



**B.Sc. V Semester Degree Examination, April/May - 2024**

**PHYSICS**

**5.2 : Elements of Atomic, Molecular and Laser Physics  
(NEP)**

Time : 2 Hours

Maximum Marks : 60

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- Note :** (i) Answer **all** the sections.  
(ii) Non programmed scientific calculators are allowed.
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**SECTION - A**

1. Answer the following sub-questions, each sub-question carries **one** mark. **10x1=10**
- (a) Define impact parameter.
  - (b) Write Bohr's frequency condition.
  - (c) What is the ionization potential required for hydrogen atom ?
  - (d) State Pauli's exclusion principle.
  - (e) What is Stark effect ?
  - (f) What is the nature of molecular spectra ?
  - (g) What is Phosphorescence ?
  - (h) What is Metastable state ?
  - (i) What is optical pumping ?
  - (j) What is Spontaneous emission ?

**SECTION - B**

- Answer **any four** of the following questions, each carries **five** marks. **4x5=20**
- 2. Derive the expression for the energy of the electron in the  $n^{\text{th}}$  Bohr orbit.
  - 3. Describe Frank-Hertz experiment.
  - 4. Discuss J-J coupling scheme.
  - 5. What is Raman effect ? Mention its characteristics.
  - 6. Explain briefly the requisites of Laser.
  - 7. Derive the relation between Einstein's co-efficients and radiation energy density.



## SECTION - C

Answer **any three** of the following questions, each question carries **ten** marks.

- 3x10=30**
- 8.** (a) Explain in brief sommerfeld's atomic model. **4+6**  
(b) Derive the condition for allowed elliptical orbits from sommerfeld's atomic model.
- 9.** (a) Explain in brief quantum numbers associated with vector atom model. **7+3**  
(b) Calculate Lande g-factor for P electron.
- 10.** Obtain an expression for rotational energy of a diatomic molecule as a rigid rotator. **10**
- 11.** (a) Describe the experimental setup used to study normal Zeeman effect. **5+5**  
(b) Discuss the quantum theory to explain Raman effect.
- 12.** (a) Explain the construction and working of Nd : YAG Laser. **7+3**  
(b) Write any three applications of Laser.

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