

COURSE-X I BSCCH 303 PHYSICAL CHEMISTRY- III

Block-1

Unit- 1 Elementary Quantum Mechanics

- 1.1 Objectives
- 1.2 Introduction
- 1.3 Black body radiation
- 1.4 Planck's radiation law
- 1.5 Photoelectric effect
- 1.6 Bohr's modes of hydrogen atom (no derivation) and its defects
- 1.7 Compton Effect.
- 1.8 de-Broglie Hypothesis
- 1.9 Heisenberg's uncertainty principles
- 1.10 Hamiltonian operator
- 1.11 Schrödinger wave equation and its importance (with derivation)
- 1.12 Physical interpretation of the wave function
- 1.13 Postulates of quantum mechanics
- 1.14 Schrodinger wave equation for H-atom,
- 1.15 Quantum numbers and their importance
- 1.16 Summary
- 1.17 Terminal Question
- 1.18 Answers

Unit- 2 Fundamentals of Spectroscopy

- 2.1 Objectives
- 2.2 Introduction
- 2.3 Introduction of Spectroscopy
- 2.4 Importance of Spectroscopy
- 2.5 The Electromagnetic Radiation
- 2.6 Regions of the spectrum
- 2.7 Basic features of different spectrometers
- 2.8 Difference between Atomic and molecular Spectroscopy
- 2.9 Absorption and Emission spectra

2.10 Born- Oppenheimer Approximation

2.11 Summary

2.12 Terminal Question

2.13 Answers

Block-2 Spectroscopic Methods-I

Unit- 3 Rotational Spectrum

2.1 Objectives

2.2 Introduction

2.3 Diatomic molecules

2.4 Energy levels of a rigid rotor (semi classical principles)

2.5 Selection rule

2.6 Rotational spectra of rigid diatomic molecule

2.7 Determination of bond length

2.8 Numerical problems

2.9 Summary

2.10 Terminal Questions

2.11 Answers

Unit- 4 Vibrational Spectra

3.1 Objectives

3.2 Introduction

3.3 Infrared spectrum

3.4 Energy levels of simple harmonic oscillator

3.5 Selection rules

3.6 Pure vibrational spectrum

3.7 Intensity

3.8 Determination of force constant and qualitative relation of force constant and bond energies

3.9 Effect of harmonic motion and isotope on the spectrum

3.10 Idea of vibrational frequencies of different functional groups

3.11 Summary

3.12 Terminal Questions

3.13 Answers

Unit- 5 Raman Spectroscopy

4.1 Objectives

4.2 Introduction

4.3 Concept of polarizability

4.4 Selection rules

4.5 Pure rotational and pure vibrational Raman spectra of diatomic molecules

4.6 Summary

4.7 Terminal Questions

4.8 Answers

Unit- 6 Electronic Spectrum

5.1 Objectives

5.2 Introduction

5.3 Optical activity and its measurement

5.4 Dipole moment and its measurement by temperature change method

5.5 Magnetic property and its measurement by Guoy balance method

5.6 Applications of optical activity

5.7 Dipole moment and magnetic property for determination of structure of molecule

5.8 Summary

5.9 Terminal Questions

5.10 Answers

Unit- 7 Photochemistry

7.1 Objectives

7.2 Introduction

7.3 Introduction of radiation with matter

7.4 Difference between thermal and photochemical processes

7.5 Laws of photochemistry

7.6 Grothus - Drapper law

7.7 Stark-Einstein law

7.8 Jablonski diagram qualitative description of fluorescence

7.9 Phosphorescence

7.10 non-radiative processes (Internal conversion, Intersystem crossing),

7.11 Quantum yield

7.12 Photosensitized reactions

7.13 Summary

7.14 Terminal Questions

7.15 Answers

Block-3

Unit- 8 Solutions Dilute Solution and Colligative properties

8.1 Objectives

8.2 Introduction

8.3 Ideal and non ideal solution

8.4 Methods of expressing concentrations of solutions

8.5 activity and activity coefficient

8.6 Dilute solution,

8.7 Colligative properties

8.8 Raoult's law

8.9 Relative lowering of vapor pressure molecular weight determination.

8.10 Osmosis, law of osmotic pressure, and its measurement

8.11 Determination of molecular weights from osmotic pressure and its measurement

8.12 Determination of molecular weight from osmotic pressure

8.13 Elevation of boiling point and depression of freezing point

8.14 Abnormal molar mass

8.15 Degree of dissociation and association of solute

7.16 Summary

7.17 Terminal Questions

8.16 Answers

Unit- 9 Thermodynamics III

9.1 Objectives

9.2 Introduction

9.3 Statement and concept of residual entropy and enthalpy

9.4 Third law of thermodynamics

9.5 Unattainability of absolute zero

9.6 Nernst heat theorem

9.7 Evaluation of absolute entropy from heat capacity data

9.8 Summary

9.9 Terminal Questions

9.10 Answers