LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – **CHEMISTRY**

FIFTH SEMESTER – **APRIL 2023**

CH 5508 – FUNDAMENTALS OF SPECTRASCOPY

Date: 29-04-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

Part-A

Answer ALL questions. **(10 x 2 = 20 Marks)**

1. What is the significance of signal to noise ratio?
2. Calculate the wavelength of the radiation having the energy of 3×10^{-17} J.
3. Define chromophores. Cite an example.
4. Distinguish between bathochromic and hypsochromic shifts.
5. Assign vibrational stretching frequencies for the following. (i) O-H (ii) C=O
6. Find the number of vibrational degrees of freedom for acetylene.
7. What is TMS? Cite its merits.
8. How many signals are expected in ^{1}H NMR spectrum of the following compounds?
   (i) benzene (ii) acetaldehyde
9. State nitrogen rule applied in mass spectroscopy.
10. What is meant by a base peak?

Part-B

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

11. Explain the various regions of electromagnetic spectrum.
12. Distinguish between absorption and emission spectra.
13. Discuss the interaction of electromagnetic radiation with matter.
14. Describe the various types of transitions involved in electronic spectroscopy.
15. With a block diagram explain the instrumentation of UV-Visible spectrophotometer.
16. Write a note on finger print region.
17. Discuss the various types of fundamental vibrations arise in the organic compounds in their infrared spectrum.
18. What are Stokes and anti-Stokes lines?
19. Explain spin-spin coupling with suitable examples.
20. A compound with molecular formula C_8H_8O gives the following proton NMR spectral data. (i) Multiplet (7.28 δ) 5H (ii) Doublet (2.8 δ) 2H (iii) Triplet (9.78 δ) 1H. Predict the structural formula of the compound.
21. Describe the basic principle of mass spectrometry.
22. Discuss the fragmentation pattern of alcohols in mass spectrometry.

Part-C

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

23. Discuss the factors influencing intensity and width of the spectral lines.
24. State and derive Beer-Lambert's law. Mention its limitations.
25. Describe the principle, instrumentation and applications of atomic absorption spectroscopy.

26a. Explain the various sampling techniques applied for scanning solid, liquid and gaseous samples in infrared spectrometer.

b. State and explain mutual exclusion principle. (6+4)

27. Define chemical shift and explain the factors affecting chemical shift in ^{1}H NMR spectroscopy.

28a. Draw the block diagram and explain the instrumentation of Mass spectrometer.

b. What are isotopic peaks in mass spectrometry? Mention its significance. (6+4)

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