

Chemistry Syllabus

ATOMIC STRUCTURE, CHEMICAL EQUILIBRIUM AND CHEMICAL KINETICS: Principles and applications of Quantum mechanics; Hydrogen atom; Bohr's theory. Quantum numbers, atomic orbitals and chemical bonding ; Reversibility – Dynamic nature of equilibrium, K_p & K_c ; Rates of chemical reactions; collision and transition state theories, Photochemical reactions and free radical intermediates; Homogeneous and heterogeneous catalysis; Adsorption isotherms.

GASEOUS STATE & SOLUTIONS: Kinetic theory of gases – Derivation of kinetic equation and deduction of gas laws – Mean free path, collision number and collision diameter – Heat capacities for mono, di and tri atomic molecules;– Vanderwaal's equation - Critical phenomena – Law of corresponding states and its usefulness/applications. Solution of gases in liquids – Henry's Law – Deviation from Raoult's law– Azeotropic mixtures – Distribution law and its applications;

THERMODYNAMICS & ELECTROCHEMISTRY: First law of thermodynamics and its application to gases – Heat capacities at constant volume and constant pressure – Isothermal and adiabatic changes; Joule Thompson effect – Heats of formation, combustion, solution, dilution, and neutralization; Hess law and its applications – Kirchoff's equation – second law of thermodynamics – Carnot cycle –concept of entropy and Free Energy. Conductance – Specific & equivalent conductance – Acid base conductometric titrations – Transport numbers-Determination by Hittorf's method – Kohlrausch law and its applications; Ionic Equilibria, Ostwald's dilution law– Debye Huckel Theory , pH, buffer solutions and Henderson equation – Acid base indicators – pH at the equivalence point, theories of indicators – Solubility product and common ion effect – Hydrolysis of salts – degree of hydrolysis and hydrolysis constant - Electromotive force of Electrochemical cells.

s-BLOCK AND p-BLOCK ELEMENTS: s-Block Elements of Group IA – The Alkali Metals : General properties – Standard electrode potentials –Extraction and uses of metals – Reactivity of elements – Oxides; p-Block Elements – Group IIIB : Extraction & reactivity of

elements - Boron and Aluminium; Boric acid and Borax. ; GROUP VIIB: The Halogens :
General group trends - Isolation & reactivity -pseudo halogens.

d & f- BLOCK ELEMENTS AND COORDINATION COMPOUNDS: d-Block Elements: Electronic configuration – general properties – f-block elements electronic configuration – general properties: COORDINATION COMPOUNDS: Double salts and coordination compounds- Werner's theory – Sidgwick's electronic interpretation – EAN rule –Crystal field theory– Isomerism - Job's method – stability constants .

STRUCTURAL THEORY AND STEREO CHEMISTRY: Acidity and basicity of organic molecules; stereoisomerism - optical and geometrical isomers; Conformational analysis of acyclic and cyclic systems. halogen compounds, Alkyl and aryl halides and their reactivities; alcohols and phenols – their properties, synthesis and reactivities; aldehydes and ketones - their properties, synthesis and reactivities; Aldol, Cannizzaro and benzoin condensations; Alkyl nitrites and nitro compounds; Amines- aliphatic and aromatic – preparation, properties and their uses; cyanides and isocyanides.

REACTIVE INTERMEDIATES, MOLECULAR REARRANGEMENTS, CARBOHYDRATES AND HETEROCYCLIC CHEMISTRY: carbocations, carbanions, carbenes, nitrenes, arynes and singlet oxygen – general methods of preparation, properties and applications; Molecular rearrangements involving electron deficient carbon, nitrogen and oxygen atoms; Carbohydrates – open chain and cyclic structures of glucose, fructose and sucrose; configurational studies and reactions; Pyrazole, Imidazole, Oxazole, Thiazole, azines such as pyridazine, pyrimidine and pyrazine; Chromones and coumarins; Organic polymers; Elastomers – Natural and Synthetic Rubbers; Plastics; Fibers; Inorganic polymers; physical properties of polymers.

UV-VISIBLE, IR, NMR, MASS AND ESR SPECTROSCOPY: Principles, technique & applications of UV-Visible Spectroscopy ; IR Spectroscopy- IR spectrometer, Sampling techniques, Interpretation and applications of IR Spectra; Mass Spectroscopy: Basic principles, Instrumentation & Applications –Mc-Lafferty rearrangement.; Principles of NMR Spectroscopy; number of signals, Chemical shift, Integration, Spin-Spin coupling, Karplus Equation; D₂O exchange process; ¹³C NMR Spectroscopy; 2D-NMR spectroscopy; NOESY & COESY Techniques. Principles, Instrumentation & Applications of ESR.