

Sr. No. of QP: 1850 E

Roll No.:.....

Unique Paper Code :217667

Name of the Paper : Analytical Chemistry-VI (ACPT-606)

Name of the Course :B.Sc Applied Physical Sciences (Analytical Chemistry)

Semester :VI

Duration :3 hours

Maximum Marks :75 Marks

Instructions for Candidates

(Write your Roll No. on the top immediately on receipt of this question paper)

Attempt five questions in all. Q. No. 1 is compulsory1. *Answer any five***(3x5 =15)**

- a) Differentiate between chromophore and auxochrome by taking suitable example.
- b) Arrange the following electromagnetic radiation in the increasing order of their wave number. Vibrational IR, Near UV, Visible, Far UV and Microwave
- c) Acetylenic hydrogens absorb at relatively high field in NMR. Explain
- d) Explain the Fermi resonance giving appropriate example.
- e) Explain why TMS is used as one of the internal reference in the measurement of chemical shift of protons.
- f) What are "finger print region" in reference to infrared spectra of organic molecule.
- g) Define Larmor precessional frequency.

Q.2.

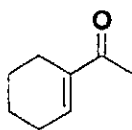
(5x3=15)

- a) What is the requirement for molecule of IR active? Explain by taking N₂, and HCl molecules as examples.
- b) The degree of hydrogen bonding has a direct influence on the -OH stretching frequency of alcohol" Explain.
- c) How will you distinguish between 1,2-dichlorobenzene and 1,4-dichlorobenzene and by ¹H NMR Spectroscopy?

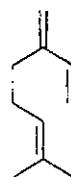
Q.3.

(5x3=15)

- a) State Lambert Beer's Law. What will be the effect on absorbance if the path length is doubled and concentration is halved?
- b) Calculate the λ_{max} for the following compounds using Woodward-Fieser rules.

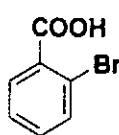


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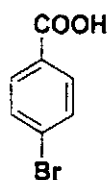


II

- c) Predict and explain whether UV spectroscopy can be used to distinguish the following pair of compounds.



(I)



(II)

Q.4.

(5x3=15)

- a) Explain how the composition of flame affects the production of gaseous atoms using suitable examples.
- b) How does double beam spectrometer differ from single beam spectrometer? Draw schematic diagram for a double beam spectrophotometer.
- c) Give the significance of "term symbols" in atomic spectroscopy. Explain it by taking example of Balmer series of hydrogen atom.

Q.5.

(3,2,10)

- a) Explain the temperature dependent ^1H NMR spectra of *N,N*-dimethylformamide (DMF).
- b) Calculate the NMR frequency (in MHz) of the proton (^1H) in a magnetic field of intensity 1.4092T, given that γ of proton is $26.753 \times 10^7 \text{ rad.T}^{-1}\text{s}^{-1}$.
- c) A compound having molecular formula $\text{C}_5\text{H}_{10}\text{O}$ shows a strong absorption band at 1702 cm^{-1} in its IR spectra and shows four peaks in its ^1H NMR spectrum.

 $\delta = 0.96$ (3H, triplet) $\delta = 1.1$ (2H, sextet) $\delta = 2.09$ (3H, singlet) $\delta = 2.45$ (2H, triplet)

Identify the compound.

Q.6.

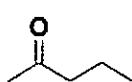
(5x3=15)

- a) H-Cl exhibits infrared spectrum where as H₂ does not, Explain. Show the nature of interaction between H-Cl and electromagnetic radiation.
- b) How can you distinguished following pairs using IR and ¹H NMR spectroscopy.
- (i) CH₃CH₂COOCH₃ and CH₃COCH₃
- (ii) CH₃CH₂CH₂COOH and CH₃CH₂CH₂CHO
- c) What are the different transitions that take place in UV spectroscopy? Give the energy level diagram.

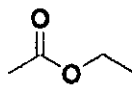
Q.7.

(5x3=15)

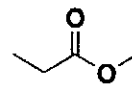
- a) How will you distinguish followings using ¹H NMR spectroscopy?



I



II



III

- b) Define the following the following terms

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- (i) Doppler broadening (ii) Natural broadening
- c) If a solution of compound C₄H₈O having 106 mg in 100 ml of ethanol in a 1 cm long cell shows absorbance 0.28. What is the value of extinction coefficient (ε) ? (Given that λ_{max} = 295 nm).