

| TOPIC   | CONTENT   |
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| Unit 1 :<br>Metallurgy                            | Occurrence of metals; Concentration of ores; Extraction of crude metal; Thermodynamic principle of metallurgy; Electrochemical principle of metallurgy and applications: Electrolytic extraction of Aluminium, electrochemical series; extraction based on oxidation and reduction; application of metals (Al, Zn, Fe, Cu, Au)  |
| Unit 2 :<br>p-Block elements – I                  | Occurrence, electronic configurations, oxidation states, general trends in physical and chemical properties of the elements in the period and group; Anomalous properties of the first element of each group;<br>Boron and Aluminium: occurrence, preparation, physical and chemical properties and uses; structure, properties and uses of borax, boric acid, boron trifluoride; Reactions with acids and alkalies; Structure, properties and uses of aluminium chloride and alums;<br>Carbon and Silicon: Anomalous behavior of carbon; Tendency for catenation; Structure, properties and uses of allotropes of carbon; Structure, properties and uses of oxides of carbon; Structure, properties and uses of silicon tetrachloride, silicones, silicate and zeolites;<br>Nitrogen and Phosphorus: Occurrence, Properties and uses of Nitrogen; Preparation, properties, structure and uses of ammonia and nitric acid; Structure of oxides and oxoacids of nitrogen; Allotropic forms of phosphorus; Properties and uses of phosphorus; Preparation, properties, structure and uses of phosphine and phosphorus halides( $\text{PCl}_3$ , $\text{PCl}_5$ ); Structure of oxides and oxoacids of phosphorus. |
| Unit 3 :<br>P block elements – II                 | Oxygen and Sulphur: preparation, properties, structure and uses of oxygen and ozone, Allotropic forms of sulphur, preparation, properties, structure and uses of sulphur dioxide and sulphuric acid.<br>Halogens: Occurrence, preparation, properties and uses of chlorine and hydrochloric acid; Trends in the physical and chemical properties of hydrogen halides; Structures of inter-halogen compounds, oxides and oxoacids of halogens;<br>Noble gases: Occurrence, trends in physical & chemical properties and uses.  |
| Unit 4:<br>Transition and inner transition metals | Position in the periodic table; Electronic configuration; General trend in properties of 3d series elements; Characteristics of transition metals; Oxides and oxo anions of transition metals;  |

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|  | Potassium dichromate & potassium permanganate: structure, shape, oxidizing nature in acidic, basic and neutral medium, use in redox titration, structure of chromate, dichromate, manganite and permanganate ion; f-block elements: position of f-block elements in periodic table, electronic configuration, atomic and ionic radii, oxidation states: Lanthanide contraction and its consequences; Actinides: oxidation states and comparison with lanthanides   |
| Unit 5 :<br>Co-ordination<br>Compounds | Definition of co-ordination compounds: coordination entity, Central metal atom/ion, Ligands, Coordination number, Coordination sphere, Coordination polyhedron, Oxidation number of central atom, Homoleptic and heteroleptic complexes; Differences with double salt; IUPAC Nomenclature of coordination compounds; Isomerism in co-ordination Compounds: structural and stereoisomerism; Theories of co-ordination compounds: Werner's theory, Valence Bond Theory, Crystal field theory; Stability and applications of co-ordination compounds. |
| Unit 6 :<br>Solid State                | Introduction to solid state; Amorphous and crystalline solids; classification of crystalline solids; Unit Cell: Types of unit cell in two dimensions and three dimensions; Calculation of no of atoms per unit cell in a cubic unit cell; Packing and packing efficiency in solids; Packing fraction in sc, fcc and bcc; Voids: types, location and formation; Calculations involving unit cell dimensions; Imperfection in solids – types of point defects; Electrical and magnetic properties  |
| Unit 7:<br>Chemical Kinetics           | Introduction of Kinetics; Rate of a reaction; order of a reaction; molecularity of a reaction; factors affecting reaction rate; Integrated rate equations (zero and first order reactions only); half-life of a reactions; pseudo first order reaction; concept of collision theory; Temperature dependence of reaction rate – activation energy and Arrhenius equation.   |
| Unit 8 :<br>Ionic Equilibrium          | Acids, bases and salts; Various concepts of acids and base; Arrhenius, Brønsted-Lowry and Lewis theory of acids and bases; Ionisation of water; The PH scale; Ionisation of weak acids- Ostwald dilution law; Common ion effect; Buffer solution; Henderson- Hasselbalch equation; Salt hydrolysis; Solubility and Solubility product;   |
| Unit 9 :<br>Electrochemistry           | Introduction; Conductivity of electrolytic solutions; Resistivity, conductivity, equivalent conductivity, molar conductivity; measurement of the conductivity of ionic solutions; Variation of conductivity with concentration; Debye Huckel Onsagar equation; Kohlrausch's law; Electrochemical Cells; IUPAC conventions for electro chemical cells Galvanic Cell; Measurement of Electrode Potential; Nernst Equation; Equilibrium constant from Nernst Equation; Electro-chemical   |

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|  | cell and Gibbs Energy of Reaction; Electrolytic cells and electrolysis; Faradays law of electrolysis; Product of electrolysis; Batteries; Primary Batteries; Secondary Batteries; Fuel cells; Corrosion; Control of corrosion;  |
| Unit 10 :<br>Surface Chemistry                       | Introduction; absorption and adsorption; Types of adsorption; Applications of Adsorption; Adsorption isotherms; Catalysis; Characteristics of catalyst; Types of catalyst, theories of catalysis; Enzyme catalysis; Colloids. Classification, Preparation and Purification of colloids; Properties of colloidal solution; Emulsions; Application of colloids and emulsions in day today life;   |
| Unit 11 :<br>Alcohols, phenols and ethers            | Alcohols; Introduction; classification; nomenclature; Monohydric alcohols methods of preparation; Physical and chemical properties, mechanism of dehydration; (Saytzeff's rule), oxidation, acidity of alcohols; Methods of differentiation of primary, secondary and tertiary alcohols; Inter conversions of primary, secondary and tertiary alcohols; Commercially important alcohols; Manufacture of methanol, ethanol and its uses; Dihydric alcohols and Trihydric alcohols; Ethylene glycol – preparation; Physical and chemical properties and uses; Phenols- classification, nomenclature occurrence; Methods of preparation Physical and chemical properties; Distinction test between alcohols and phenols; Uses of phenols; Ether classification, nomenclature; methods of preparation; physical and chemical properties and uses; Crown ethers.                   |
| Unit 12 :<br>Aldehydes, Ketones and Carboxylic acids | Carbonyl compounds; Introduction; structure of carbonyl group; nomenclature; aliphatic aldehydes and ketones; Methods of preparation; physical and chemical properties; order of reactivity of aldehydes and ketones; Nucleophilic addition reaction and mechanism; uses of aliphatic aldehydes and ketones; Aromatic aldehydes; Methods of preparation and ; Chemical reactions; carboxylic acids; Introduction; Structure of carboxyl group; nomenclature; Aliphatic and aromatic carboxylic acids; Methods of preparation; Physical and Chemical properties; Acidity of carboxylic acids – effect of substituents (Concept of $K_a$ and $pK_a$ ); Test for carboxylic acids; uses of carboxylic acids; Acid derivatives; Acid chlorides, esters, acid anhydrides and acid amides: Nomenclature, order of reactivity of acid derivatives; Preparation, properties and uses; |
| Unit 13 :<br>Organic compounds containing Nitrogen   | Nitrocompounds: Nomenclature, isomerism, preparation, chemical reactions and uses; Amines: classification, nomenclature, structure; methods of preparations, physical properties, chemical properties, Basic character of amines ( $K_b$ and $pK_b$ ); distinction between primary, secondary and   |

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|   | tertiary amines; Diazonium salts: structure, preparation, physical and chemical properties ; Cyanides and Isocyanides: nomenclature, preparation, properties and uses   |
| Unit 14 :<br>Biomolecules               | Carbohydrates: Monosaccharides; preparation and cyclic structures; disaccharides cyclic structure; polysaccharides; sources and cyclic structures; Importance of carbohydrates; Proteins: amino acids, classification, Zwitter ions, isoelectric point, peptide bond, classification proteins; structure of proteins: denaturation of proteins; Enzymes: mechanism of enzyme action; Lipids: classification and biological functions; Vitamins: definition, classification, sources and deficiency diseases; Nucleic acids: definition : DNA & RNA, Nucleoside and nucleotides, ATP and its importance.   |
| Unit 15 :<br>Chemistry in everyday life | Introduction; Medicinal chemistry: classification of drugs, drug target interactions; different classes of drugs; Food chemistry: food additives, artificial sweeteners, food preservatives, antioxidants; Cleansing agents: Soaps and detergents – types, cleansing action, Polymer chemistry: classification based on source, structure, molecular forces; Types of polymerisation, addition polymerization and mechanism; Preparation of addition polymers (polyethene, Teflon, poly acrylonitrile); Condensation polymers: preparation of polyamides (Nylon-6 & Nylon 6,6), polyesters (terelene), Bakelite, melamine, formaldehyde polymer; Copolymerisation: Rubber: natural rubber, vulcanization of rubber; Biodegradable polymers: PHBV, Nylon-2, Nylon-6; Commercially important polymers |