LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

M.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FOURTHSEMESTER – APRIL 2018

CH 4809- APPLICATIONS OF SPECTROSCOPY

Date: 07-05-2018 Dept. No. Max. : 100 Marks

Time: 09:00-12:00

Part-A

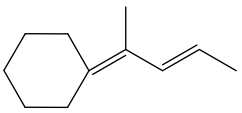
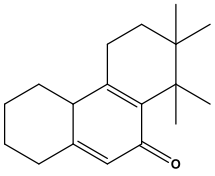
Answer ALL questions. **(10 × 2= 20)**

1. What is the base peak obtained for ethyl benzene in mass spectroscopy?
2. State the principle of FAB-mass spectrometry.
3. Why do amines absorb at higher wavelength than alcohols in UV-Visible spectroscopy?
4. Mention the significance of IR spectroscopy in distinguishing the linkage isomers? Give an example.
5. What is transannular conjugation? Give an example.
6. What are isochronous protons? Give an example.
7. Predict the number of lines in the ^{19}F-NMR of the compound ClF_3.
8. Sketch the EPR spectrum of tertiary butyl radical.
9. Mention the significance of isomer shift.
10. Define quadrupole coupling constant.

Part-B

Answer any EIGHT questions. **(8 × 5= 40)**

11. Discuss the mass spectral pattern of primary, secondary and tertiary alcohols using mass spectroscopy.
12. Explain the fragmentation pattern of pentanoic acid using mass spectroscopy.
13. What are charge transfer complexes? Explain their characteristics.
14. Calculate λ_{max} of the following compounds:

a)  b) 

15. Draw the Orgel energy level diagram of octahedral complexes of Co^{2+}.
16. How can you distinguish the following using infrared spectroscopy
    a) phenol and cyclohexanol, b) cis and trans-2-butene.
17. Explain the ^1H-NMR spectra of homotopic and enantiotopic protons with examples.
18. What is an AX spectrum? Explain with an example.
19. Explain nuclear hyperfine splitting with an example.
20. While $Fe(CO)_5$ shows quadrupole splitting, $K_4[Fe(CN)_6]$ does not. Justify.
21. Distinguish between prolate and oblate nuclei with relevant examples.

22. Describe the importance of electric field gradient and quadrupole moment.

Part-C

Answer any FOUR questions. **(4 × 10= 40)**

23. Explain the mass spectral pattern of benzaldehye and methyl butanoate.

24. Draw and explain the Orgel energy level diagram of octahedral Mn^{2+} complexes.

25. An organic compound (Mol.wt 72) exhibits the following spectral data.

    IR: 1715 cm^{-1} (s), 2940-2855 (m) and1460 cm^{-1} (m)

    UV: λmax at 274 nm

    ^{1}HNMR: 7.52 τ quartet, 7.88 τ singlet and 8.93 τ triplet

    Mass : 72, 43, 29

    Deduce the structure of the compound.

26. Explain the importance of diagonal and off-diagonal spots in the interpretation of the COSY of isopentyl methyl ketone.

27a. Obtain the 'g' value for d^4 configuration.

b. Two isomers of the radical C_3H_7• exhibit36 and 14 lines in their EPR spectra. Predict the isomers. (5+5)

28a. Explaine the transitions in the Mossbauer spectrum of a nucleus with ground state spin ½ and excited state spin 3/2 when $e^2Qq \neq 0$; B = 0.

b. What is zero field quadrupole resonance? Give an example. (5+5)

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