



LOYOLA COLLEGE (AUTONOMOUS), CHENNAI – 600 034

B.Sc. DEGREE EXAMINATION – CHEMISTRY

FIFTH SEMESTER – APRIL 2019

CH 5513– FUNDAMENTALS OF SPECTROSCOPY

Date: 22-04-2019
Time: 09:00-12:00

Dept. No.

Max. : 100 Marks

PART- A

Answer ALL questions

(10X2 = 20 Marks)

1. State selection rule in UV- Visible spectroscopy.
2. Calculate the energy associated with a radiation having wavelength 4000 \AA .
3. What is the principle involved in flame photometry?
4. What are blue and red shifts?
5. Define Rayleigh lines.
6. State mutual exclusion principle.
7. Why is TMS used as standard in NMR?
8. How will you distinguish cis and trans isomers with the help of NMR spectroscopy?
9. Predict the structure of an organic compound which exhibits m/e peaks at 15, 43, 57, 91, 105 and 148 in its mass spectrum.
10. State Nitrogen rule.

PART- B

Answer any EIGHT questions

(8x5 = 40 Marks)

11. Describe the important characteristics of electromagnetic radiation.
12. Write notes on emission and absorption spectrum.
13. (i). List the limitations of Beer- Lambert's law.
(ii). $2.5 \times 10^{-4} \text{ M}$ solution of a substance in a 1 cm length cell at $\lambda_{\text{max}} 245 \text{ nm}$ has absorbance 1.17.
Calculate ϵ_{max} for this transition. (3+2)
14. Mention the applications of atomic absorption spectroscopy.
15. Discuss the various types of stretching and bending vibrations.
16. Differentiate Infrared and Raman spectroscopy.
17. Write notes on stoke and anti stoke lines.
18. Describe relaxation process.
19. How will you detect the following using NMR spectroscopy?
(i). H- bonding (ii). Geometrical isomers

20. (i). What is coupling constant?
(ii). An aromatic compound (Molecular mass = 135) gives the following signals in its PMR spectrum. Predict the structure of the compound.
- | | |
|-------------------------------------|---|
| a. Singlet(2.09 δ), 3H | b. A distorted singlet (3.09 δ), 1H |
| c. A multiplet (7.27 δ), 3H | d. A multiplet (7.75 δ), 2H (2+3) |
21. Write notes on meta stable ions.
22. How will you distinguish isomeric alcohols with molecular formula $C_4H_{10}O$, using mass spectroscopy?

PART- C

Answer any FOUR questions

(4x10 = 40 marks)

23. (i). Explain the types of electronic transitions
(ii). Explain UV spectrophotometer with a block diagram (5+5)
24. (i). Describe the types of absorption band.
(ii). Explain the factors governing absorption maxima and intensity. (5+5)
25. Give a brief account on the applications of Raman spectroscopy.
26. Enumerate the instrumentation in infrared spectroscopy.
27. Discuss the factors influencing chemical shift.
28. Write in detail the general fragmentation mode in mass spectroscopy.
