BIRLA INSTITUTE OF TECHNOLOGY & SCIENCE, PILANI
First Semester 2022-2023
Comprehensive Examination

Course Name: Instrumental Methods of Analysis   Course No: PHA F313
Total Marks: 35   Date: 30-12-2022   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) a) Draw a neat schematic representation of double beam fluorescence spectrophotometer, label it's various components and mention their purpose briefly.   **(2x1.5=3)**
b) Differentiate between fluorescence and phosphorescence.

2) a) Draw a neat schematic representation of AAS, label it's various components and steps involved in the same briefly.   **(2x1.5=3)**
b) Write the applications of AAS.

3) a) How will you classify chromatography based on attractive forces involved in the separation. Write the steps in involved affinity chromatography.   **(2x1.5=3)**
b) Explain the steps involved in HPTLC analysis.

4) a) Draw a neat schematic representation of HPLC system, label it's various components and steps involved in the same briefly.   **(2x1.5=3)**
b) Pharmaceutical applications of HPLC.

5) a) Write a note on Ion trap Mass analyzer.   **(2x1.5=3)**
b) Write the steps involved in NMR analysis. How will you get signal in ^{1}H-NMR.
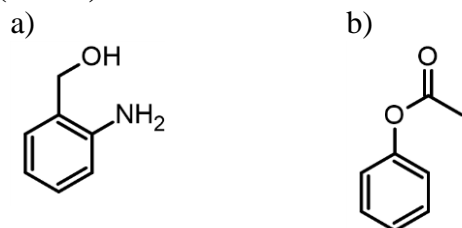

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1) Predict the λ_{max} for the following by using appropriate empirical rules,
(2x2=4)

a)

b)
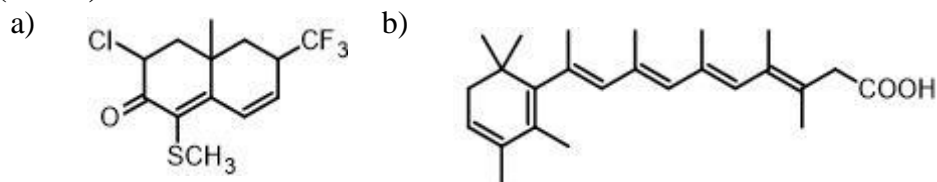
2) Write the characteristic IR absorption bands, DBE for the following with justification,
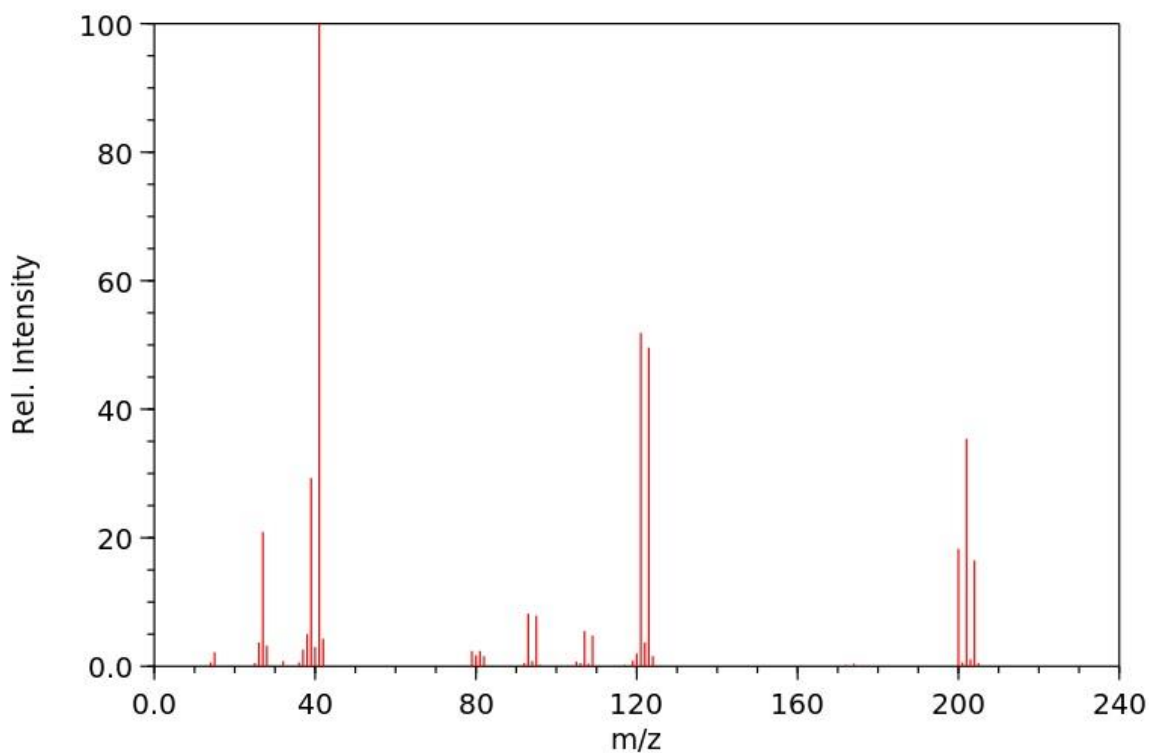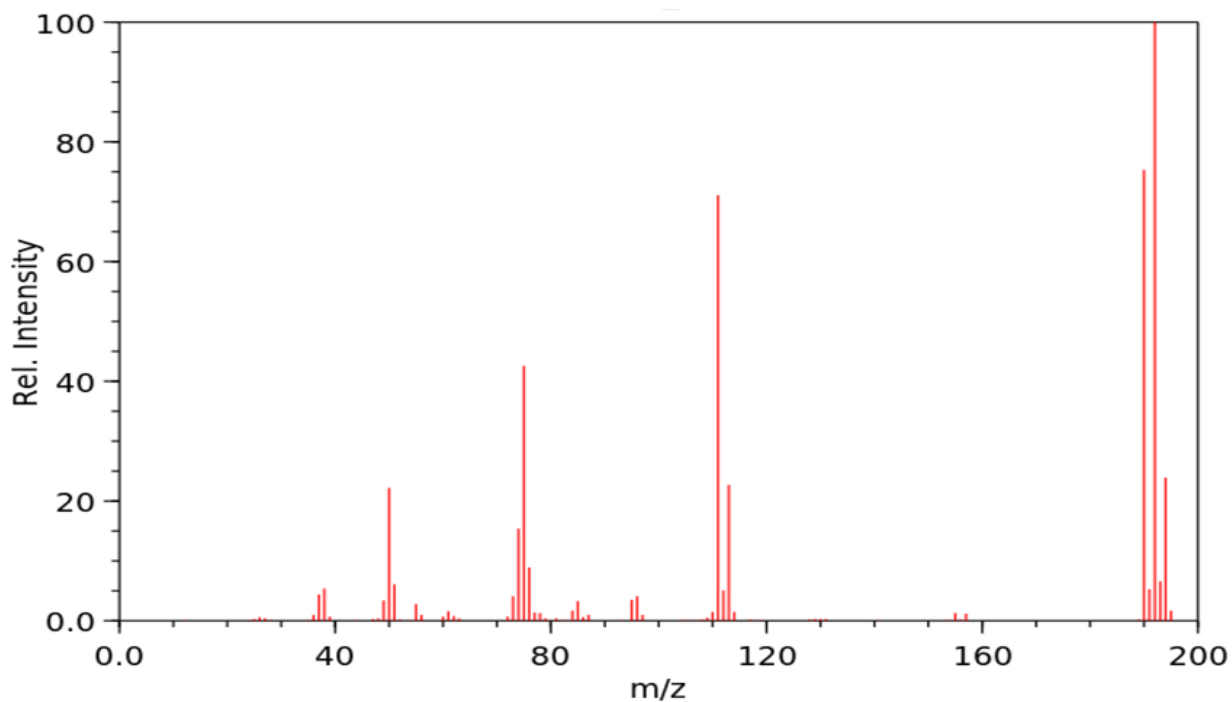**(2x2=4)**

a)

b)

3) Identify m/z value for base peak, molecular ion peak and satellite peak (if any) in the given mass spectra of the following compounds
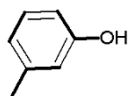**(2x2=4)**

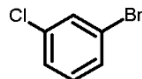a) Mol. Formula: $C_3H_6Br_2$

b) Mol. Formula: C_6H_4BrCl

4) For each given molecule, predict the sets of chemically non-equivalent H's present, number of signals in ^{1}H-NMR

a)

b)

5) a) Ibuprofen has a specific rotation of +54.26º. How many grams of Ibuprofen is required to produce an angle of rotation of 45° using a 10 mL cell with a path length of 10 cm?
(3x1=3)
b) An optically active sample has 50% EE and αobs =20° for a concentration of 4g in 10 ml and l = 5 cm. What is $[\alpha]$D for the pure isomer of the same sample?
c) The specific rotation of (*d*)-salbutamol is +16°. Determine the % composition of a mixture of (*d*) and (*l*) salbutamol as well as racemic form if the specific rotation of the mixture is +8°.

6) Both chromatograms (left and right side) are obtained using same column packing material, same column length as well as with same mobile phase with same flow rate. The only difference is the left side spectra was obtained with 5µ column particle size and the right side spectra was obtained with 1.7 µ column particle size. Write your inference.
(1)

50mm
5 micron

50mm
1.7 micron