Unit III

6. (a) Explain coupling schemes in atoms and discuss conditions for LS and j-j coupling. **6**

(b) Discuss the role of Pauli exclusion principle in spectral term formation. **2**

7. Explain spectral terms for equivalent and non-equivalent electrons. Find possible term symbols for configuration p^2. **8**

Unit IV

8. (a) Explain normal Zeeman effect using classical theory and obtain the expression for frequency shift. **6**

(b) Calculate Zeeman splitting for a spectral line of wavelength 500 nm in a magnetic field of 1 Tesla. **2**

9. What is Raman effect ? Explain the origin of Raman lines using the quantum theory. Give some applications of this effect. **8**

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B.Sc. EXAMINATION, 2026

(Sixth Semester)

(Re-appear Only)

PHYSICS

Paper-XII

Atomic and Molecular Spectroscopy

Time : 3 Hours] [*Maximum Marks :* 40

Before answering the question-paper, candidates must ensure that they have been supplied with correct and complete question-paper. No complaint, in this regard will be entertained after the examination.

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. **1** is compulsory.

Compulsory Question

1. (a) What is the basic difference between atomic spectra and molecular spectra ? **2**

(b) Define wave number and write its unit. **1**

(c) Define Bohr magneton and write its expression. **1**

(d) What do you understand by the hyperfine structure of spectral lines ? **2**

(e) What is stark effect ? Give the selection rules for strong field stark effect in hydrogen. **2**

Unit I

2. (a) Explain the origin of spectral lines in hydrogen atom and discuss Lyman and Balmer series with suitable expressions. **4**

(b) Describe Bohr's atomic model, clearly stating its postulates and success in explaining hydrogen spectra. **4**

3. (a) Discuss limitations of Bohr model and explain how Sommerfeld introduced the elliptical orbits and relativistic correction. **5**

(b) Explain the concept of spatial quantization in vector atom model. **3**

Unit II

4. (a) Define orbital magnetic moment and derive its relation with angular momentum. **3**

(b) Explain Larmor precession and derive expression for Larmor frequency. Calculate Larmor frequency of an electron in a magnetic field of 1 Tesla. **5**

5. (a) Explain fine structure of hydrogen spectral lines due to spin-orbit interaction. **4**

(b) Describe doublet structure of alkali spectra and explain its origin. **4**