M.Sc.(Physics) (NEP Pattern) - Semester-III

03MSCPH3 - Major Paper-III : Atomic and Molecular Physics

P. Pages : 2 **GUG/W/24/16025**

Time : Three Hours * 7 3 2 9 * Max. Marks : 80

Either:

1. a) Discuss basic principles of interaction of spin and applied magnetic field. **8**

b) Explain Mossbauer effect of gamma rays. **8**

OR

e) Explain:

i) Spin-spin relaxation **4**

ii) Chemical Shift **4**

f) Explain concept of NMR Spectroscopy. **8**

Either:

2. a) What is Zeeman effect? Explain anomalous Zeeman effect? **8**

b) Discuss the general theory of hyperfine shifting. **8**

OR

e) Explain the principle of ESR. Describe an experimental set-up with neat diagram. **8**

f) Explain the MASER and principle of MASER action. **8**

Either:

3. a) Give experimental set-up for Raman Spectroscopy. **8**

b) Discuss the terms:

i) Polyatomic molecules **4**

ii) Symmetric top molecules **4**

OR

e) Explain Raman spectra of diatomic molecules. **8**

f) Explain rotational energy and frequency of diatomic molecules. **8**

Either:

4. a) Explain born Oppenheimer approximation. **8**

b) Explain vibrational structure coarse structure of electronic bands and intensity of electronic band. **8**

OR

e) Explain:

i) Selection rule **4**

ii) General treatment of molecular orbitals. **4**

f) Explain electronic spectra of diatomic molecules. **8**

5. Answer all the followings.

a) Explain spin-lattice relaxation. **4**

b) Explain LS and JJ coupling. **4**

c) Discuss molecular polarizability. **4**

d) Explain dissociation energy and pre-dissociation energy. **4**

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