

[Time: Three Hours]

[ Marks:70]

Please check whether you have got the right question paper.

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

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

07

- i) Give any one reason for tailing observed in TLC.
- ii) Name an internal standard used in NMR spectroscopy.
- iii) Name the effect due to which acetylenes protons are shielded.
- iv) Name one carrier gas used in Gas chromatography.
- v) Name the peak in Mass spectrometry that has highest m/z value.
- vi) Name an elution mode used in HPLC.
- vii) Name the column used for protecting analytical column.
- viii) Name a stationary phase used in RP-HPLC.

**Q.1 B** Explain the term (**any 4**):

08

- i) Hyphenated technique
- ii) Internal standard
- iii) Isoabsorptive point
- iv) Metastable ion
- v) Temperature Programming in gas chromatography.

**Q.2 A** Answer the following (**any 2**):

08

- i) List any 4 detectors used in HPLC. Give any one advantage and one disadvantage of each detector.
- ii) Explain the principle of ion-pair chromatography. Give any one application of the same.
- iii) Give the significance of hyphenated technique. Explain any one interface used in GC-MS.

**Q.2 B** Compound A was analyzed on two different columns. Retention time of A when analyzed on a 25 cm column was found to be 19.45 min and the width of the peak at base was found to be 0.92 min. when compound A was analyzed on a 10 cm length of column, the retention time was observed to be 5.20 min and the width of the peak at base was found to be 0.52 min.

Calculate:

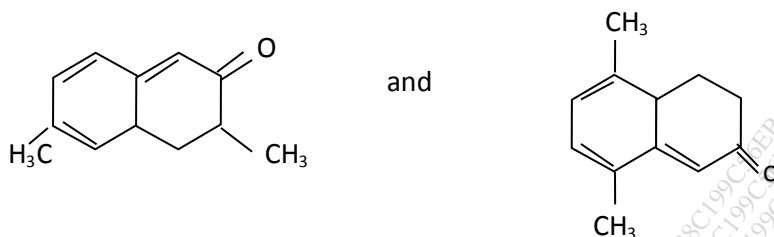
- i) Number of theoretical plates for each column.
- ii) Justify which column was more suitable for analysis.

**Q.3 A** Answer the following (**any 2**):

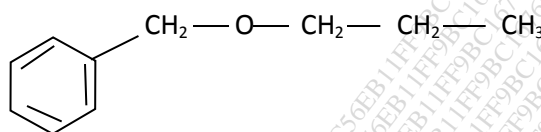
08

- i) Explain how you will distinguish between the following pair of compounds by the use of a suitable spectroscopy technique. Justify your answer giving its spectral characteristic.

TURN OVER



- ii) Explain the splitting pattern for protons of Isopropyl chloride in  $^1\text{H-NMR}$  spectroscopy'  
 iii) Depict any two fragmentation pathways for the following compound :



**Q.3 B** Discuss any 3 factors affecting resolution in TLC. **03**

**Q.4 A** Answer the following (**any 2**): **08**

- i) Explain any one ionization technique used in mass spectrometry.  
 ii) With the help of a suitable example. Explain 'chemical equivalence' in  $^1\text{H-NMR}$  spectrometry.  
 iii) With reference to Analytical method validation, explain the conduct of Precision studies.

**Q.4 B** Give a schematic classification of chromatographic method. **03**

**Q.5 A** Answer the following (**any 2**): **08**

- i) Draw block diagram showing various components of Gas chromatography instrument. Give any two advantages of Gas chromatography technique.  
 ii) Predict the structure of the compound, whose spectral characteristic are as following:

Molecular formula :  $\text{C}_9\text{H}_{11}\text{O}_2\text{N}$

I.R ( $\text{cm}^{-1}$ ) : 3500, 3400, 2850, 1725

$^1\text{H NMR}$  spectrum ( $\delta\text{ppm}$ ) :

2.3 (t, 2H)

2.5 (t, 2H)

4.8 (bs, 2H)

7.8 (d, 2H) & 7.3(d, 2H)

10.10 (s, 1H)

Give appropriate justification for your answer.

- iii) Compound with molecular formula  $\text{C}_5\text{H}_7\text{O}_2\text{N}$  has the following spectral characteristics :

IR : 2965, 2200, 1720  $\text{cm}^{-1}$

$^1\text{H NMR}$

$\delta$  2.1 s 3H

2.2 t 2H

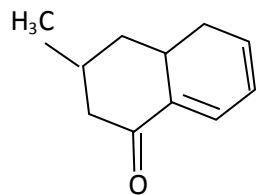
2.4 t 2H

Deduce the structure and justify your answer.

**TURN OVER**

**Q.5 B** Predict the  $\lambda_{\text{max}}$  for the following compound which shows u.v absorbance. Justify your answer.

03



**Q.6 A** Answer the following (any 2):

08

- Explain the working of any one pump used in HPLC instrument
- Explain any one developmental technique used in paper chromatography.
- List any 3 methods used for multicomponent analysis by u.v spectroscopy. And explain one method in detail.

**Q.6 B** Predict the positions of absorption bands in the I.R. spectra of the following compound.

03

