



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

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

**FIFTH SEMESTER – NOVEMBER 2013**

**CH 5508 – FUNDAMENTALS OF SPECTROSCOPY**

Date : 12/11/2013  
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

**PART – A**

**Answer ALL questions:**

**(10 x 2 = 20 marks)**

1. Define (a) Photon (b) Wave number
2. Rotational, vibrational and electronic energies are quantized. Explain.
3. State Beer- Lambert's law.
4. What are chromophores? Give examples.
5. What are the significance of finger print region?
6. State Mutual Exclusion Principle.
7. Define chemical shift.
8. What is TMS? Write its uses.
9. What is fragmentation in mass spectral analysis?
10. State the nitrogen rule.

**PART – B**

**Answer any EIGHT questions:**

**(8 x 5 = 40 marks)**

11. Explain the following terms: (a) selection rules (b) line width (c) resolution.
12. Write short notes on absorption and emission spectra.
13. Explain Frank-Condor principle.
14. Define the following terms: (a) Auxochromes (b) Monochromator (c) Bathochromic shift.
15. Explain the instrumentation of IR spectroscopy.
16. Explain Stokes and anti-stokes line.
17. Distinguish between Raman and IR spectroscopy.
18. Compare the NMR spectra of the following compounds:  
(a)  $\text{CH}_3\text{COCH}_3$  (b)  $\text{CH}_3\text{CH}_2\text{CHO}$  (c)  $\text{CH}_2=\text{CH}-\text{CH}_2\text{OH}$ .
19. Explain shielding and de shielding effects.
20. Write notes on spin-spin coupling and coupling constant.
21. Differentiate between base peak, isotopic peak and meta stable peak.
22. Discuss the instrumentation of mass spectrometry.

**PART – C**

**Answer any FOUR questions:**

**(4 x 10 = 40 marks)**

23. a) Discuss the various types of electronic transitions. (8)  
b) What are forbidden transitions? (2)
24. Explain the principle, instrumentation and applications of flame photometry. (10)
25. a) Briefly explain the difference in the IR spectra of  
HO-CH<sub>2</sub>-CH<sub>2</sub>OH and CH<sub>3</sub>COOH. (3)  
b) Explain the various types of bending and stretching vibrations. (7)
26. a) Elucidate the geometry of CO<sub>2</sub>, H<sub>2</sub>O and N<sub>2</sub>O molecules by Raman spectroscopy. (6)  
b) What are fundamental vibrations and overtones? (4)
27. a) Elaborate the instrumentation of NMR spectroscopy. (6)  
b) Write notes on deuterium labeling. (4)
28. a) Discuss Mclafferty rearrangement. (6)  
b) Predict the structure of the compound who speaks in the mass spectrum have  
m/e 88, 70, 55, 43, 42(base) 41 and 31. (4)

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