Exam. Code : 103206
Subject Code : 1332

B.A./B.Sc. 6th Semester
CHEMISTRY (Physical Chemistry-B)

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 photoelectric effect.

2. Define degeneracy with appropriate example.

3. What is de Broglie wavelength of electron moving with speed of one-tenth the speed of light ?

4. Draw radial distribution function for 3p and 3d.

5. What is the significance of quantum numbers obtained during solution of Hydrogen atom ?

6. Draw the plane 111 in FCC system.

7. Define quantum yield.

8. Draw structure of NaCl crystal unit cell. $8 \times 1 = 8$

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PART—B
SECTION—I

9. (a) Describe black-body radiation. How Plank succeeded in explaining it ?

   (b) What is Hamiltonian operator ? Write Hamiltonian operator for particle in three dimensional box with potential energy of V.   2.5,2

10. Write postulates of quantum mechanics.   4.5

11. Solve Schrodinger equation for particle in one dimensional box.   4.5

SECTION—II

12. (a) Solve Schrodinger equation for simple harmonic oscillator and prove that vibrational energy is quantized.

    (b) Prove that Simple Harmonic Oscillator is model system for vibrating molecules.   3.5,1

13. (a) What is the need for spherical polar coordinates ? Derive relation between Cartesian coordinates and spherical polar coordinates.

    (b) Compare the results of solution of Schrodinger equation for harmonic oscillator with those of rigid rotator.

                                                          2,2.5

14. Set up Schrodinger equation for rigid rotator. Solve the equation for wave function.   4.5

SECTION—III

15. (a) Derive Bragg's law in reciprocal space. 2

    (b) Explain the symmetry elements glide plane and screw axis. What is their importance ? 2.5

16. When X-ray powder pattern of crystalline copper is obtained using copper target (with wavelength 154.05), reflections are found at 21.65°, 25.21°, 37.06°,44.96°, 47.58° and other angles.

    (a) What is the type of cubic crystal formed by copper?

    (b) What is the length of side of unit cell ?

    (c) Determine the value of Avogadro constant if density of copper is 8.812 g cm^{-3}.

    (d) Calculate the radius of copper atom. 4.5

17. (a) Explain photosensitized reaction with example.

    (b) What is importance of photosensitized reactions ? 3,1.5