21PHY1C3L

Sl. No.

M.Sc. I Semester Degree Examination, April/May - 2024
PHYSICS
Atomic, Molecular and Optical Physics
(NEP)

Time : 3 Hours   Maximum Marks : 70

Note : Answer **any five** of the following questions with Question No. 1 **(Q1)** is **Compulsory**, each question carries **equal** marks.

1. (a) What is spin orbit interaction ? Obtain the general expression for spin-orbit interaction energy.   **8+6=14**

   (b) What is diffuse series in alkali spectra ? Show that the intensity ratio of compound doublet of the diffuse series in alkali spectra is 1:9:5.

2. (a) What is Zeeman effect ? Obtain the expression for magnetic interaction energy for a single valence electron atom in Zeeman effect.   **9+5=14**

   (b) State and prove Lande Interval rule.

3. (a) Discuss the vibrating molecule as a simple harmonic oscillator.   **9+5=14**

   (b) Explain the working principle of microwave spectrometer.

4. (a) Explain the intensities of vibrational-electronic spectra based on Franck-Condon principle.   **9+5=14**

   (b) Differentiate between infrared and Raman spectroscopy.

5. (a) Obtain the threshold condition for light amplification in lasers.   **8+6=14**

   (b) Explain the construction and working of Nd-YAG laser.

6. (a) Discuss L-S coupling scheme in case of two valence electron atoms and derive the expression for interaction energy in this case.   **8+6=14**

   (b) Explain the intensity of spectral lines in rotational spectra.

7. (a) Give the theory of pure rotational Raman spectra of linear molecules.   **9+5=14**

   (b) Explain the application of laser in eye surgery.

8. (a) Calculate the magnetic moment of atom in the states $^2D_{5/2}$ and $^2F_{7/2}$ in Bohr magneton.

                                                               4+5+5=14

(b) Explain the application of microwaves in microwave oven.

(c) Explain the construction stage in holography.

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