LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

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

FIFTH SEMESTER – **NOVEMBER 2014**

CH 5513/CH 5508 - FUNDAMENTALS OF SPECTROSCOPY

Date : 07/11/2014   Dept. No.   Max. : 100 Marks
Time : 09:00-12:00

PART-A

Answer ALL questions: (10×2 =20marks)

1. Name the factors that contribute to width of spectral lines.
2. Give the selection rules for vibrational and electronic spectroscopy
3. What is an auxochrome? Give examples.
4. Mention the significance of molar extinction coefficient.
5. What are hot bands?
6. What is the requirement for a molecule to be Raman active?
7. Define precessional frequency of nuclei.
8. What do you understand by the term magnetically equivalent protons? Give example.
9. Calculate the double bond equivalents in benzene.
10. How does ionization of a sample occur in mass spectra?

PART-B

Answer any EIGHT questions: (8×5=40marks)

11. What are molecular energy levels?

12. How is population of energy levels influence the intensity of spectral lines.

13. Discuss the effect of polar solvents on $\pi - \pi^*$ & $n-\pi^*$ transitions

14. Give the block diagram of a Flame photometer.

15. Write about sample handling in IR spectroscopy.

16. Explain the principle of Raman spectroscopy.

17. Account for the very broad band at 3000-2500 cm^{-1} in the IR spectra of carboxylic acids.

18. Predict the number of signals and approximate chemical shift values for the following compounds

    a) $CH_2 = CH_2$ b) $CH_3 \, CH \, Cl \, CH_3$.

19. Explain shielding of acetylenic protons.

20. Write notes on coupling constant.

21. Describe the basic principle of mass spectrometry.

22. What are the various fragmentation modes of benzyl alcohol?

PART-C

Answer any FOUR questions: (4×10=40marks)

23. a) State Beer-Lambert's law. What are its limitations? (4)

   b) Name the type of electronic transitions present in the following compounds.
      i)CH_3CH_3 ii) C_6H_5OH iii) $CH_2=CH_2$ (6)

24. Explain the principle, instrumentation and applications of Atomic absorption spectroscopy (AAS). (10)

25. a) How will you differentiate o-hydroxy benzoic acid and m-hydroxy benzoic acid by IR Spectroscopy? (6)

   b) Sketch the different modes of vibrations of H_2O molecule. (4)

26. a) Explain Raman scattering on the basis of quantum theory of radiation. (5)

   b) How is mutual exclusion principle used to elucidate the geometry of SO_2 and CO_2? (5)

27. a) Discuss spin-spin coupling for the protons of --CH_2- CH_3. (6)

   b) Write notes on Deuterium labeling. (4)

28. a) An organic compound($C_6H_{12}O$) reduces Tollen's reagent. Its mass spectrum shows signals at m/e values 100, 71, 58, 43,41&29 . Identify the compound and describe the fragmentation pattern. (6)

   b) Draw the mass spectrum of 2-butanol. (4)

$$$$$$$