Roll No. .....
300 -/-/10/10

DS-547

January 2022
M. Sc. III 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. What is Nuclear Magneton ? Obtain its value in S. I. unit compare it with Bohr magneton. Explain Quadruple Relaxation.

OR

What is chemical shift ? How it is measured in a spectrometer operating at 60 MHz and NMR signal appears at 120 Hz with reference to TMS ? Calculate the chemical shit in δ and τ scale.

2. Give an account of the salient features observed in the electronic spectrum of a diatomic molecule. Explain formation of electronic spectra generally in which region electronic spectra is found.

OR

What is meant by dissociation and pre dissociation ? Discuss about the dissociation energy.

3. Illustrate with example of $CO_2, N_2O, SO_2, NO_3, ClO_3$ and ClF_3 to determine the shape of molecules from Raman and Infrared spectroscopy.

OR

Discuss vibration Rotational Raman spectra of linear molecules. Mention differences between Raman and Infrared spectra.

4. Explain the principle of Mossbauer spectroscopy. Discuss applications of Mossbauer spectroscopy with special reference to isomer shift and Quadruple effects.

OR

What are the requirements for elements that display Mossbauer effect ?
What are the drawbacks of Mossbauer spectroscopy ? What device is used to focus the gamma radiation between source and sample ?

5. Describe experimental set up of ESR spectrometer and explain its working.

OR

Explain the mechanism of hyperfine interaction in the ESR spectra of organic radicals.
