

**A-064**

Total Pages : 4

Roll No. ....

**MSCCH-509**

**M.Sc. CHEMISTRY (MSCCH)**

**(Spectroscopy-I)**

2nd 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.

**A-064/MSCCH-509 ( 1 )**

P.T.O.

1. (a) Discuss the rotational spectrum of Diatomic rigid rotator.  
(b) Explain the determination of bond length with the help of rotational spectroscopy.
2. (a) Discuss the spectrum of simple harmonic oscillator.  
(b) Write and discuss the equation used to calculate the vibrational frequency of a diatomic molecules.
3. What is Raman spectra ? Define stoke's and antistoke's line in Raman spectra. Write down the application of Raman Spectroscopy ?
4. (a) Define microstate. Calculate the number of microstate for  $p^1$ -configuration and  $p^2$ -configuration ?  
(b) Discuss the reason for bathochromic shift in polyconjugated compounds ?
5. What is Michelson interferometer discuss the difference between dispersive and FT-IR 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.

**A–064/MSCCH–509 ( 2 )**

- 1 (a) Discuss effect of nuclear spin in vibrational spectroscopy ?  
(b) What are P, Q and R branches of the vibration-rotation spectrum ?
2. Discuss the effect of conjugation on vibrational frequency of carbonyl group.
3. Write a short notes on :
  - (a) Applications of IR-spectroscopy
  - (b) Light source in IR-spectroscopy
4. Discuss the factor affecting the vibrational frequencies of functional groups in IR-spectrum ?
5. Define the electronic transitions and in various energy level in UV region ?
6. Write and discuss the equation used to calculate the vibrational frequency of a diatomic molecule ?
7. Write a short notes on the following :
  - (a) Beer-Lambert law
  - (b) Effect of polar solvent in  $n - \pi^*$  and  $\pi - \pi^*$  transition

8. (a) Define the Heisenberg's Uncertainty Principle ?
- (b) Uncertainty in position of a electron and helium is similar. If uncertainty in momentum of electron is  $32 \times 10^5$ , then Calculate the uncertainty of helium ?

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