# S-466

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# MSCCH-509

**Spectroscopy-I**

M.Sc. Chemistry (MSCCH)

2nd Semester Examination, 2022 (Dec.)

**Time : 2 Hours]** **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.

## SECTION–A

## (Long Answer Type Questions)

**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.

(2×19=38)

**1.** (a) Define electromagnetic spectrum and explain the characteristics of electromagnetic radiations.

(a) Explain spectroscopy along with the fundamental laws of absorption.

**2.** (a) In IR-spectrum what factors affected the vibrational frequencies of functional groups ?

(b) Describe the concept of polarizability in Raman scattering.

**3.** What is Raman spectra? Define stake'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) How will you distinguish $1^0$, $2^0$ and $3^0$ amines with the help of IR-spectroscopy? Discuss with example.

**5.** What is Michelson interferometer. Discuss the difference between dispersive and FT-IR Spectrophotometer.

## SECTION–B
## (Short Answer Type Questions)

**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. (4×8=32)

**1.** What are P, Q and R branches of the vibration-rotation spectrum ?

**2.** Write a short notes on :

(a) Classification of IR-bands.

(b) Applications of IR-spectroscopy.

**3.** Discuss the reason for bathochromic shift in poly conjugated compounds.

**4.** Discuss effect of nuclear spin in vibrational spectroscopy.

**5.** Discuss the rotational spectrum of Diatomic rigid rotator.

**6.** Give selection rules based on symmetry ideas.

**7.** (a) Define Heisenberg's Uncertainty Principle.

(b) A cricket ball weighing 100 g is to be located within 0.1 Å. What is the uncertainty in its velocity ? Comment on your answer. Plank's constant(h) = $6.626 \times 10^{-34}$ Js.

**8.** Explain Einstein coefficient of spontaneous emission, and absorption.

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