

# C.U.SHAH UNIVERSITY

## Summer Examination-2022

**Subject Name: Qualitative Optical Spectroscopic Method - I**

**Subject Code: 5SC03QSC1**

**Branch: M.Sc. (Chemistry)**

**Semester: 3**

**Date: 22/04/2022**

**Time: 02:30 To 05:30**

**Marks: 70**

**Instructions:**

- (1) Use of Programmable calculator and any other electronic instrument is prohibited.
  - (2) Instructions written on main answer book are strictly to be obeyed.
  - (3) Draw neat diagrams and figures (if necessary) at right places.
  - (4) Assume suitable data if needed.
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### SECTION – I

- Q-1 Attempt the Following questions (07)**
- A** Define spectroscopy **1**
  - B** Why water is not used as solvent in IR spectroscopy? **1**
  - C** What do you mean by Rayleigh scattering? **1**
  - D** Why we can't distinguish enantiomers by IR spectroscopy? **1**
  - E** Define Raman scattering **1**
  - F** Give any three examples of molecules, which are active in Raman but not in IR spectroscopy. **1**
  - G** Give wavelength range for mid IR region. **1**
- Q-2 Attempt all questions (14)**
- A** Write a note on various factors affecting vibrational frequency. **07**
  - B** Explain the mechanism of Raman scattering by classical theory. **07**
- OR**
- Q-2 Attempt all questions (14)**
- A** Explain the sampling techniques used in IR spectroscopy. **07**
  - B** Discuss the mechanism of Raman effect by quantum theory. **07**
- Q-3 Attempt all questions (14)**
- A** Explain the instrumentation of Dispersive IR spectroscopy. **05**
  - B** Discuss the disadvantages of Raman spectroscopy over Infrared spectroscopy. **05**
  - C** Give the applications of IR spectroscopy. **04**

**OR**



- Q-3** Attempt all questions (14)
- A** Explain fundamental vibrations for IR spectroscopy. 05
- B** Discuss the advantages of Raman spectroscopy over Infrared spectroscopy. 05
- C** Explain resonance Raman technique. 04

**SECTION – II**

- Q-4** Attempt the Following questions (07)
- A** Define the term: Signal to Noise ratio (S/N) for FT-NMR. 01
- B** What do you mean by shielding? 01
- C** Write equation of Larmor frequency for NMR spectroscopy. 01
- D** What do you mean by downfield field shift? 01
- E** Write any two examples of nuclei having half-integral spin value. 01
- F** Give the Bragg's equation and name of different terms involved in the equation. 01
- G** Define X-Ray Diffraction 01
- Q-5** Attempt all questions (14)
- A** Discuss the continuous wave NMR instrumentation. 07
- B** Write a note on powder diffraction method in detail. 07

**OR**

- Q-5** Attempt all questions (14)
- A** Explain types of detectors used in X-ray diffraction. 07
- B** Discuss the various factors affecting chemical shift in NMR. 07
- Q-6** Attempt all questions (14)
- A** Discuss the single crystal X-ray diffraction. 05
- B** Explain spin-spin coupling mechanism for NMR in detail. 05
- C** Draw a labeled instrumental diagram of FT-NMR instrument. 04

**OR**

- Q-6** Attempt all questions (14)
- A** Discuss the Monochromators used in X-ray spectrometer. 05
- B** Write a note on chemical shift for NMR spectroscopy. 05
- C** Write applications of X-ray diffraction. 04

