

M.Sc. (Physics) (NEP Pattern) Semester-III  
**03MSCPH3 - Major Paper-III : Atomic and Molecular Physics**

P. Pages : 1

Time : Three Hours



**GUG/S/25/16025**

Max. Marks : 80

**Either:**

- |    |    |   |   |
|----|----|---|---|
| 1. | a) | Explain the spectrum of Hydrogen and its relativistic corrections for energy level. | 8 |
|    | b) | Explain spin lattice relaxation and spin-spin interaction in NMR.                   | 8 |

**OR**

- |    |   |   |
|----|---|---|
| e) | Explain the Mossbauer effect of gamma rays. | 8 |
| f) | Explain NMR spectroscopy in detail.         | 8 |

**Either:**

- |    |    |  |   |
|----|----|--|---|
| 2. | a) | Explain the electron spin resonance with experimental setup. | 8 |
|    | b) | Explain normal and anomalous zeeman effect.                  | 8 |

**OR**

- |    |   |   |
|----|---|---|
| e) | Explain the stark effect in detail.                         | 8 |
| f) | What is MASER? Explain principle of MASER action in detail. | 8 |

**Either:**

- |    |    |  |   |
|----|----|--|---|
| 3. | a) | State Raman effect and explain experimental setup for structure determination of simple molecules. | 8 |
|    | b) | Explain the quantum theory of vibrational Raman Spectra of diatomic molecule.                      | 8 |

**OR**

- |    |  |   |
|----|--|---|
| e) | Explain the quantum theory of rotational Raman Spectra.              | 8 |
| f) | Explain intensity alteration in Raman Spectra of diatomic molecules. | 8 |

**Either:**

- |    |    |   |   |
|----|----|---|---|
| 4. | a) | Explain Born Oppenheimer approximation.               | 8 |
|    | b) | Explain the electronic spectra of diatomic molecules. | 8 |

**OR**

- |    |                                  |                         |
|----|----------------------------------|-------------------------|
| e) | Explain Franck Condon principle. | 8                       |
| f) | Write note on.                   | 8                       |
|    | i) Selection rule                | ii) Dissociation        |
|    | iii) Pre-dissociation            | iv) Dissociation energy |

5. Answer all the followings.

- |    |  |   |
|----|--|---|
| a) | Explain magnetic hyperfine interaction.                | 4 |
| b) | Explain LS & JJ coupling.                              | 4 |
| c) | Explain Hunds rule.                                    | 4 |
| d) | Discuss rotational fine structure of electronic bands. | 4 |

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