

4294

2008-2009
 B.Sc.(HONS.) (PART-III) EXAMINATION
 PHYSICS
 ATOMIC, MOLECULAR, LASER AND SOLID STATE PHYSICS
 (PH-309)

Maximum Marks: 40

Duration : Three Hours.

Answer all questions.

1.(a) Discuss Pauli's exclusion principle. Apply this principle to energy levels of equivalent electrons p^2 . 05

(b) Explain Zeeman effect. How this effect can be observed? 02

OR

1'(a) Explain the fine structure of Hydrogen atom. Discuss the Lamb's shift. 05

(b) Explain LS and j j couplings. Obtain the terms of pd configuration in LS coupling scheme. 02

2.(a) Find the energy levels of a diatomic molecule as a rigid rotator. Explain the properties and applications of these rotational energy levels. 05

(b) Describe the infrared spectrum of a diatomic molecule. 02

OR

2'(a) Describe Raman effect. Discuss the Rotational Raman spectra of diatomic molecules. 05

(b) Explain the energy levels of a diatomic molecule as simple harmonic oscillator model. 02

20, 3.(a) Discuss spontaneous and stimulated emission. Explain population inversion. Find the relation between Einstein coefficients A and B. 04

(b) Describe the construction and working of He - Ne Laser. What are the advantages of this laser? Give the relevant energy level diagram. 03

4.(a) Discuss primitive cell, unit cell and Wigner-Seitz cell. Explain Bravais's lattices. 05

(b) Explain the structure of NaCl crystal. 02

OR

- 4'(a) Discuss the cohesion of atoms and primary bonds in the crystal. Explain covalent and metallic bonds. 05
- (b) Explain the structure of diamond crystal. 02
- 5.(a) Explain Bragg's law of diffraction in crystal. Explain Laue's experiment and Laue photograph in crystal. 04
- (b) Briefly explain the dispersion curve of a one- dimensional monatomic chain. 02
6. Describe the occurrence of the energy band gaps in solids. Outline the Kronig-Penny model and discuss it qualitatively. 06

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