

January 2013

M. Sc. IIIrd Semester Examination

PHYSICS

Fourth Paper Atomic and Molecular Physics

Time 3 Hours]

[Max. Marks 85

Note : Attempt all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. Explain the concept of nuclear magnetic resonance. Discuss various relaxation processes.
OR
What is population of energy levels ? Discuss the following in brief :
(a) Spin Spin Interaction
(b) Spin Spin Coupling between two nuclei 17
2. Describe electronic spectra of diatomic molecules. What is Born Oppenheimer approximation?
OR
What is Franck Condon principle ? Discuss vibrational coarse structure of electronic spectra. 17
3. Discuss quantum theory of Raman effect. Explain vibrational Raman spectra.
OR
Explain molecular polarisability in Raman effect. Discuss Raman spectra of diatomic molecules. 17
4. Discuss the principle and application of Mossbauer spectroscopy. What is recoilless emission of gamma emission ?
OR
Explain Mossbauer effect. Discuss line width and resonance absorption in detail. 17
5. Discuss
(a) ESR Spectrometer and
(b) ESR spectra of free radicals in solution.
OR
Describe principle and experimental setup of ESR. What are G-values ? Explain. 17

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