

Sr.No.6725

Exam.Code: 107406
Subject Code : 1782

**B.Sc. Biotechnology-6th Semester
(2720)**

Paper: BT-7

Physical, Organic & Inorganic Aspects of Spectroscopy-B

Time Allowed: 2 hrs.

Max. Marks: 40

Note: Attempt any four questions. All questions are of equal marks.

- I. Proton NMR spectrum of benzyl acetate $\{C_6H_5-CH_2-O-C(=O)-CH_3\}$ showed three signals at 2.3, 5.4 and 7.5 ppm. Draw spectrum and assign these signals to the respective type of protons of the above compound. Write the chemical shift of each signal with units.
- II. Explain clearly the spin-lattice and spin-spin relaxation phenomena as observed in NMR spectroscopy. Also comment on population difference of nuclei in the ground and excited states.
- III. Describe in detail the basic principles of NMR spectroscopy with special reference to : NMR transition, solvents needed, chemical shift, nuclear spin-nuclear spin coupling constant, radiations used and advantages in respect of structure elucidation.
- IV. Suppose 1H NMR spectrum of compound A (formula C_2H_6O) showed three signals : one triplet at $\delta = 2.5$ ppm; one quartet of doublets at $\delta = 3.5$ ppm and another triplet at $\delta = 5.5$ ppm. Draw the spectrum keeping in view

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intensities. Derive structure of compound based on the above data.

- V Explain major mass spectral fragments and their intensity of the following compounds : cyclopentane (C_5H_{10}); toluene ($C_6H_5-CH_3$) and *ortho*-xylene $\{C_6H_4(CH_3)_2\}$.
- VI (a) Both n-butane and isobutane showed most intense peak at $m/z = 43$. Identify the species and also explain its high intensity.
- (b) Illustrate with an example, Diels-Alder fragmentation encountered in mass spectrometry of organic compounds.
- VII How the mass spectral fragments of aliphatic and aromatic compounds differ. Explain using suitable examples.
- VIII (a) What is the importance of metastable ions in mass spectrometry? Illustrate using a suitable example.
- (b) Describe mass spectrum of butyrophenone ($C_{10}H_{12}O$; MW 148). Illustrate Mc Lafferty rearrangement shown, if any, by this compound.
- (Atomic masses: C = 12, H = 1; N = 14, O = 16).

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