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25-PH-24

**M.Sc. II SEMESTER [MAIN/ATKT] EXAMINATION
MAY - JUNE 2025**

PHYSICS

Paper - IV

[Atomic and Molecular Physics]

[Max. Marks : 75]

[Time : 3:00 Hrs.]

[Min. Marks : 26]

Note : Candidate should write his/her Roll Number at the prescribed space on the question paper.
Student should not write anything on question paper.
Attempt all five questions. Each question carries an internal choice.
Each question carries **15 marks**.

- Q. 1** What do you understand by one electron and Many electron system of Atom. What quantum numbers are associated with an atom. Explain each. Discuss the different series obtained in the spectrum of hydrogen atom on the basis of Bohr model.

OR

What is meant by L-S coupling. Derive the interaction energy in SP system of atom.

- Q. 2** What are characteristic x-ray. Explain their origin. Derive Moseley's law and state its application.

OR

Discuss Rotational Spectra of diatomic molecule as a rigid rotator. Show that the rotational energy states of diatomic molecule is quantised but they are not equispaced.

- Q. 3** Discuss vibrating diatomic molecule as a Harmonic Oscillator. Explain its frequency of Vibration, Energy Level, Population of Energy Level.

OR

- a) Discuss P Q R branches in Vibrational Spectrum of diatomic molecules.
b) The molecules of HCL shows a strong absorption line of wave length 3.456 microns. Assuming origin of line due to vibration. Calculate the force constant for HCL bond $\{K - 4 \pi^2 \nu^2 m\}$

- Q. 4** What is Zeeman Effect. How is it studied experimentally. Distinguish between the normal and anomalous Zeeman effect. Obtain an expression for Zeeman shift.

P.T.O.

OR

Discuss Thomas fermi statistical model to calculate the electro static potential due to nucleus and cloud of electrons.

Q. 5 Write short notes on **any two** of the following -

- i) Spectroscopic Notation.
- ii) Types of Molecules.
- iii) Raman Photo electron.
- iv) Visible spectroscopy.

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