BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
First Semester 2023-2024
Comprehensive Examination

Course Name: Instrumental Methods of Analysis   **Course No: PHA F313**

Total Marks: 35   **Date: 07-12-2023**   **Duration: 180 (min)**

Note: Answer for all questions precisely with appropriate illustrations if required.

Give the answer for part-A and part-B separately.

Give the answer for all sub-parts together in one place.

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Part-A (Closed Book)   **15 Marks**

1) Write the effect of following w.r.t fluorimetric analysis.   **(3X1=3)**

a) Polarity of the solvent   b) Presence of dissolved oxygen   c) Light scattering

2) a) Draw a neat schematic representation of FES, label it's various components and processes involved in the analysis of the same briefly.   **(2x1.5=3)**

b) Write the pharmaceutical applications of FES.

3) a) How will you classify chromatography based on mobile phases used in the separation. Write a brief account on convergence chromatography.   **(2x1.5=3)**

b) Enumerate the difference between multiple development and two dimensional development techniques.

4) a) Draw a neat schematic representation of constant pressure pump, label it's various components and explain the working principle of the same.   **(2x1.5=3)**

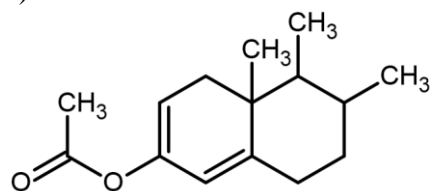b) Pharmaceutical applications of HPLC.

5) a) Draw a neat schematic representation of VPC, label it's various components, mention their purpose and working method of the same.   **(2x1.5=3)**

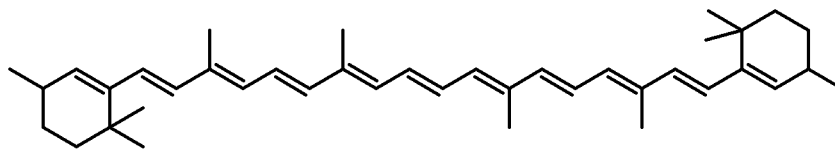b) Compare and contrast between packed column and capillary column.

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1) Predict the appropriate λ_{max} for the following by using appropriate empirical rules,   **(2X2=4)**
   a)   b)

2) a) Interpret the following IR spectrum and report DBE, aliphatic / aromatic, saturated / unsaturated, functional group present in the compound (Molecular Formula: $C_4H_{11}N$).   **(2X2=4)**

b) Indicate the characteristic IR absorption bands expected for benzamide and acetophenone.

3) a) What is the enantiomeric excess of a solution with a specific rotation of –60 where the pure solution rotates at –120? For the above same solution, how much of the (–) and (+) enantiomers are present? **(2x2=4)**

b) Cetrizine has a specific rotation of +48.44°. How many grams of Cetrizine are required to produce an angle of rotation of 36° using a 10 mL cell with a path length of 20 cm?
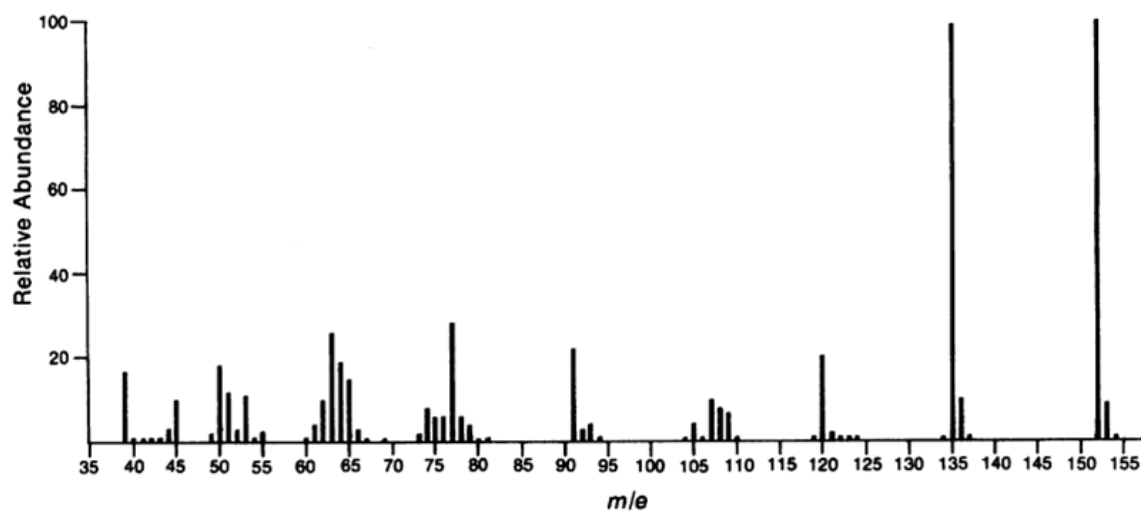
4) Identify m/z value for base peak, molecular ion peak and satellite peak (if any) in the given mass spectra of the following compounds
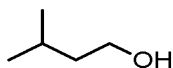**(2x2=4)**
a) Molecular formula: $C_6H_4Cl_2$
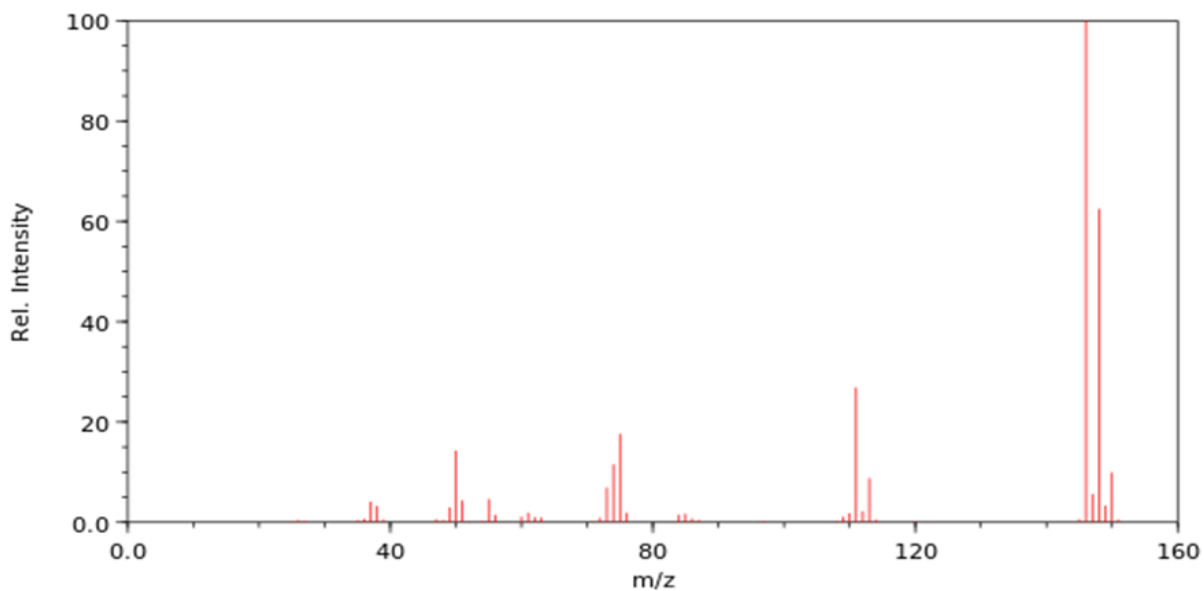
b) Molecular formula: $C_8H_8O_3$

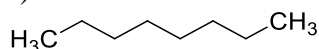5) For each given molecule, mark the sets of chemically non-equivalent H's present, number of signals in ^{1}H-NMR spectrum. **(4x1=4)**
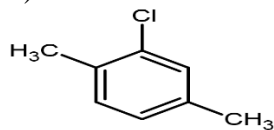
a)

b)

c)

d)