

LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – NOVEMBER 2011

CH 5508 - FUNDAMENTALS OF SPECTRASCOPIY

Date : 08-11-2011
Time : 9:00 - 12:00

Dept. No.

Max. : 100 Marks

PART – A

Answer ALL questions.

(10 x 2 = 20 marks)

1. What are the regions of electromagnetic spectrum?
2. Define the term transition probability.
3. State Lambert-Beer's law.
4. What are auxochromes? Give an example.
5. Calculate the energy of radiation having wavelength 4000 \AA
6. What is known as finger print region?
7. Define coupling constant.
8. What is deuterium labelling?
9. State nitrogen rule.
10. What is a molecular ion peak?

PART – B

Answer any EIGHT questions.

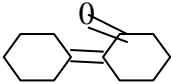
(8 x 5 = 40 marks)

11. Explain the factors that affect the line width and intensity of spectral lines.
12. Discuss the differences between absorption and emission spectra.
13. Explain the principle and instrumentation of flame photometry.
14. Describe the various types of absorption bands which results in electronic transitions.
15. Discuss the instrumentation techniques of IR spectroscopy.
16. State and explain mutual exclusion principle.
17. Explain the following terms:
 - (i) Fundamental vibration
 - (ii) Over tones
18. Explain Larmour precession frequency.
19. (a) The observed chemical shift of proton is 300 Hz from TMS and the operative frequency of the spectrometer is 100 MHz. Calculate the chemical shift in terms of $\delta(\text{ppm})$.
(b) Explain why aldehydic proton appears much downfield in the pmr spectrum.
20. Explain the pmr spectra of (i) ethanol with trace amount of acid (ii) pure ethanol.
21. Describe the importance of metastable peak and isotope peak in mass spectral analysis.
22. Explain the mass spectrum of pentanoic acid.

PART – C

Answer ANY FOUR questions.

(4 x 10 = 40 marks)

23. a) Explain Frank-Condon principle. (6)
 b) Benzene is colourless but its isomer, fulvene is yellow. Explain. (4)
24. a) Differentiate between photocolorimeter and spectrophotometer. (6)
 b) Calculate λ_{\max} of
- (i)  (ii) $\text{CH}_3 - \text{CH}_2 - \overset{\text{O}}{\underset{\text{CH}_2}{\parallel}}\text{C} - \text{COCH}_3$ (4)
25. a) Discuss the theory of Raman Spectroscopy. (5)
 b) Explain how IR spectroscopy can be used to differentiate inter and intra molecular hydrogen bonding. (5)
26. a) How will you distinguish p-amino acetophenone and p-methoxy acetophenone by IR method. (6)
 b) Discuss Fermi-resonance. (4)
27. a) Explain the term chemical shift? What are the factors influencing it? (6)
 b) Discuss the nmr spectrum of 2- methyl propene. (4)
28. a) Illustrate McLafferty rearrangement with a suitable example. (6)
 b) Explain the fragmentation modes of n-butane. (4)

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