DS-547

Roll No. .....
1000 -/-/40/20

January 2017

M. Sc. IIIrd Semester Examination

PHYSICS

Fourth Paper : Atomic and Molecular Physics

Time 3 Hours] [Max. Marks : Regular 85 / Private 100
[Min. Marks : Regular 28 / Private 33

Note : This question paper is meant for all Regular and Private students. Answer all five questions. All questions carry equal marks. The blind candidates will be given 60 minutes extra time.

1. Discuss population of energy levels in concern with NMR. Describe different relaxation process and corresponding relaxation time.

OR

Explain the fundamentals of NMR. Give its applications.

2. Discuss Vibrational Energy of a Diatomic Molecule.

OR

Write notes on the following :
(a) Dissociation and Pre-Dissociation Energy.
(b) Born-Oppenheimer Approximation.

3. (a) Explain Molecular Polarizability in Raman Effect.
(b) The small rotational Raman displacement for HCl molecule is 41.6 cm^{-1}. Find the internuclear distance between the atoms forming the molecule. Given that :

$h = 6.63 \times 10^{-34}$ Js
$C = 3 \times 10^{8}$ m/s
$N_A = 6.023 \times 10^{23}$ mol^{-1}.

OR

Discuss applications of IR and Raman Spectroscopy in structure determination.

4. Write notes on the following :
(a) Isomer Shift.
(b) Quadrupole Interaction.

OR

(a) Discuss Mossbauer Effect.
(b) Magnetic Hyperfine Interaction.

5. Write notes on the following :
(a) Principle of ESR.
(b) Hyperfine Structure of ESR Absorption.

OR

(a) Explain ESR spectra of free radical in solution.
(b) ESR Spectrometer with a block diagram.

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