

BSc. (Hons) Chemistry III year

Inorganic chemistry

Transition elements: general group trends, colour, magnetic and catalytic properties of the transition elements, Latimer and Ebsworth diagrams. Chemistry of Ti, V, Cr, Mn, Fe and Co. Lanthanides and Actinides: electronic configuration, colour, spectral and magnetic properties, lanthanide contraction and separation of lanthanides.

Coordination Chemistry: Bonding theories Warner's theory, Valence bond, Crystal field theory, (Jahn Teller distortion), Ligand Field theory. Nomenclature, isomerism and stereochemistry of complexes, chelate effect, trans effect, thermodynamic and kinetic stability of complexes.

Organometallics: Definition, classification of organometallic compounds, metal alkyls, effective atomic number rule, metal carbonyls, ferrocene, and olefin complexes.

Bioinorganic chemistry: Metal ions present in the biological system, biochemistry of sodium, potassium, magnesium, calcium, iron and zinc. Excess and deficiency of metal ions. Toxicity of metal ions.

Inorganic polymers

Non aqueous solvents

Principles involved in qualitative analysis of a mixture of cations and anions and gravimetric.

Organic chemistry

Carbohydrates : Occurrence, classification and properties of monosaccharides, configurations of hydroxyl groups, mutarotation, Haworth projection, elementary treatment of starch, cellulose and glycogen.

Amino acids, peptides and proteins: Synthesis and properties of proteins, zwitterionic nature, isoelectric point, electrophoresis, classification and biological importance of proteins, secondary structure of proteins, pyrimidines and purines. Synthesis, reaction and elementary idea of nucleic acids

Enzymes: nomenclature, coenzymes, specificity, stereospecificity of enzymes, alcoholic fermentation, Krebs's cycle and glycolysis.

Lipids: Biological functions, oils and fats, industrial oils of vegetable origin, extraction, refining, hydrogenation, identification of fats and oils, saponification value, acid value, iodine number, reversion and rancidity of oils.

Terpenes: Essential oils, occurrence, isolation, classification, chemical composition, isoprene rule, structure and synthesis of citral and dipentene, classical and non classical carbonium ions.

Cleansing agents: Mineral and fixed oils, toilet and washing soap and synthetic detergents.

Spectroscopy: UV, IR, NMR and their applications to identification of organic compounds

Polynuclear hydrocarbons: naphthalene, anthracene and phenanthrene

Heterocyclic compounds: Synthesis, reaction, and aromaticity of furan, pyrrole, indole, thiophene, quinoline and isoquinoline

Pharmaceutical compounds: sulphadiazine, analgesics (aspirin, phenacetin, paracetamol) antimalarials- chloroquine and antibiotics - chloramphenicol

Dyes: synthesis and importance of azo dyes methyl red, methyl orange, congo red, Triphenylmethane dyes: malachite green, pararosaniline, rosaniline, crystal violet, methyl

violet, Phthalein dyes: phenolphthalein, fluorescein, copper phthalocyanine, alizarin, indigo.

Polymers: synthetic polymers, type of polymers, polymerization reactions, mechanism of polymerization, Zeigler Natta catalyst, vinyl polymers, natural and synthetic rubbers.

Alkaloids: Occurrence, importance and properties of alkaloids (nicotine, atropine, cocaine), and Hofmann's exhaustive methylation.

Physical chemistry

Paper XVII

Chemical kinetics: order of a reaction, rate law, differential and integral rate expressions, kinetics of complex reactions, opposing, parallel, consecutive reactions and their differential equations, chain reactions, catalysis, Michaelis-Menten equation, acid base catalysis, activation energy, collision theory of reaction rates, and Lindemann mechanism
Photochemistry: Laws of light absorption and photochemistry, Primary and secondary effects of light absorption, quantum efficiency and its experimental determination with emphasis on actinometry. Reasons of reactions with low and high quantum efficiency.

Electrochemical cells: Electromotive force of a cell and its measurement, Nernst equation, application of EMF measurement in determining the free energy, enthalpy, entropy, equilibrium constants and pH value. Concentration cells, liquid junction potential and potentiometric titrations.

Surface chemistry: physical adsorption, chemisorption, adsorption isotherms, catalytic activity, mechanism of catalyzed reactions and micelles.

Paper XVIII

Atomic structure: Postulates of quantum mechanics, quantum mechanical operators, Schrödinger equation, energy levels and wave functions, qualitative treatment of rigid rotator, harmonic oscillator, hydrogen atom, electron spin and multielectron systems. Covalent bonding: Variation theorem, valence bond, molecular orbital approach, treatment of H_2 , H_2^+ , BeH_2 , H_2O , CO_2

Electric and magnetic properties of matter.

Molecular structure: Molecular spectroscopy: Interaction of electromagnetic radiation with molecular systems. Born-Oppenheimer equation, Evaluation of physical parameters of diatomic and triatomic species, Vibrational, Raman, Electronic, Electron spin resonance and Nuclear magnetic resonance spectroscopy.

Structure of condensed phases: Nature of solid state, symmetry elements, symmetry operations, crystal systems and X-ray diffraction.