols

**Ethers:** Nomenclature, Methods of Preparation, Physical and Chemical Properties, Uses

## Unit XII: Aldehydes, Ketones, and Carboxylic Acids

**Aldehydes and Ketones:** Nomenclature, Nature of Carbonyl Group, Methods of Preparation, Physical and Chemical Properties, Mechanism of Nucleophilic Addition, the Reactivity of Alpha Hydrogen in Aldehydes; Uses

**Carboxylic Acids:** Nomenclature, Acidic Nature, Methods of Preparation, Physical and Chemical Properties; Uses

## Unit XIII: Organic Compounds Containing Nitrogen

**Amines:** Nomenclature, Classification, Structure, Methods of Preparation, Physical and Chemical Properties, Uses, Identification of Primary Secondary, and Tertiary Amines

**Cyanides and Isocyanides** – Will Be Mentioned at Relevant Places in Context

**Diazonium Salts:** Preparation, Chemical Reactions, and Importance in Synthetic Organic Chemistry

## Unit XIV: Biomolecules

**Carbohydrates** – Classification (Aldoses and Ketoses), Monosaccharide (Glucose and Fructose), D-L Configuration, Oligosaccharides (Sucrose, Lactose, Maltose), Polysaccharides (Starch, Cellulose, Glycogen): Importance.

**Proteins** – Elementary Idea of A-Amino Acids, Peptide Bond, Polypeptides, Proteins, Primary Structure, Secondary Structure, Tertiary Structure and Quaternary Structure (Qualitative Idea Only), Denaturation of Proteins; Enzymes.

**Hormones** – Elementary Idea (Excluding Structure).

**Vitamins** – Classification and Functions.

**Nucleic Acids:** Dna and Rna

### Unit XV: Polymers

**Classification** – Natural and Synthetic, Methods of Polymerization (Addition and Condensation), Copolymerization. Some Important Polymers: Natural and Synthetic Like Polythene, Nylon, Polyesters, Bakelite, Rubber. Biodegradable and Non-biodegradable Polymers

### Unit XVI: Chemistry in Everyday Life

1. Chemicals in Medicines – Analgesics, Tranquilizers, Antiseptics, Disinfectants, Antimicrobials, Antifertility Drugs, Antibiotics, Antacids, Antihistamines
2. Chemicals in Food – Preservatives, Artificial Sweetening Agents, Elementary Idea of Antioxidants
3. Cleansing Agents – Soaps and Detergents, Cleansing Action