LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **APRIL 2023**

UCH 5503 – SPECTROSCOPY

Date: 05-05-2023 Dept. No. Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

PART-A

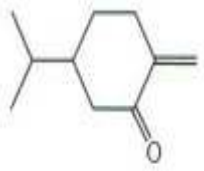
Answer ALL questions. **(10 x 2 = 20 Marks)**

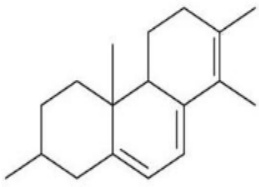
1. State Born-Oppenheimer approximation.
2. Calculate the frequency for a monochromatic light of wavelength 6000Å.
3. Define a chromophore. Cite an example.
4. What are bathochromic and hypsochromic shifts?
5. State Hooke's law and mention the terms in it.
6. Find the number of vibrational degrees of freedom for acetylene and benzene.
7. How many H^1NMR signals expected for ethylchloride?
8. Draw the EPR spectrum of methyl radical.
9. State Nitrogen rule applied in mass spectrometry.
10. Why the unipositive ions are considered to be the most significant features of mass spectra?

PART-B

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

11. Discuss the different types of energies possessed by a molecule.
12. Write a note on (i) signal to noise ratio (ii) selection rule
13. State and explain Franck Condon principle.
14. Calculate the λ_{max} for the following compounds using Woodward – Fieser rule.

a. 

b. 

15. Discuss the various types of fundamental modes of vibrations arise in the organic compounds in their IR spectrum.
16. Mention the differences between IR and Raman spectra.
17. What is meant by chemical shift? Write the factors affecting chemical shift.
18. Calculate and draw the number of EPR lines obtained for benzene radical.
19. What is spin-spin splitting? Discuss the NMR spectrum of ethanol under high resolution.

20. Mention the significance of the following in mass spectrometry. (i) base peak (ii) molecular ion peak (iii) metastable ion peak

21. Explain McLafferty rearrangement with an example.

22. Mention the five important components in mass spectrometer.

PART-C

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

23. (a) Discuss the factors affecting line width and intensity of spectral lines. **(6)**

(b) Explain the different regions of electromagnetic spectrum. **(4)**

24. State and derive Beer-Lambert's law and mention its limitations.

25. (a)Discuss the components of UV spectrometer with a block diagram. **(6)**

(b) Explain the mutual exclusion principle with an example. **(4)**

26. (a) Discuss any two factors affecting vibrational frequencies in IR spectroscopy. **(6)**

(b) What are Stokes' and anti-Stokes' lines? **(4)**

27. What is coupling constant? Discuss the factors affecting the coupling constant.

28. Discuss the basic principles of mass spectrometry. How will you differentiate primary and secondary alcohols using mass spectrometry?

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