

**A-0413**

Total Pages : 3

Roll No. ....

**MSCCH-602**

**M.SC. CHEMISTRY (MSCCH)**

**(Spectroscopy-II)**

Examination, June 2025

Time : 2:00 Hrs.

Max. Marks : 70

**Note :-** This paper is of Seventy (70) marks divided into Two (02) Sections 'A' and 'B'. Attempt the questions contained in these sections according to the detailed instructions given therein. *Candidates should limit their answers to the questions on the given answer sheet. No additional (B) answer sheet will be issued.*

**Section-A**

**Long Answer Type Questions**      2×19=38

**Note :-** Section 'A' contains Five (05) Long-answer type questions of Nineteen (19) marks each. Learners are required to answer any *two* (02) questions only.

1. What is hyperfine interaction ? Explain the different types of hyperfine interactions in hydrogen atom and free radicals.
2. Explain the Chemical Shift and spin-spin coupling in AX, AMX molecules.
3. Explain the McLafferty rearrangement, its mechanism, and its significance in mass spectrometry.
4. Discuss the chemical shift in Carbon-13 NMR spectroscopy with special reference to alkyne and carbonyl carbon.
5. What is Mossbauer Spectroscopy and discuss the Quadrupole splitting and hyperfine interaction with special reference to  $^{119}\text{Sn}$ .

### Section–B

#### Short Answer Type Questions      4×8=32

**Note** :– Section ‘B’ contains Eight (08) Short-answer type questions of Eight (08) marks each. Learners are required to answer any *four* (04) questions only.

1. What are the implications of chemical exchange on the interpretation of  $^1\text{H}$  NMR spectra ?
2. What are some common 2D NMR techniques and what types of structural information can they provide ?

3. Define the term ionisation in mass spectrometry and write short note on the ion production methods EI and CI.
4. What is the zero field splitting ? Discuss it with giving the suitable examples.
5. Define the chemical shift. How the chemical shift value affected by different factors ?
6. Write nitrogen rule with giving the suitable example and its implication in analysis of mass spectrum.
7. What is NOE and how it is useful to identification of  $^1\text{H}$ -NMR spectrum.
8. Write the number of peaks and spin-spin splitting in the following molecules :
  - (a) 2-Butanol
  - (b) Benzene
  - (c) Cyclobutane
  - (d) 1-Propene

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