

**LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034**



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

**FIFTH SEMESTER – APRIL 2018**

**CH 5513 / CH 5508 – FUNDAMENTALS OF SPECTROSCOPY**

Date: 04-05-2018

Dept. No.

Max. : 100 Marks

Time: 09:00-12:00

**PART – A**

**Answer ALL questions.**

**(10 × 2 = 20 marks)**

1. Account for the blue colour of the sea and sky.
2. What are hot bands? Give its significance.
3. Why UV - Vis spectra observed are always broad?
4. How will you predict allowed and forbidden transition using  $\epsilon_{\max}$  values?
5. Give the selection rules of IR and Raman Spectra.
6. Give the mutual exclusion principle..
7. Why do we use TMS as reference in NMR Spectroscopy?
8. What is chemical shift?
9. Write the possible mass spectral fragments of  $C_2H_5OH$ .
10. Give the principle of mass spectrometry.

**PART – B**

**Answer any EIGHT questions:**

**(8 × 5 = 40 marks)**

11. Explain harmonic and anharmonic oscillations using Morse Potential energy diagram.
12. Explain the significance of base peak and metastable peak.
13. Explain Bathochromic and Hypsochromic shifts.
14. Explain the origin of Stoke and antiStoke line?
15. Draw the possible stretching and bending vibrations for linear and non-linear  $AB_2$  molecules.
16. Distinguish between absorption and emission spectra.
17. Comment on IR vibrational frequencies for free OH group and H - bonded OH group.
18. Explain the factors that control the width of a NMR signal?

19. Distinguish cis-stilbene from its trans isomer using NMR Spectroscopy.
20. How will you simplify complex NMR signals?
21. An organic compound consisting of C, H and O shows the peak height ratio  $M : M+1 = 100 : 13.4$ .  
Find the number of carbon atoms per molecule of the compound.
22. How will you determine the isotopic abundance of an element using mass spectrometry?

**PART – C**

**Answer any FOUR questions:**

**(4 × 10 = 40 marks)**

23. a) Explain the types of electronic transitions. (5)
- b) Explain Lambert – Beer's Law, give equation. (5)
24. a) What are chromophores and auxochromes? Give an example. (6)
- b) The  $\pi \rightarrow \pi^*$  transitions are stronger than  $n \rightarrow \pi^*$  transition. Account. (4)
25. a) Sketch the working principle and block diagram of IR spectrophotometer. (5)
- b) Explain the fundamental and Fermi resonance peaks in IR spectroscopy. (5)
26. a) Explain diamagnetic anisotropy with an example. (5)
- b) Discuss the principle of Raman spectroscopy. (5)
27. a) What is the principle of spin –decoupling? (5)
- b) Predict the number of signals obtained in the NMR spectrum of (i) acetaldehyde and (ii) propane. (5)
28. Explain the principle, instrumentation and applications of atomic absorption spectroscopy. (10)

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