

Exam. Code : 103206

Subject Code : 1397

B.A./B.Sc. Semester—VI

CHEMISTRY

Physical Chemistry—IV

Time Allowed—3 Hours] [Maximum Marks—35

Note :— (1) Part A is compulsory. Each question carries 1 mark.

(2) Attempt two questions each from the Sections I, II and III in Part B. Each question carries 4.5 marks.

PART—A

1. Define Compton effect.
2. What is degeneracy? Explain with an appropriate example.
3. State Planck's radiation law.
4. Prove that vibrational energy is quantized.
5. What is the need for spherical polar coordinates?
6. Define unit cell and space lattice.
7. Differentiate between fluorescence and phosphorescence.
8. What are photosensitized reactions?

PART—B

SECTION—I

9. (a) Explain photoelectric effect.
(b) Compare de Broglie wavelength of an electron moving at $1 \times 10^8 \text{ cm s}^{-1}$ and an object of mass 1 g moving with the speed of 1.0 cm s^{-1} .

10. State and elaborate postulates of quantum mechanics.
11. Solve Schrodinger equation for particle in one dimensional box.

SECTION—II

12. (a) Prove that Simple Harmonic Oscillator is model for vibrating molecules. Write Hamiltonian operator for the simple harmonic oscillator.
(b) Compare the solution from simple harmonic oscillator with that of particle in one dimensional box.
13. Solve Schrodinger equation for rigid rotator.
14. (a) Separate the Schrodinger equation for hydrogen atom into radial and angular parts.
(b) Draw spherical and radial distribution functions for 2p.

SECTION—III

15. (a) Define the laws related to crystallography.
(b) Derive Bragg's equation.
16. Draw Jablonski diagram depicting various processes occurring in excited state. Define all the processes.
17. (a) Compare thermal and photochemical processes.
(b) What are photosensitized reactions? Explain with minimum one example.