# Contents

#### Chapter 1 : Adsorption

Mehanism of adsorption; Differences between adsorption and absorption; Types of Adsorption; Potential Energy Curves of Adsorption; Heat of Adsorption; Factors Influencing Adsorption; Adsorption isobar and Adsorption isostere; Languuir Adsorption Isotherm; B.E.T. Theory of Multilayer Adsorption; Types of Adsorption Isotherms; Mean Life Time of the Adsorbates on Adsorbent Surface; Adsorption From Solution; Types of Mechanical Adsorption; Gibbs Adsorption Isotherm; Significance of Gibbs adsorption isotherm; Surface Films on Liquids; Thermodynamics of Solid-Gas Adsorption; Applications of Adsorption; Some Solved Problems; Some Possible Questions.

### Chapter 2 : The Colloidal State

General Classification of Solute-Solvent System; Classification of Colloidal Solutions; Preparation of Colloidal Solution; Purification of Colloidal Solution; Properties of Colloidal Solution; Stability of Colloidal Particles; Coagulation of Colloidal Solution; Protective; Colloids; Size of Colloidal Particles; Colloidal Electrolytes; Applications of Colloids; Some Possible Questions

### Chapter 3 : Distribution Law

Nernst Distribution Law; Explanations of Distribution Law; Conditions For the Validity of The Distribution Law; Thermodynamic Derivation of Distribution Law; Modified Distribution Law Due to Change in Molecular States; Henry's Law—A Special Form of Distribution Law; Determination of Equilibrium Constant Using Distribution Law; Determination of Formula of Complex Ions; Solvent Extraction; Derivation of A General Formula for Substance Left Unextracted; Partition Chromatography; Important Applications of Distribution Law; Some Solved Problems; Some Possible Questions.

## Chapter 4 : Catalysis

Classification of Catalysis; General Characteristics of Catalytic Reactions; Promoters and Their Action; Catalytic Poisoning; Function of Catalyst; Mechanism of Reaction of Heterogeneous Catalysts; Theories of Catalysis; Quantitative Treatment of Adsorption Theory; Kinetics of Autocatalysis Reaction; Effect of Temperature on Catalytic Reaction; Acid-Base Catalysis; Kinetics of Acid-Base Catalysed Reactions; Effect of pH on Acid-Base Catalysis; Characteristics of Enzyme Catalysis; Uses of Different Catalysis; Some Solved Problems; Some Possible Questions.

#### Chapter 5 : Electrolysis and Electrical Conductivity

Electricity Conduction; Mechanism of Electrolytic Conduction; Ostwald's Dilution Law; Electrolysis; Faraday's Law of Electrolysis; Applications of Electrolysis; Electrical Conductivity; Factors Influencing Conductance of An Electrolyte; Kohlrausch's Law; Applications of Conductance Measurement; Conductometric Titration; Some Solved Problems; Some Possible Questions.

### Chapter 6 : Theories of Electrolytes and Migration of Ions

Arrhenius Theory; Debye-Hückel Theory of Strong Electrolytes; Derivation of Debye-Hückel–Onsagar Equation; Validity of Debye–Hückel–Onsagar Equation; Activity and Activity Coefficient of Strong Electrolytes; Ionic Srenth of Electrolyte Solution; Debye–Hückel Theory of Dilute Ionic Solution; Extension of Debye–Hückel Limiting Equation; Migration of Ions; Drift Velocity and Mobility of Ion; Current Carried by Ions; Discharge of Ions on Electrolysis; Hinttorf's Theoretical Device; Transport Number or Transference Number; Determination of Transport Number; Determination of Transport Number by Hittorf's Method; Factors Influencing Transport Number; Zero and Negative Transport Number; Some Solved Problem; Some Possible Questions.

#### Chapter 7 : Ionic Equilibrium

Concepts of Acids and Bases; Superiority of Bronsted—Lowry Concept Over Arhenius Concept; Extended Bronsted—Lowry Theory (Solvent-System Concept); Lewis Theory (Electronic Theory of Acid Base); Some Salient Features of Acids and Bases; Dissociation of Acids; Dissociation of Bases; Relative Strengths of Weak Bases; Relationship between  $K_a$  and  $K_b$ ; Effect of Substitutents on Acid Strenth; Effect of Substituents on Basic Strength; Ionic Product of Water; Isohydric Solution; Buffer Solution; Buffer Capacity of Buffer Index; Acid Base Indicators or Hydrogen Ion Indicator; Acid-Base Titration and Use of Indicators; pH Changes during Acid-Base Titration; Salt Hydrolysis; Experimental Determination of Degree of Hydrolysis; Common Ion Effect; Concept of Solubility Product; Some Solved Problems; Some Possible Questions.

## Chapter 8 : Electromotive Force: Electrochemical Cell

Redox Reactions; Electrochemical Cells; Some Examples Electrochemical Cells; Reversible and Irreversible Cells; Reversible Electrodes; Electrode Potential or Single Electrode Potential; Origin of Electrode Potential; Nernst's Solution Pressure Theory; Normal Hydrogen Electrode (NHE or SHE); Electromotive Force (EMF) or Cell Potential; Measurement of EMF; Relationship Between Free Energy Change and Electrical Energy  $(E_{coll})$ ; Relationship Between Entropy Change and Electrical Energy; Relationship Between Heat Change and Electrical Energy; Thermodynamics of Reversible Cells; Electrode Potential in Terms of Osmotic Pressure and Solution Pressure; Effect of Electrolyte Concentration on Electrode Potential; The Nernst Equation Relating Electrode Potential and Concentration; Fuel Cell; Electrochemical Series; Concentration Cells; Liquid Junction Potential or Diffusion Potential; Application of EMF Measurement; Potentiometric Titration or Electrometeric Titration; Oxidation-Reduction Indicators; Some Commonly Used Electrochemical Cells (Batteries); Irreversible Electrode Processes; Corrosion; Passivity of Metals; Polarography; Amperometric Titration; Some Solved Problems; Some Possible Questions.

*Chapter 9 : Quantum Mechanical Concept of Atomic Structure* Fundamental Particles; Electron; Proton; Neutron; Rutherford's Model of Atom; Concept of Atomic Number; Concept of Mass Number; Different Nuclear Structures; Electromagnetic Radiation; Electromagnetic Spectrom; Continuous Spectrum; Atomic Spectra; Spectrum of Hydrogen; Maxwell's Electromagnetic Theory; Black Body and Black Body Radiation; Photoelectric Effect; Planck's Quantum Theory of Radiation; Bohr's Atomic Model; Major Achievements of Bohr's Atomic Model; Facts Supporting Bohr's Atomic Model; Limitations of Bohr's Atomic Model; Sommerfeld Model; Electronic Arrangement in Orbit; Some Solved Questions; Some Possible Questions.

Chapter 10 : Wave Mechanical Concept of Atomic Structure Dual Character of Matter; Heisenberg's Uncertainty Principle; Schrödinger's Wave Equation; Normalised Wave Function; Orthgonal Wave Function; Degeneracy; Application of Schrodinger's Wave Equation; Postulates of Quantum Mechanics (Wave Mechanics); Particle in A One Dimensional Potential Box; Particle in A Three Dimensional Potential Box; Schrodinger's Wave Equation For Aydrogen Atom; Trasformation of Cartesian Coordinates To Polar Coordinates; Calculation of Energy of An Orbital of Hydrogen Atom; Space Wave Function; Probability Distribution of Electron in Atomic Orbital; Angular Probability Distribution for Different Orbitals; Quantum Numbers; Pauli's Exclusion Principle; Shielding Effect and Effective Nuclear Charge; Hund's Rule; Stability of Half Filled and Fully Filled Orbitals; Method of Writting Electronic Configuration; Simple Harmonic Oscillater; Some Solved Problems; Some Possible Questions.

Chapter 11 : Wave Mechanical Concept of Chemical Bonding Valence Bond Theory; Discussion of  $H_2$  molecule on the Basis of VB. Theory; Pauling Slater's Theory (Orbital Overlap Theory); Molecular Orbital Theory (MOT); Formation of Bonding and Antibonding Molecular Orbitals; Molecular Orbitals Due to Combination of s–Orbitals; Molecular Orbitals Due to Combination of s and p–Orbitals; Molecular Orbitals Due to Combination of Two  $p_x$ –Orbitals; Molecular Orbitals Due to Combination of 2 $p_y$ , or 2 $p_z$  Orbitals; Energy Level Diagram For Molecular Orbitals; Mixing of Orbitals; Electronic Configuration of Some Diatomic Species; Molecular Orbitals

of  $H_2^+$ -Ion; Compression Between Valence Bond Theory and

Molecular Orbital Theory; Hybridisation; Salient Features of Hybridisation (Rules of Hybridisation); Wave Functions For Hybrid Orbitals; Construction of Wave Function For-Hybrid Orbitals; Construction of Wave Function for  $sp^2$ -Hybrid Orbitals; Construction of Wave Function for  $sp^1$ -Hybrid Orbitals; Some Solved Problems; Some Possible Questions.

Chapter 12 : Environmental Pollution and Its Consequences Introduction; Pollutants; Types of Pollutants; Agents Causing Pollution; Classification of Pollution; Effects of Pollution; Air Pollution; Sources of Air Pollution; Air Pollution; Effects of Air Pollution; Control of Air Pollution; Water Pollution; Sources of Water Pollution; Major Water Pollutions; Causes of Water Pollution; Control of Water Pollution; Land Pollution or Terrestrial Pollution; Sources of Land Pollution; Detrimental Effects of Land Pollution; Control of Land Pollution or Terrestrial Pollution; Noise Pollution; Sources of Noise Pollution; Effects of Noise Pollution; Control of Noise Pollution; Radiation Pollution; Sources of Radiation Pollution; Effect of Radiation Pollution; Control of Radiation Pollution; Thermal Pollution; Sources of Thermal Pollution; Effect of Thermal Pollution; Industrial Pollution; Some Possible Questions.

## Chapter 13 : Reactions of Primary Pollutants In Environment and Subsequent Changes

Carbon Monoxide (CO); Sink; Detrimental Effects; Control of Co-Emission; Sulphur Dioxide (SO<sub>2</sub>); Sources; Sink of SO<sub>2</sub>; Detrimental Effects of SO<sub>2</sub>; Control of SO<sub>2</sub> Pollution; Nitrogen Oxide (NO<sub>x</sub>); Source of NO<sub>x</sub>; Sink; Consequences of NO<sub>x</sub> Accumulation; Detrimental Effects of NO<sub>x</sub> On Living Organisms; Control of NO<sub>x</sub> Pollution; Hydrocarbons; Sources; Detrimental Effects of Hydrocarbons; Control of Hydrocarbons; Particulates; Sources; Types of Particulates; Detrimental Effects; Control of Particulate Emission; Consequences of Air Pollution; Ozone Layer Depletion; Green House Effect; Smog Formation; Acid Rain; Some Possible Questions.

Appendices References

Index