

SHRIMATHI DEVKUNVAR NANALAL BHATT VAISHNAV COLLEGE FOR WOMEN
(AUTONOMOUS)

(Affiliated to the University of Madras and Re-accredited with 'A+' Grade by NAAC)
Chromepet, Chennai - 600 044.

M.Sc.Chemistry - END SEMESTER EXAMINATIONS - APRIL 2025

SEMESTER - III

22PCHCT3008 - Molecular Spectroscopy and its Applications

Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

Section B

Answer any **SIX** questions ($6 \times 5 = 30$ Marks)

- How would you differentiate collision broadening from Doppler broadening? Explain.
- Discuss the various types of electronic transitions that are possible in an organic compound and indicate them by energy diagram.
- Explain (i) Fermi-resonance and (ii) Overtones
- What do you mean by chemically equivalent protons? How many kinds of protons are there in the following compounds and predict the number of PMR signals to be expected. (i) Propan-1-ol (ii) Propene
- Define the following terms:
(i) Molecular ion peak (ii) Base peak (iii) Fragment ions
- Explain the applications of Mossbauer spectra using any two iron metal complexes.
- Discuss the hyperfine structure in the ESR spectra of an electron interacting with a proton.
- Explain (i) quadrupole moment of a nucleus and (ii) electric field gradient.

Section C

I - Answer any **TWO** questions ($2 \times 10 = 20$ Marks)

- Sketch the fundamental modes of vibrations of CO_2 and H_2O molecules. Show which of them are IR active.
- Describe the various factors which control the magnitude of chemical shift with suitable examples.
- Write in detail the general modes of fragmentation processes in mass spectrometry.

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12. Explain Kramer's theorem with an example.

II - Compulsory question (1 × 10 = 10 Marks)

13. (a) Predict the number of signals with relative intensities in the low-resolution NMR spectra of the following isomers:

(i) CH_3CH_2OH and $(CH_3)_2O$

(ii) $(CH_3)_2C=O$ and CH_3CH_2CHO

(iii) $C_6H_5-CH_2-CH_3$ and $p-CH_3-C_6H_4-CH_3$

(b) Explain the distortion less enhanced polarisation transfer (DEPT) spectra of ^{13}C with appropriate examples.
