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GANDHI INSTITUTE OF ENGINEERING AND TECHNOLOGY UNIVERSITY, ODISHA, GUNUPUR

(GIET UNIVERSITY)

Ph.D. (Second Semester-Summer) Examinations, May – 2025

23SPPECY2014 – Organic Spectroscopy & Green Chemistry

(Chemistry)

Time: 3 hrs Maximum: 70 Marks

The figures in the right hand margin indicate marks.

Answer *ANY FIVE* Questions. (14 x 5 = 70 Marks) **Marks**

1.a.	Describe how FTIR spectroscopy can be used to determine the molecular structure and composition of a substance.	7
b.	Describe the various types of electronic transitions observed in UV-Visible spectroscopy.	7
2.a	What is meant by shielding and deshielding in ^{1}H NMR spectroscopy?	14
3.a.	Define the molecular ion and the base peak in a mass spectrum.	7
b.	Discuss the process of fragmentation in mass spectrometry.	7
4.a.	What are green solvents? Discuss their classification and role in sustainable chemistry. Compare and contrast the use of water, supercritical CO_2, and ionic liquids as green solvents with conventional organic solvents.	14
5.a.	Explain the Diels–Alder reaction and a decarboxylation reaction performed under microwave conditions, highlighting improvements in yield, time, and selectivity.	14
6.a.	What is the McLafferty rearrangement? Describe the mechanism of this rearrangement and explain in which types of compounds it occurs.	14
7.a	Why is tetramethylsilane (TMS) used as a standard, and what are the criteria for selecting appropriate deuterated solvents?	14
8.a.	A compound with molecular formula $C_9H_{10}O_2$ shows the following data: IR absorption at 1715 cm^{-1} and 2750–2850 cm^{-1}; ^{1}H NMR shows a singlet at δ 9.8 ppm, a multiplet in the aromatic region, and a singlet at δ 3.8 ppm. Propose a structure and justify it using the spectral evidence.	7
b.	An unknown organic compound has the molecular formula $C_4H_8O_2$. Its IR spectrum shows a strong absorption at 1740 cm^{-1}. The ^{1}H NMR spectrum displays a triplet at δ 1.2 ppm and a quartet at δ 4.1 ppm. Identify the compound and explain your reasoning using all spectral data.	7

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