

SYLLABUS :-

Module 1 Physical Chemistry Principles of Thermodynamics: First and Second Law of Thermodynamics, Concept of Entropy, Helmholtz and Gibbs free energy, Equilibrium and spontaneity conditions for Closed Systems, Maxwell Relations, The Chemical Potential; Definition and Concept of Open Systems. Applications: Phase equilibria, Reaction Equilibria, Electrochemical Equilibrium, Application of thermodynamics to real world Problems. Module 2 Inorganic Chemistry Bonding and Coordination Chemistry: Bonding in homo (Li_2 to N_2 , O_2 and F_2) and hetero (CO only) dinuclear systems. CFT and its applications. Metal ions from laboratory to living systems: Spectroscopic, magnetic, functional properties of new age coordination compounds and Hemoglobin. Organometallics and Catalysis: Metal carbonyls. Oxidative addition and reductive elimination, insertion and elimination reactions. Hydrogenation (Wilkinson's catalyst) and Carbonylation (Monsanto process). Redox Chemistry: Diagrammatic representation and use of Latimer and Frost diagrams. Applications of redox chemistry in energy storage (primary and secondary batteries). Materials Chemistry: Metal oxides, spinels, superconductors, and boron nitride. Module 3 Organic Chemistry Understanding the 3-D Structure of Organic Compounds: Concept of chirality and molecular structure (basic symmetry elements Sigma -plane and inversion centre); Representations in 2D and 3D forms; Absolute configuration and CIP nomenclature (case studies); Molecules devoid of point chirality (allenes and biphenyls, brief discussion); Significance of chirality in living systems (brief discussion) Conformational analysis (definition and implication); Dihedral angle, torsional angle and strain); Few acyclic systems (Gauche butane interactions); Few monocyclic systems and its conformational aspects (Cyclopropane to Cyclohexanes) Initial Strategies towards the Synthesis of New Chemical Entities: Nucleophilic Substitution reaction at saturated carbon ($\text{S}_\text{N}2/\text{S}_\text{N}1$ and $\text{S}_\text{N}i$ reaction; definitely brief $\text{S}_\text{N}i$ and NGP in detail), Stereochemical implication of SN reactions Elimination reaction: Syn 1,2 elimination reactions (Cope and related reactions with examples)