

Exam. Code : 107406

Subject Code : 1696

B.Sc. (Bio-Technology) 6th Semester
PHYSICAL, ORGANIC AND INORGANIC
ASPECTS OF SPECTROSCOPY—B

Paper—BT-7

Time Allowed—3 Hours] [Maximum Marks—40

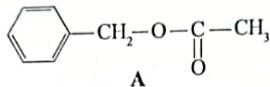
Note :—Attempt FIVE questions in all, selecting at least ONE question from each section. The fifth question may be attempted from any section. All questions carry equal marks.

SECTION—A

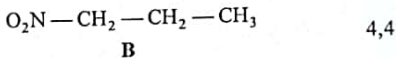
- I. (a) Explain NMR transition and discuss how resonance occurs in NMR spectroscopy.
- (b) How protons of benzene appear at low magnetic field in its proton NMR spectrum? Explain the role of the ring current in this observation. 4,4
- II. (a) Draw and explain ^1H NMR spectrum of $\text{CH}_3 - \text{C}(=\text{O}) - \text{O} - \text{CH}_3$. Also explain how will you calculate chemical shift.
- (b) ^1H NMR spectrum of compound 'A' in CDCl_3 solvent (99.5% deuterated) showed a signal at 7.26 ppm which is not due to compound 'A'. What is the origin of the signal? 4,4

SECTION—B

- III. (a) The ^1H NMR spectrum of benzyl acetate (A) showed three signals at 2.3, 5.4 and 7.5 ppm. Assign these signals to the respective type of protons of compound 'A'.



- (b) Predict ^1H NMR spectrum of nitropropane. Draw the spectrum and explain occurrence of various peaks. Mark chemical shift and spin-spin coupling constants.



- IV. (a) How will you distinguish the following three compounds using proton NMR spectroscopy ?
 $\text{CH}_3\text{-OH}$; $\text{CH}_3\text{-C(=O)H}$ and $(\text{CH}_3)_2\text{C=O}$.
- (b) Predict ^1H NMR signals of $\text{Cl-CH}_2\text{-OH}$. 6,2

SECTION—C

- V. Explain briefly fragmentation and rearrangements which occur in mass spectrum of an organic compound. Illustrate with at least two examples. 8
- VI. (a) How metastable ions are generated ? What is their importance in mass spectrometry ?
- (b) Explain Nitrogen rule as used in mass spectrometry. 5,3

SECTION—D

- VII. (a) Benzonitrile (C_6H_5CN) showed three major mass peaks at : $m/z = 103$ (100%); 77 (10%) and 76 (35%) positions. Suggest which are possible species formed. The values in brackets are relative abundances of ions formed (Atomic masses : $C = 12$, $H = 1$; $N = 14$).
- (b) Ethylamine showed three major mass peaks at : $m/z = 45$ (20%); 45 (21%) and 30 (100%) positions. Suggest which are possible species formed. The values in brackets are relative abundances of ions formed. 4,4
- VIII. (a) Give some important differences in mass spectra of aliphatic and aromatic compounds. Explain using suitable examples.
- (b) ^{79}Br and ^{81}Br have nearly equal abundance, then suggest various molecular ions obtained from mass spectrum of methyl bromide. 6,2