

IASE Deemed University, Sardarshahr
Syllabus for Ph.D. Course Work-2014-15

Subject: Chemistry

Paper: II

Unit I Coordination Chemistry

Classification of complex compounds, Nomenclature, Coordination number and stereochemistry (geometries of transition metal complexes); Isomerism in coordination compounds, stereoisomerism; Factors influencing complex formation; Detection of complex formation in solution; Methods for determination of stability constant and formulae of complexes; stabilization of oxidation states by complex formation; Applications of coordination compounds. Chelates: characteristics and classification factors influencing the stability of metal chelates. Detection of chelates, the importance of chelates.

Unit II Spectroscopy

Structure elucidation by joint application of UV, IR, NMR and Mass spectroscopy, double bond equivalent and ring equivalents, characterization of simple compounds of lipid, carbohydrates, amino acids, aliphatic, aromatic, heterocyclic compounds and cyclohydrocarbons, numerical problems. Fluorescence based analysis. Applications in organic analysis, inorganic analysis, biomedical and biochemical analysis, pharmaceutical chemical analysis, agricultural chemical analysis, forensic and environmental analysis.

Unit III Chemical Kinetics and Reaction Mechanism

Concepts of specific reaction rate, order, molecularity and stoichiometry of a reaction, Differential, Graphical and Ostwald methods for determining the order, Michaelis-Menten type Kinetics, Thermodynamic, Activation Parameters and their calculations. Isokinetic Relationship, Factors governing the rates in Solution, Salt Effect, Kinetic isotope Effect, Solvent Isotope Effect

Introductory aspects of - Hammett and Brown's Equations, Separation of polar, steric and resonance effect, Pávelich-Taft Dual-Substituent Equation, Charton's triparametric (LDR) and Charton's four-parametric (LDRS) equations, Introduction of Linear-Free energy relationships related to Solvent Effect: Grunwald-Winstein, Kamlet-Taft and Swain's Equations

Unit IV Electrochemistry

Potential sweep methods: Cyclic Voltammetry & its applications; Pulse techniques & their applications; Stripping methods: (ASV CSV Adv.) & their applications; Application of Coulometry, Chemically modified electrodes; Electrochemical impedance spectroscopy.

Unit V Analytical Techniques

Applications of GCMS for analysis of environmental samples with special reference to pesticides; Applications of HPCL in analysis of phytochemicals; Ion chromatography for separation of rare earth metals and transition metals; Radio Immuno assay techniques and applications; Chemical sensor with special reference to F^- , NO_2^- and K^+ ; Biosensors with special reference to glucose and cholesterol.

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Paper: III

Unit I Polymer Chemistry

General concept of polymers, classification & their characteristics; Methods for synthesis of polymers; Crosslinking in polymers and its significance, chelating agents and types, polymer bound chelating ion exchangers; their characterization. Characterization of polymers: Physical testing of polymers, Chemical methods, Spectroscopic methods, Thermal methods; Polymer rheology ;Applications in various fields.

Unit II Phytochemistry

Natural Fats: Oils and Fats from Vegetable Origin; Industrial oils; Properties of Oils; Isolation and Characterization of fatty acids from seed oil by chemical, Spectral and Chromatographic methods; Alkaloids: Classification; Extraction; General Properties; Structure Determination by Chemical & Spectral Methods; Terpenoids: Classification; Isolation; General Properties; Chemical & Spectral methods for Structure Determination.

Unit-III Heterocyclics in Medicinal Chemistry

Heterocyclics-Basic classifications; Heterocyclic precursors in medicinal chemistry specially thiazole, imidazole, benzimidazole, quinazolone and their substituted derivatives; Structure elucidation by IR, NMR and Mass Spectrometry; Chemotherapeutic Agents- Introduction, mode of action of antimicrobials, anti-cancer agents; SAR and QSAR for drug design and development.

Unit IV Photochemistry

Electromagnetic radiations and their interaction with matter, types of excitations, fate of excited molecules, quantum yield, transfer of excitation energy, actinometry; Photo-Fries reactions of anilides, Photo-Fries rearrangement, Barton reaction, Singlet molecular oxygen reactions, photochemical formation of smog, Photodegradation of polymers, Photochemistry of vision; Solar energy conversion and storage, Honda's cell, Iron-Thionine Photogalvanic cell, Photosynthesis, Latent image; Dye sensitized solar cells. Solar Photovoltaics : Fundamentals of Photovoltaic conversion, photon energy, semiconductor materials, Electronic structure of semiconductor, Semiconductor junctions, light absorption by a semiconductor. The solar cell, solar cell materials, power losses in solar cells, Temperature irradiance effect, solar cell fabrication, module fabrication, thin film solar cells, efficiency of solar cells.

Unit V Environmental Chemistry

Environmental Pollution: Pollutants from effluents of Metals, Textile, Paper-Pulp, distillery and soap-detergent industries and their effects. Treatment of Pollutants: General treatment methods for water and soil pollutants. Applications of adsorbents and resins in removal of heavy metals and dyes from industrial effluents; Trace elements: Toxicity, significance to public health and biochemical effects; Green Chemistry and sustainable development; laws pertaining to all types of pollutions.

Paper: IV Review of Literature


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