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 - NOV' 2024
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)

1. Explain the concept of quantization of energy in molecules, focusing on rotational, vibrational, and electronic energy levels.
2. Distinguish K and R band which arises due to electronic excitation in carbonyl group of ketones.
3. Distinguish between primary, secondary and tertiary alcohols using IR spectroscopy.
4. Elaborate and explain the factors affecting chemical shift.
5. Analyse the techniques used for the simplification of $13_C$ NMR spectrum.
6. Explain Mc-Lafferty rearrangement by giving suitable examples.
7. Discuss the importance of Mossbauer spectroscopy in characterization of iron complexes.
8. Explain the theory of ESR.

## Section C

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

9. Explain in detail the factors that influence the resolution and intensity of spectral transitions.
10. Distinguish between the compounds in each pair by IR spectral studies.
    i) Phenol and Cyclohexanol ii) cis and trans – 2 – butene
    iii) Ethyl benzene and o-Xylene iv) Acetaldehyde and acetone
11. How will you distinguish among the four isomeric alcohols represented by the molecular formula $C_4H_{10}O$ on the basis of $^{13}C$ NMR spectroscopy?
12. Discuss the following:
    i) Hyperfine Splitting in ESR. ii) Principles of NQR.

**Contd...**

II - Compulsory question $(1 \times 10 = 10$ Marks)

13. A compound with molecular weight 100 gave the following spectral information:
    i) UV: $\lambda_max$ 273 m$\mu$ $\epsilon_max$ 2050.
    ii) IR : 3031 $(\upsilon)$, 2941 $(w)$, 1725$(s)$, 1608, 1504$(w)$, 1060$(s)$ and 830 cm$^{-1}(s)$
    NMR : (i) Singlet 7.65 $\tau$ (3H),
    (ii) Singlet 6.18 $\tau$ (3H) Unsymmetrical pattern 2.15 -2.8$\tau$ (4H).
    Determine the structural formula of the compound.

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