Exam. Code : 103206
Subject Code : 1427

B.A./B.Sc. 6th Semester

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. How did Planck's explanation differ from that of Rayleigh
and Jeans for black body radiation ?

2. What is de Broglie's hypothesis ?

3. What is average value postulate in quantum mechanics ?

4. Prove that rotational energy is quantized.

5. Define angular momentum along with diagram.

6. Define first law of crystallography.

7. What is quantum yield ?

8. Draw crystal structure of sodium chloride. $1 \times 8 = 8$

PART–B

SECTION–I

9. (a) Explain photoelectric effect. How does it lead to emergence of quantum mechanics ?

    (b) Explain Compton Effect.   3,1.5

10. (a) Derive Schrodinger equation and describe its importance.

    (b) The work function of sodium is 2.75 eV. Calculate kinetic energy of emitted electrons and the longest wavelength that can cause photoelectron ejection.

                                                                2,2.5

11. Solve Schrodinger equation for particle in one dimensional box. Discuss the solution in detail.   4.5

SECTION–II

12. (a) What are the assumptions under which simple harmonic oscillator acts as model of vibrational motion ?

    (b) Describe solution of simple harmonic oscillator.

                                                                1.5,3

13. Write Schrodinger equation for rigid rotator and solve it for the energy and wave function. Describe the conclusions.

                                                                4.5

14. Describe radial and angular part of wave function for hydrogen atom. Plot radial and angular part of the probability distribution function for 2s, 2p,3s,3p,3d.

                                                                4.5

SECTION–III

15. Define space lattice. What are Miller indices ? Calculate Miller indices for a face having intercepts $a : \frac{1}{3}$ $b : \frac{1}{2}c$.

    4.5

16. (a) Describe powder method for determination of crystal structure.

    (b) Define Grotthus Draper law and Stark Einstein law.

    2,2.5

17. Draw Jablonskii diagram and define all the terms used in the diagram.   4.5