

[This question paper contains 6 printed pages.]

Your Roll No.

5144

B

B.Sc. (Prog.)/III

AC-302 : Instrumental Methods of Analysis

(Admissions of 2005 and onwards)

Time : 3 Hours

Maximum Marks : 75

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

Attempt Six questions in all.

Question No. 1 is compulsory and carries 15 marks

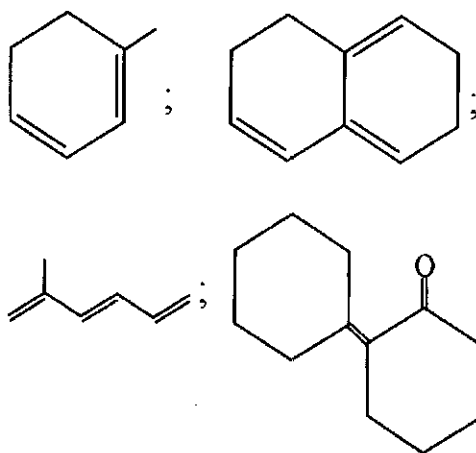
and remaining questions carry 12 marks each.

1. (a) Explain, why absorption peaks obtained in UV-spectra are broader than those obtained in IR spectra? 3
- (b) Explain the various types of molecular vibrations associated with IR absorption. 3
- (c) Which of the following are NMR active and why?
 C^{12} , O^{16} , N^{14} , H^2 , F^{19} , C^{13} , P^{31} . 3

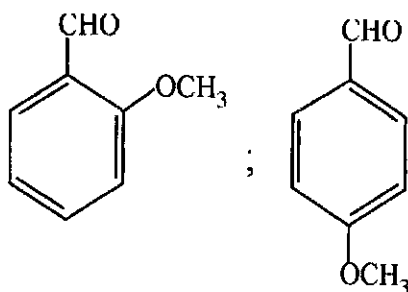
[P. T. O.]

- (d) Derive the relationship between absorption of frequency and applied magnetic field at the nucleus in NMR spectroscopy. 3
- (e) What is the role of Ca^{2+} in the coagulation of blood? 3
2. (a) How does IR spectra help in distinguishing between intermolecular and intramolecular hydrogen bonding? 3
- (b) "Stretching and Bending vibrations may not always lead to IR-activity." Justify. 3
- (c) Sketch the optical path of double beam instrument used in IR spectrophotometric analysis and precisely describe its functioning. 3
- (d) How many translational, rotational and vibrational degrees of freedom are there in H_2O and CO_2 ? 3
3. (a) "A conjugated diene absorbs at higher wavelength with higher value of extinction coefficients as compared to a diene in which double bonds are isolated. Explain, with suitable examples. 4

- (b) Find out the most probable absorption position of the most intense band of these compounds using Woodward-Fieser rules. 4



- (c) Predict and explain whether UV spectroscopy can be used to distinguish between the following pair of compounds. 2



- (d) What are the different criteria for selecting a solvent used in UV-visible spectroscopy? 2

4. (a) Why TMS is selected as reference in NMR spectroscopy? 3
- (b) A compound with molecular formula $C_{10}H_{14}$ shows four peaks in PMR spectrum at $\delta = 0.88$; 6H (doublet),
 $\delta = 2.45$; 2H (doublet),
 $\delta = 1.86$; 1H (multiplet),
 $\delta = 7.15$; 5H (singlet), respectively.
Identify the compound. 3
- (c) What is the necessary criteria for a compound to give NMR spectrum? Illustrate your answer with two examples. 3
- (d) From the low resolution spectrum of ethylchloride, which absorption peak corresponds to high τ -value? Explain. Also draw a high resolution spectrum of Ethylchloride. 3
5. Write short notes on the following :
- (a) Chemical shift; 3
- (b) Fluorescence and phosphorescence; 3

- (c) Homopolysaccharides; 3
- (d) Saponification value of fats. 3
6. (a) A reagent X cleaves selectively those peptide bonds whose carbonyl functions is donated by methiorenene. Predict the action of this reagent on the following peptide :
- Gly – Tyr – Ser – Ala – Met – Gly – His – Val
– His – Met – Pro – Phe – Met – Asp 4
- (b) Describe Sanger's method for the determination of N-terminal amino acid. 2
- (c) What is Erythrocyte sedimentation rate? Explain its biological significance. 2
- (d) What are enzymes and how are they classified according to IUB nomenclature? 2
- (e) What is invert sugar? Explain. 2
7. (a) Give an account of various interferences that may affect flame emission or flame absorption analysis. 3
- (b) Explain the operation of a "hollow cathode lamp" used in Atomic absorption spectrophotometer. 3

- (c) Describe in brief, the reactions that take place when a solution of the sample is aspirated into the flame for recording atomic absorption spectrum. 3
- (d) Explain, what is meant by enzyme specificity? 3
8. (a) Define "Specific Rotation" and describe on which factors it depends? 4
- (b) How is polarimeter used for the determination of specific rotation and molecular rotation of sucrose solution? 4
- (c) Briefly describe the Nicol prism and also explain why half shadow devices are essentially required for an ideal polarimeter? 4