

OLYCHEM SYLLABUS – 2016

(100 multiple choice questions will be asked each carrying 1 mark covering the entire syllabus. There will be -1 mark for each wrong answer. Duration of the examination is 2 hours.)

Unit-I : Structure of atom :

Rutherfords nuclear model of atom , its defects. Hydrogen spectrum. Different spectral series. Bohrs model of atom, radius of electron orbits, energy of electron in hydrogen and hydrogen like atoms, speed of electron in different orbits, explanation of hydrogen spectra. Dual nature of matter and de Broglie theory of matter waves. Heisenbergs uncertainty principle. Quantum numbers and shapes of s,p,d,f orbitals. Paulis exclusion principle and Hunds rule of maximum multiplicity.

Unit-II Periodic classification and Chemical bonding :

Periodic law, classification of elements into s,p,d,and f block.Periodicity in properties of elements.

Electrovalent, covalent and co-ordinate covalent bond, Lattice energy , Born-Haber cycle. Dipolemoment and polarity of covalent bond. Hybridization (sp,sp²,sp³,dsp²,dsp³,d²sp³) of covalent molecules and ions. VSEPR theory and shapes of linear, angular, plannar, pyramidal, tetrahedral and octahedral molecules.Sigma and pi bonds.

Unit III: 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 & p type semiconductors.

Unit IV: Solutions

Types of solutions, expression of concentration of solutions of solids in liquids, 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 molecular mass, van't Hoff factor.

Unit V : Electrochemistry

Redox reactions, conductance in electrolytic solutions, specific and molar conductivity, variations of conductivity with concentration, Kohlrausch's Law, electrolysis and law 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 VI : 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 VII: Surface Chemistry

Adsorption - physisorption and chemisorptions, factors affecting adsorption of gases on solids, catalysis, homogenous and heterogeneous activity and selectivity; enzyme catalysis 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 VIII : 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 and nitric acid, oxides of nitrogen (Structure only) ; Phosphorus - allotropic forms, compounds of phosphorus: preparation and properties of phosphine, halides PCl_3 , 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, Sulphure - allotropic forms; compounds of sulphure: 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 IX : 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 $K_2Cr_2O_7$ and $KMnO_4$.

Lanthanoids - Electronic configuration, oxidation states, chemical reactivity and lanthanoid contraction and its consequences.

Actinoids - Electronic configuration, oxidation states and comparison with lanthanoids.

Unit X : 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; structure and stereo isomerism, importance of coordination compounds (in qualitative inclusion, extraction of metals and biological system).

Unit XI : 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 in monosubstituted compounds only.

Uses and environmental effects of - dichloromethane, trichloromethane, tetrachloromethane, iodoform freons, DDT.

Unit XII : 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, electrophillic substitution reactions, uses of phenols.

Ethers: Nomenclature, methods of preparation, physical and chemical properties, uses.

Unit XIII : Aldehydes, Ketones and Carboxylic Acids

Aldehydes and Ketones: Nomenclature, nature of carbonyl group, methods of preparation, physical and chemical properties, mechanism of nucleophillic addition, reactivity of alpha hydrogen in aldehydes: uses.

Carboxylic Acids: Nomenclature, acidic nature, methods of preparation, physical and chemical properties; uses.

Unit XIV : 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 XV: Biomolecules

Carbohydrates - Classification (aldoses and ketoses), monosaccharides (glucose and fructose), D-L configuration oligosaccharides (sucrose, lactose, maltose), polysaccharides (starch, cellulose, glycogen) importance.

Proteins - Elementary idea of α - amino acids, peptide bond, polypeptides, proteins, structure of proteins - primary, secondary, tertiary structure and quaternary structures (qualitative idea only), denaturation of proteins; enzymes. Hormones - Elementary idea excluding structure.

Vitamins - Classification and functions.

Nucleic Acids: DNA and RNA.

Unit XVI: Chemistry in Everyday life

Chemicals in medicines - analgesics, tranquilizers antiseptics, disinfectants, antimicrobials, antifertility drugs, antibiotics, antacids, antihistamines.

Chemicals in food - preservations, artificial sweetening agents, elementary idea of antioxidants.

Cleansing agents - soaps and detergents, cleansing action.
