

CHEMISTRY

For +2 2nd year Science Revised 2020

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.

Unit II: Solutions

Types of solutions, solubility of gases in liquids, solid solutions, colligative properties, relative lowering of vapour pressure, Raoult's law, elevation of boiling point, depression of freezing point, osmotic pressure, determination of molecular masses using colligative properties, Abnormal colligative properties (Preliminary idea only).

Unit III: Electrochemistry

Electrolytes and non-electrolyte conductor, conductance in electrolytic solutions, specific and molar conductivity, variation of conductivity with concentration, Kohlrausch's law, electrolysis and laws of electrolysis (elementary idea), dry cell electrolytic cells and Galvanic cells, 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.

Unit IV: Chemical Kinetics

Rate of a reaction (Average and instantaneous), factors affecting rate 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, catalysts, colloidal state distinction between true solutions, colloids and suspension; lyophilic, lyophobic, multimolecular and macromolecular colloids; properties of colloids; Tyndall effect,

Brownian movement, electrophoresis, coagulation, emulsion - 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.

Unit VII: p - Block Elements

Group 15 Elements: General introduction, electronic configuration, occurrence, oxidation states, trends in physical and chemical properties; nitrogen preparation properties & uses; compounds of nitrogen, preparation and properties of ammonia, oxides of nitrogen (Structure only); Phosphorus – allotropic forms.

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, 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 (structure 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.

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 and CFT.

Unit X: Haloalkanes and Haloarenes

Haloalkanes: Nomenclature, nature of C-X bond, preparation from alcohols, halogenations of alkanes, alkenes, Sandmeyer's reaction, halogen exchange reaction, physical properties and

chemical properties, nucleophilic substitution reactions (unimolecular and bimolecular), stereochemical effect of substitution reaction, elimination reaction, Electrophilic substitution reactions (halogenations, nitration, sulphonation), Friedel-Crafts reaction, reaction with metals (Wurtz Fittig and Fittig reaction), optical rotation.

Haloarenes: Nature of C - X bond, substitution reactions (Directive influence of halogen in monosubstituted compounds only).

Unit XI: Alcohols, Phenols and Ethers

Alcohols: Nomenclature, methods of preparation, from alkenes, carbonyl compounds, Grignard reagent, physical properties and chemical properties (of primary alcohols only), esterification, reaction with (hydrogen halide, phosphorus trihalide Oxidation (identification of primary, secondary and tertiary alcohols mechanism of dehydration).

Phenols: Nomenclature, methods of preparation from haloarenes, benzene sulphonic acid, diazonium salt, cumene, physical properties and chemical properties, acidic nature of phenol, esterification, Electrophilic aromatic substitution (halogenations, nitration) ReimerTiemann reaction, reaction with Zn dust, oxidation.

Ethers : Nomenclature, methods of preparation dehydration of alcohols, Williamson synthesis, physical properties and chemical properties, formation of alcohols, Electrophilic substitution (halogenations, nitration, Friedel-Craft reaction.

Unit XII : Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones : Nomenclature nature of carbonyl group methods of preparation, from alcohols (oxidation and dehydrogenation), ozonolysis of alkenes, hydration of alkynes, preparation of ketones from acyl chlorides and nitriles, preparation of acetone by FriedelCraft acylation reaction, physical properties and chemical properties, nucleophilic addition reaction with hydrogen cyanide, sodiumhydrogen sulphite, reaction with NH_3 and $\text{NH}_2\text{-G}$ compounds (Hydrazine, hydroxyl amine, semicarbazide, phenyl hydrazine, 2,4-dinitro phenylhydrazine), alcohol, Grignard reagent, Clemmensen reaction, Wolff-Kishner reduction, Fehling's Test, Tollen's Test, haloform reaction, Aldol condensation, Cannizzaro's reaction, special reaction of (formaldehyde with ammonia and acetone with concentrated sulphuric acid), Electrophilic substitution reactions of aromatic aldehydes and ketones.

Carboxylic Acids : Nomenclature, acidic nature, methods of preparation, from primary alcohols, aldehydes, anhydrides, esters, nitriles and Grignard reagent, preparation of benzoic acid from toluene and benzanilide, physical properties, chemical properties, reaction with (metals, alkalis, PCl_3 , PCl_5 , SOCl_2 , NH_3), formation of anhydride, esterification, reduction,

decarboxylation, Hell-Volhard-Zelinsky reaction. Substitution reaction of benzoic acid (nitration, bromination) uses.

Unit XIII : Organic compounds containing Nitrogen

Amines : Nomenclature classification, structure, methods of preparation, reduction of (nitrocompounds, nitriles, amides) amonolysis of alkyl halides, Hoffmann bromamide degradation, Gabriel phthalamide synthesis. Physical properties and chemical propties, basic character of amines, alkylation, acylation, carbylamines reaction, identification of primary, secondary and tertiary amines (reaction with nitrous acid and arylsulphonyl chloride). Electrophilic substitution reactions of aniline (nitration, sulphonation, bromination). Cyanide and Isocyanides-will be mentioned at relevant places in context.

Unit XV: Polymers

Classification-Natural and synthetic methods of polymerization(addition and condensation)co polymerization, some important polymers, natural and synthetic like polythene, nylon, polyester, bakelite, rubber, Biodegradable and non-biodegradable polymers.

Unit XVI : Chemistry in Everyday life

Chemical in Medicines- Angesics, traqulizers antiseptics, disinfectants, antimicrobials, antifungal, drugs, antibiotics, antacids, antihistamines.

Cleansing agents – Soap & detergents, cleansing action.

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