

Roll No.

(05/25)

15035

M. Sc. EXAMINATION

(For Batch 2021 & Onwards)

(Fourth Semester)

CHEMISTRY

MSc/Chem/4/SEC2

Applied Spectroscopy

Time : Three Hours

Maximum Marks : 70

Note : Attempt *Five* questions in all, selecting *one* question from each Unit. Q. No. 1 is compulsory.

1. Answer the following in brief : $5 \times 2 = 10$

(a) What is the role of Auxochromes in UV-Vis spectroscopy ?

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- (b) What is the difference between proton-coupled and proton-decoupled ^{13}C NMR ?
- (c) Define hot band in IR spectroscopy.
- (d) Define Fermi resonance in IR spectroscopy.
- (e) What do you mean by FAD measurement techniques ?

Unit I

- 2. (a) Discuss and explain the Frank-Condon principle. 3
- (b) Explain, how solvent effects influence UV absorption spectra. 6
- (c) Describe the various electronic transitions and selection rule in UV spectroscopy. 6
- 3. (a) What is Cleavage ? Explain the cleavage associate with common function group like ketone and alcohols. 9
- (b) Describe Retro Diels-Alder Fragmentations. 6

Unit II

- 4. Explain the various type functional group frequency and types of bending vibration. Explain fingerprinting region also. 15
- 5. (a) Describe the effect of conjugation on carbonyl stretching frequencies. 10
- (b) Basic Principle of IR spectroscopy. 5

Unit III

- 6. Describe the principle of nuclear magnetic resonance spectroscopy and explain, how is it used to determine the structure of organic compound. 15
- 7. Find out the ^1H signals in THF, DMF, DMSO, alkyne and ortho-meta chloro benzene, with chemical shift. 15

Unit IV

8. (a) What is coupling constant ? Explain the chemical shift of Aliphatic, alkyne hydrocarbon of ^{13}C NMR. 8
- (b) What is Nuclear Overhauser effect ? 7
9. A Compound with molecular formula $\text{C}_9\text{H}_{10}\text{O}_2$, in IR spectra show absorption band at 3040, 2950, 1740, 1480, 1440, 1220, 750 and 700 cm^{-1} . In ^1H -NMR spectra the compound shows three peaks at δ 1.96 (3H, s), 5.00 (2H, δ) and 7.22 (5H, s) and ^{13}C -NMR spectra (off resonance) it show two singlets (at δ 171 and 136), one triplet, one quartet and three doublets. In mass spectra the compound shows prominent peak at m/z 150 (M^+), 108, 91 and 77. Deduce the structure of compound and explain the spectral data. 15

