

A-0987

Total Pages : 3

Roll No.

MSCCH-509

M.Sc. Chemistry (MSCCH)

Spectroscopy-I

Examination February, 2026

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.

A-0987

(1)

P.T.O.

1. Explain the Woodward-Fieser rules for conjugated dienes. Illustrate the method of calculating λ_{\max} with suitable examples.
2. Describe the theory of rotational spectra of diatomic molecules using the rigid rotator approximation.
3. Explain the factors influencing vibrational frequencies in infrared spectroscopy with suitable examples.
4. Explain the Franck-Condon principle with the help of a potential energy diagram. Discuss how the principle accounts for the intensity distribution of vibronic bands observed in electronic absorption spectra.
5. Describe linear molecules, spherical tops, symmetric tops, and asymmetric tops, giving examples for each category and commenting on their rotational spectra.

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. State the Beer–Lambert law and write its mathematical expression.

2. Why is the fingerprint region important for the identification of organic compounds, even though it is difficult to interpret ?
3. Explain why the energy levels of a non-rigid rotator are lower than those of a rigid rotator.
4. Define electromagnetic radiation and mention its main components.
5. Define a microstate in the context of electronic configurations and explain how it is related to the determination of term symbols.
6. How does isotopic substitution affect the vibrational frequency of a molecule ?
7. Why are overtone bands generally weaker in intensity compared to fundamental vibrational bands ?
8. Explain the phenomenon of Fermi resonance in vibrational spectroscopy and give one example where it is observed.
