

COURSE-VII BSCCH 203 PHYSICAL CHEMISTRY- II

Block 1 Chemical Thermodynamics

Unit -1 Thermodynamics II

- 1.1 Objectives
- 1.2 Introduction
- 1.3 Second law of thermodynamics
- 1.4 Need for the law
- 1.5 Different statement of the law
- 1.6 Carnot cycles and its efficiency
- 1.7 Carnot theorem
- 1.8 Thermodynamic scale of temperature
- 1.9 Summary
- 1.10 Terminal Question
- 1.11 Answers

Unit -2 Concept of entropy

- 2.1 Objectives
- 2.2 Introduction
- 2.3 Entropy as a state function
- 2.4 Entropy as a function of V and T
- 2.5 Entropy as a function of P and T
- 2.6 Entropy change in physical change
- 2.7 Entropy change in ideal gases and mixing of gases
- 2.8 Clausius inequality
- 2.9 Summary
- 2.10 Terminal Question
- 2.11 Answers

Unit -3 Chemical Equilibrium

- 3.1 Objectives
- 3.2 Introduction
- 3.3 Equilibrium constant and free energy
- 3.4 Thermodynamic derivation of law of mass action

- 3.5 Le-Chatelier's principle
- 3.6 Reaction isotherm and reaction isochore
- 3.7 Clapeyron equation
- 3.8 Clapeyron Clapeyron-equation
- 3.9 Applications of Clapeyron Clapeyron-equation
- 3.10 Summary
- 3.11 Terminal Question
- 3.12 Answers

Unit 4 Ionic Equilibrium

- 4.1 Objectives
- 4.2 Introduction
- 4.3 Electrolytes and Non-electrolytes
- 4.4 Acids, Bases and Salts
- 4.5 Ionic product of water
- 4.6 Common Ion Effect
- 4.7 Ionic Equilibria in weak Acids and Bases including Multistage Equilibria
- 4.8 pH Scale Exact treatment of Calculation of H^+ ions and pH for HA and BOH
- 4.9 Hydrolysis
 - 4.9.1 Salt hydrolysis
 - 4.9.2 Hydrolysis constant
 - 4.9.3 pH calculation
 - 4.9.4 Degree of hydrolysis
- 4.10 Titrations Acid- Base Titration Curve
- 4.11 Buffer solution
- 4.12 Buffer capacity
- 4.13 Henderson equation
- 4.14 Solubility and solubility product
- 4.15 Indicators
- 4.16 Common ion effect and the Solubility of a Sparingly soluble salt
- 4.17 Summary
- 4.18 Terminal Question

4.19 Answers

Block 2 Phase Rule and Surface Chemistry

Unit 5 Phase equilibrium I

5.1 Objectives

5.2 Introduction

5.3 Statement and meaning of the term

5.3.1 Phase

5.3.2 Component

5.3.3 Degree of freedom

5.4 Derivation of Gibbs phase rule

5.5 Phase equilibrium of one component system

Water, CO₂ and S system

5.6 Phase equilibrium of two component system

5.7 Solid liquid equilibrium, simple eutectic- Bi- Cd, Pb-Ag system,

5.8 Desilverisation of lead

5.9 Summary

5.10 Terminal Question

5.11 Answers

Unit -6 Phase Equilibrium II

6.1 Objectives

6.2 Introduction

6.3 Solid solution

6.4 Compound formation with congruent melting point(Mg-Zn)

6.5 Incongruent melting point

(NaCl-H₂O), (FeCl₃- H₂O) and (CuSO₄- H₂O) system

6.6 Freezing mixtures

6.6.1 Acetone-dry ice

6.6.2 Liquid- liquid mixtures

6.7 Ideal liquid mixtures

6.8 Results and Henry's law

6.8.1 Non- ideal system

- 6.8.2 Azeotropes- HCl-H₂O
- 6.8.3 Ethanol- water systems
- 6.9 Partially miscible liquids-
- 6.9.1 Phenol water
- 6.9.2 Trimethylamine-water,
- 6.10 Nicotine- water systems
- 6.11 Lower and upper consolute temperature
- 6.12 Effect of impurity on consolute temperature
- 6.13 Immiscible liquids, Steam distillation
- 6.14 Summary
- 6.15 Terminal Question
- 6.16 Answers

Unit -7 Surface Chemistry

- 7.1 Objectives
- 7.2 Introduction
- 7.3 Types of absorption
- 7.4 Freundlich's and Langmuir's absorption isotherm
- 7.5 Charge on the colloidal particle
- 7.6 Size of the colloidal particle
- 7.7 Perrin's method of determination of the Avogadro's number
- 7.8 Summary
- 7.9 Terminal Question
- 7.10 Answers

Block 3 Electrochemistry

Unit -8 Electrochemistry I

- 8.1 Objectives
- 8.2 Introduction
- 8.3 Electrical transport-
- 8.3.1 Conduction in metal and in electrolyte solution
- 8.3.2 Specific conductance and equivalent conductance
- 8.3.3 Measurement of equivalent and specific conductance with dilute

- 8.4 Migration of ions and Kohlrausch law
- 8.5 Arrhenius theory of electrolyte dissociation and its limitations
- 8.6 Weak and strong electrolytes
- 8.7 Ostwald's dilution law its uses and limitations
- 8.8 Debye- Huckel- Onsager's equation for strong electrolytes
- 8.9 Transport number,
 - 8.9.1 Definition
 - 8.9.2 Determination by Hittorf's method and moving boundary method.
- 8.10 Application of conductivity measurements:
- 8.11 Determination of degree of dissociation,
- 8.12 Determination of K_a of acids
- 8.13 Determination of solubility product of sparingly soluble salt
- 8.14 Conductometric titrations
- 8.15 Summary
- 8.16 Terminal Question
- 8.17 Answers

Unit -9 Electrochemistry II

- 9.1 Objectives
- 9.2 Introduction
- 9.3 Types of reversible electrodes
 - 9.3.1 Gas- metal ion,
 - 9.3.2 Metal-metal ion
- 9.4 Metable insoluble salt
- 9.5 Anion and redox electrodes
- 9.6 Electrode reactions
- 9.7 Nernst equation
- 9.8 Derivation of cell E.M.F. and single electrode potential
- 9.9 Standard hydrogen electrode reference electrodes
- 9.10 Standard electrode potential
- 9.11 Single conventions
- 9.12 Electrochemical series and its significance

9.13 Summary

9.14 Terminal Question

9.15 Answers

Unit -10 Electrolytic and Galvanic cells

10.1 Objectives

10.2 Introduction

10.3 Reversible and irreversible cells

10.4 Conventional representation of electrochemical cells

10.5 EMF of a cell and its measurements

10.6 Computation of cell EMF

10.7 Calculation of thermodynamic quantition of cell reaction (ΔG , ΔH and K)

10.8 Polarization

10.9 Over potential and hydrogen overvoltage

10.10 Concentration cell with and without transport

10.11 Liquid junction potential

10.12 Applications of concentration cells

10.13 Valency of ions

10.14 Solubility product and activity coefficient potentiometric titration

10.15 Summary

10.16 Terminal Question

10.17 Answers