

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 - NOVEMBER 2025  
SEMESTER - III

**25PCHCT3008 -Spectroscopy: Interpretation and Applications**

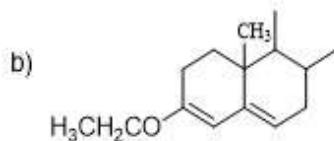
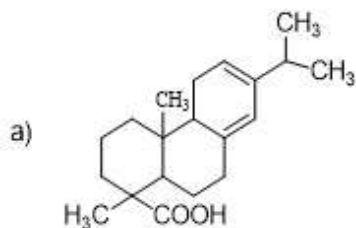
Total Duration : 2 Hrs. 30 Mins.

Total Marks : 60

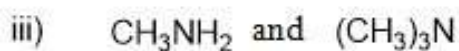
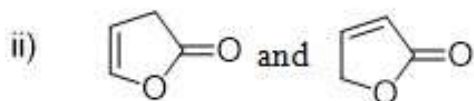
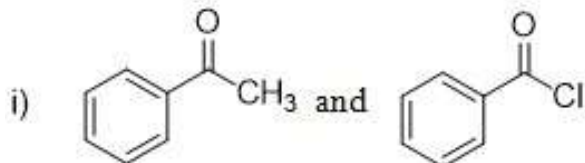
**Section B**

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

1. Calculate  $\lambda_{\max}$  values for following organic compounds using Woodward-Fieser rules:



2. Distinguish the following pairs using IR spectroscopy.



3. Explain the simplification of complex NMR spectra using chemical shift reagents.  
4. Explain the principle and applications of DEPT spectra with suitable example.  
5. Illustrate Mc-Lafferty rearrangement with examples.  
6. Describe Mössbauer spectra of  $\text{Fe}^{2+}$  and  $\text{Fe}^{3+}$  complexes. How does oxidation state affect the isomer shift?  
7. Illustrate hyperfine structure of organic free radicals observed in ESR spectra.

**Contd...**

8. Explain the principle and applications of NQR spectroscopy with a diagram of nuclear energy level splitting.

### Section C

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

9. Explain the effect of ring size, conjugation and hydrogen bonding on vibrational frequencies with appropriate examples.
10. i) Discuss various factors influencing chemical shift values.  
ii) Describe nuclear Overhauser effect and give its applications.
11. Discuss the rules that govern mass spectral fragmentation and various peaks observed in mass spectrum.
12. Compare ESR and NQR spectroscopy in terms of principle, nuclei and spectral interpretation.

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

13. i) Deduce the structure of an organic compound with a molecular formula  $C_7H_8O$  shows a band in the region  $3200 - 3550 \text{ cm}^{-1}$  in IR spectrum and three  $^1\text{H}$  nmr signals:  $\delta$  2.43 (singlet, 1H);  $\delta$  4.58 (singlet, 2H);  $\delta$  7.28 (multiplet, 5H).  
ii) Distinguish 2-pentanone and 3-pentanone using mass spectra.  
Write the possible fragmentation pattern and show corresponding m/z values.

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