



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

**B.Sc. DEGREE EXAMINATION - CHEMISTRY**

FIFTH SEMESTER – NOVEMBER 2015

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

Date : 11/11/2015  
Time : 09:00-12:00

Dept. No.

Max. : 100 Marks

**PART- A**

Answer **ALL** the questions:

(10x2= 20 marks)

1. Mention any two advantages of spectroscopic methods.
2. Give the formula of Boltzman distribution.
3. State Beer- Lambert's law.
4. What is the effect of auxochrome in an organic compound?
5. What is Finger print region?
6. How does Fermi resonance occur?
7. What is coupling constant?
8. Mention the merits of using TMS as NMR reference compound.
9. State nitrogen rule.
10. The mass spectrum of 1-hexanol gives a base peak at  $m/z = 56$ . How can one account for this?

**PART-B**

Answer any **EIGHT** questions:

(8x5 = 40 marks)

11. Write notes on absorption and emission spectra.
12. How does the population of energy levels influence the intensity of spectral lines?
13. Discuss the types of electronic transitions.
14. Describe the instrumentation of a spectrophotometer.
15. Sketch the different modes of vibration in  $\text{CO}_2$  molecule.
16. Discuss the principle of Raman spectroscopy.
17. What is mutual exclusion principle? Mention its applications. (2+3)
18. Explain spin-spin splitting with suitable example.
19. Give the signals obtained in the NMR spectrum of
  - (i)  $\text{CH}_3\text{CH}_2\text{OH}$
  - (ii)  $\text{CH}_3\text{CH}_2\text{CH}_3$ .
20. State and explain the factors which influence Chemical shift.
21. Describe the instrumentation in mass spectrometry.
22. Explain the fragmentation mode of ethanol and draw its mass spectrum.

**PART-C**

Answer any **FOUR** questions:

(4x10 = 40 marks)

23. Enumerate the principle, instrumentation and applications of flame photometry.
24. (i) Explain the factors that govern the absorption maxima and intensity. (4)  
(ii) Mention the types of electronic transition present in (3 x 2 = 6)  
a.  $\text{CH}_3\text{CH}=\text{CH}_2$   
b.  $\text{CH}_3\text{CH}_2\text{NH}_2$   
c.  $\text{CH}_3\text{COCH}_3$ .
25. Give a detailed account on the instrumentation of IR spectroscopy.
26. (i) Write notes on Stoke's and Antistoke's lines. (5+5)  
(ii) Discuss briefly the underlying principle in the detection of organic compounds by IR spectroscopy.
27. (i) Discuss the rules governing splitting of signals. (4)  
(ii) Explain spin-spin splitting for the protons of (2+4)  
a.  $\text{CH}_3\text{-CH}_3$   
b.  $\text{CH}_3\text{-CH}_2\text{-OH}$ .
28. (i) Describe the basic principle of mass spectrometry. (5 + 5)  
(ii) What are the various fragmentation mode of benzyl alcohol?

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