

(3 HOURS)

Total Marks-70

N.B:

1. All questions are compulsory
2. Answer all sub questions together
3. Draw neat labelled diagrams where necessary
4. Figures to the right indicate full marks

Q.1.A. Do as directed: (Any seven)**(7)**

- i. Name any one ion pairing reagent used in HPLC analysis
- ii. Write the structure for base peak of methanol, stating its m/z value
- iii. Name a solute property detector that can be used in HPLC analysis
- iv. Name any one detector used in gas chromatographic analysis
- v. Name the spectrometry technique that can distinguish different isotopes of an element
- vi. Name any one solvent that can be used in $^1\text{H-NMR}$ spectroscopic analysis
- vii. Name any one spraying reagent used for visualisation of spots in TLC analysis
- viii. Give an example of a carrier gas used in gas chromatography

Q.1.B. Explain the following terms: (Any four)**(8)**

- i. Coupling constant
- ii. Linearity studies in validation of analytical procedures
- iii. Reference standard in chromatographic analysis
- iv. MALDI technique
- v. Van Deemter equation

Q.2.A. Answer the following: (Any two)**(8)**

- i. Draw diagrams to depict the working of Rheodyne injection system in HPLC
- ii. Explain the principle of Size exclusion chromatography
- iii. Explain any one interface used in GC-MS analysis

Q.2.B. Two compounds 'X' and 'Y' were analysed by RP-HPLC using a column of length 25 cm. The retention times of 'X' and 'Y' were found to be 6.4 min and 7.2 min respectively. The peak widths measured at the base were 1.1 min and 1.2 min respectively. Calculate the resolution between compounds 'X' and 'Y'. Justify whether this value of resolution can be accepted or not. **(3)**

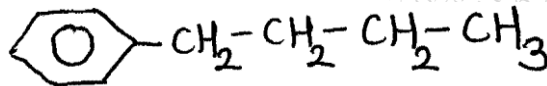
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Q.3.A. Answer the following: (Any two) (8)

- With the help of an inverted tree diagram explain the formation of a triplet for CH_3 protons of ethyl chloride.
- Suggest a suitable spectroscopic method to distinguish the following pairs of compounds, giving spectral characteristics.



- Depict any two fragmentation pathways for the following compound:



Q.3.B. Draw diagrams depicting 'Two dimensional' developmental technique in TLC (3)

Q.4.A. Answer the following: (Any Two) (8)

- Explain the working of 'Time of Flight' mass analyser.
- Explain the effect of anisotropy on the chemical shift of benzene protons with diagram.
- Explain the conduct of 'Accuracy' studies for analytical method validation as described in ICH guidelines.

Q.4.B. Explain normal phase HPLC and reverse phase HPLC. Give example of any one solvent used in each technique. (3)

Q.5.A. Answer the following: (Any Two) (8)

- Explain the different types of columns used in gas chromatographic analysis.
- Predict the structure of the following compound whose spectral characteristics are as follows:

Molecular formula: $\text{C}_{10}\text{H}_{14}\text{O}$

I.R. (cm^{-1}): 3400, 2963, 1599, 1500

$^1\text{H-NMR}$ (δ -ppm)= 7.4 (d) (2H)

6.8 (d) (2H)

4.9 (broad,s) (1H)

1.3 (s) (9H)

Give appropriate justification for your answer.

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- iii. Predict the structure of the following compound whose spectral characteristics are as follows:

Molecular formula: $C_8H_8O_2$

I.R. (cm^{-1}): 2924, 1689, 1589

1 H-NMR (δ -ppm)= 12.5 (s) (1H)

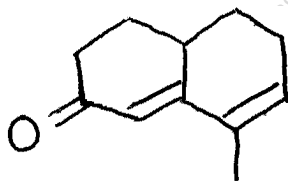
7.3 (d) (2H)

7.8 (d) (2H)

2.4 (s) (3H)

Give appropriate justification for your answer.

- Q.5.B Predict the λ_{max} for the following compound showing UV absorbance: (3)



- Q.6.A. Answer the following: (Any two) (8)

- i. Explain the working of refractive index detector used in HPLC analysis
- ii. Explain 'Radial development technique' in Paper chromatography with diagram.
- iii. With the help of a diagram, explain multicomponent analysis by UV spectroscopy using Difference spectroscopy method.

- Q.6.B. Predict the positions of absorption bands in the IR spectra of the following compound: (3)

