A–0411

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

MSCCH-509

M.SC. CHEMISTRY (MSCCH)

(Spectroscopy-I)

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. Explain the concept of finding the expression of term symbol and determine the term symbol for p2 configuration.

2. Write a short note on :

   (a) Bathochromic shift

   (b) Isobestic point

   (c) Beer-Lambert law

   (d) Hypsochromic shift

   (e) Chromophore

3. (a) Discuss in details the various factors which influence the vibrational frequency of a particular group.

   (b) Write applications of UV-visible spectroscopy.

4. (a) Explain transition probability.

   (b) Describe the various types of absorption bands which arise as a result of the electronic transitions. Discuss the effect of solvent polarity on K and R band.

5. What is Michelson interferometer. Discuss the difference between dispersive and FTIR Spectrophotometer.

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. Explain the breakdown of the Born-Oppenheimer approximation.
2. Discuss the rotational spectrum of non-rigid rotator.
3. What is P, Q and R branches of the vibration-rotation spectrum.
4. How bond angle and ring strain influence the vibrational frequency ? Discuss with example.
5. Explain the applications of Raman Spectroscopy.
6. What are the rotational selection rules and their basis and the uses ? Explain.
7. Explain Einstein coefficient of spontaneous emission, and absorption.
8. Write note on :
   (a) non-rigid rotor
   (b) Hook's Law.

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