

B.Sc. Part-III: PHYSICAL CHEMISTRY
PAPER-THIRD

1. THERMODYNAMICS:

Thermodynamic derivation of the law of mass action. Reaction isotherm and Van't Hoff equation (influence of temperature on equilibrium constant K), Thermodynamic derivation of phase rule. Chemical potential, Gibbs-Duhem equation, Effect of temperature on chemical potential. Effect of pressure on chemical potential, Chemical potential of real gases and fugacity of real gases. Colligative properties (thermodynamic treatment).

2. CHEMICAL KINETICS AND CATALYSIS:

Steady state approximation, Lindemann's theory of unimolecular reactions, Quantitative treatment of transition state theory of reaction rates, Primary salt effect in ionic reactions. Kinetics of homogeneous, acid-base and enzyme catalysis, heterogeneous catalysis, negative catalysis and inhibition. Effect of pH and temperature on enzyme catalyzed reactions, Effect of temperature on surface reactions, promoters and poisons.

3. PHOTOCHEMISTRY:

Absorption of light, chain reactions, free radical chains (Rice-Herzfeld mechanism for the decomposition of ethane), Lambert's and Beer's law, Einstein's law of photochemical equivalence and quantum efficiency. Kinetics of decomposition of acetaldehyde and dimerization of anthracene. Photosensitization.

4. E.M.F. :

Concentration cells with and without transference, Liquid junction potential, Fuel cells.

5. ATOMIC STRUCTURE AND NUCLEAR CHEMISTRY:

Bohr's theory, Dual nature of electron and de Broglie equation, Heisenberg's uncertainty principle. One dimensional Schrodinger's wave equation and physical significance of wave function.

Radioactive decay and equilibrium, Natural and artificial radioactivity, Radioactive series, Nuclear binding energy, radioactive isotopes, fission and fusion products.

SYLLABUS FOR B. Sc.-III
CHEMISTRY PRACTICAL

1. Organic analysis of industrial importance 20 Marks
- (i) Identification of simple organic compound
 - (ii) Paper chromatographic separation of amino acids and sugars (only binary mixtures)
2. Physical Chemistry Experiments 25 Marks
- (i) Acid or alkaline hydrolysis of esters.
 - (ii) Acetone-iodine reaction catalyzed by H⁺ ions
 - (iii) Adsorption of acetic acid on charcoal
 - (iv) Heat of solution of a substance (oxalic acid) by solubility method
 - (v) Molecular weight determination of a volatile substance by Duma's method
3. Inorganic analysis and preparation
- (i) Determination of hardness of water
 - (ii) Preparation of simple inorganic complexes
 - (iii) EDTA titrations of Ca²⁺, Mg²⁺, Zn²⁺ and Cu²⁺.
 - (iv) Paper-chromatographic separation of metal ions – Pb²⁺, Zn²⁺, Cu²⁺, Ni²⁺, Cd²⁺ ions
(binary mixtures only)