A–066

Total Pages : 3 **Roll No. .....**

MSCCH–602

M.Sc. CHEMISTRY (MSCCH)

(Spectroscopy–II)

3rd Semester Examination, 2024 (June)

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. Explain the following :
   (a) Coupling constant
   (b) NOE
   (c) Shift Reagent
2. Define the following terms :
   (a) Larmor frequency
   (b) Spin-spin relaxation
   (c) Spin-spin coupling
3. Write note on the following
   (a) APT
   (b) FT-NMR
   (c) NOSY
4. What is hyperfine splitting and zero field splitting. Discuss the hyperfine splitting of methyl free radical.
5. Discuss the theory, instrumentation and different ionization methods used in the Mass spectrometry.

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 is the nitrogen rule ? Explain it with suitable example.
2. Discuss the shielding and deshielding effects.
3. Explain the proton coupled and proton decoupled carbon-13 spectra.
4. What is recoilless emission ? Elaborate the conditions under which Mossbauer effect is most likely to occur.
5. Discuss the mass fragmentation pattern in the alcohol and phenol molecules.
6. Predict the ^{1}H–NMR signals with their multiplicity in the following compounds
   (a) Propan-2-ol
   (b) Ethylacetate
   (c) 1-Chlorocyclobutane
7. Predict the number of ^{13}C-NMR signal and multiplicity of peaks in the following compounds
   (a) 2, 5-Dimethylhexane
   (b) Cyclohexanol
   (c) 2, 3-Dimethylbuta-1, 3-diene
8. Discuss the hyperfine interactions in mossbauer spectroscopy,

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