

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



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

**SIXTH SEMESTER – APRIL 2022**

**16/17/18UCH6MS01 – SPECTROSCOPY**

Date: 27-06-2022

Dept. No.

Max. : 100 Marks

Time: 01:00 PM - 04:00 PM

**Part-A**

*Answer ALL questions.*

**(10 × 2= 20)**

1. The transmittance of a solution at 600 nm is 4% in a 2 cm cell. Determine its absorbance.
2. What is resolution?
3. Define auxochrome. Cite an example.
4. What is the source of UV-visible radiation in UV-Visible spectroscopy?
5. Mention any two advantages of Raman spectroscopy.
6. What are fundamental and overtone vibrations?
7. Mention the significance of TMS as a reference in NMR Spectroscopy.
8. Draw the EPR spectrum of methyl radical.
9. What are the types of fragmentation possible in carbonyl containing compounds?
10. How are isotopes differentiated by Mass spectroscopy?

**Part-B**

*Answer any EIGHT questions.*

**(8 × 5= 40)**

11. Explain the characteristic features of electromagnetic spectrum.
12. State and explain Boltzmann distribution law.
13. Justify the following:
  - (a) Benzene is colourless but its isomer, fulvene is yellow.
  - (b) Aniline absorbs at 230 nm ( $\epsilon$  max 8600) but in acidic solution, the main absorption band is seen at 203 ( $\epsilon$  max 7500) nm.
14. Explain the types of electronic transitions. Mention possible electronic transitions in acetic acid.
15. Derive Beer-Lambert's law equation. Mention its limitations.
16. Draw the block diagram for double beam IR spectrometer. Explain the method of sample preparation.
17. State and explain mutual exclusion principle.
18. How many NMR signals do you expect for the following compounds?
  - (i) Vinyl chloride
  - (ii) n-Butanol
19. Write a note on (i) Larmor frequency (ii) Magnetic equivalence.
20. How will you use IR and NMR spectroscopy to distinguish o- and p-hydroxyace
21. Explain the principle of Mass Spectrometry.
22. Write the mechanism of McClafferty rearrangement.

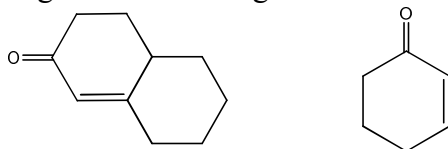
**Part-C**

*Answer any FOUR questions.*

**(4 × 10= 40)**

23. Write a note on the following:
  - (i) Transition probability
  - (ii) Selection rules
  - (iii) Bathochromic shift
  - (iv) Hypsochromic shift

24a. Calculate the  $\lambda_{\max}$  for the following molecules using Woodward-Fieser's rule:



b. Explain the principle and applications of atomic absorption spectroscopy. (4+6)

25a. Differentiate the following:

(i) Raman Scattering from Rayleigh scattering ii) Stokes from antistokes lines.

b. What are fundamental and overtone bands IR spectroscopy? (5+5)

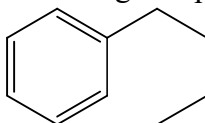
26a. Discuss the factors affecting coupling constant values?

b. The NMR spectrum of a compound  $C_8H_{11}N$  showed signals with  $\delta$  values at 8.6 (d), 8.4 (s), 5.9(q) and 2.7(s). Suggest the structure of the compound. (6+4)

27a. Enumerate the advantages of TMS as reference in NMR spectroscopy.

b. Draw the schematic block diagram of NMR spectrophotometer and explain its essential components. (4+6)

28a. Predict the fragmentation pattern for the following compound:



b. Explain the importance of base and metastable peaks in mass spectroscopy. (4+6)

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