Roll No. .....

(12/24)

15022

M. Sc. EXAMINATION

(For Batch 2021 & Onwards)

(Third Semester)

CHEMISTRY

MSc/Chem/3/CC14

Spectroscopy

Time : Three Hours *Maximum Marks : 70*

Note : Attempt *Five* questions in all. Q. No. **1** is compulsory consisting of five short answer type questions. Each question carries 2 marks. Attempt *four* more questions, selecting *one* question from each Unit. Each question carries 15 marks.

(Compulsory Question)

1. (a) What is an anharmonicity constant ? 2

(b) What is fingerprint region ? 2

(c) What is anisotropic splitting ? 2

(d) Explain the rule of mutual exclusion in Raman spectroscopy. 2

(e) Differentiate between point group, space group and unit cell. 2

Unit I

2. (a) Describe the rotational spectra of a rigid diatomic molecule. How does it differ from a non-rigid rotator ? 10

(b) How can you determine the moment of inertia and bond length from rotational spectra ? 5

3. (a) Describe the vibrational spectra of a simple harmonic oscillator. 7

(b) Explain the following : 4,4

(i) Sampling techniques in vibrational spectroscopy

(ii) Vibrations of polyatomic molecules.

Unit II

4. (a) Explain the basic principle of NQR spectroscopy. Discuss the relationship between electric field gradient and molecular structure. 10

(b) Describe the interpretations of structural information from NQR spectra. 5

5. (a) Explain the following : 4,4

(i) Features of ESR spectra

(ii) Hyperfine coupling in isotropic system.

(b) What are g-values ? Describe the factors affecting g-value in transition metal complexes. 7

Unit III

6. (a) Compare the pure rotational Raman spectra with the vibrational Raman spectra of diatomic molecules. 10

(b) Explain the factors affecting absorption frequencies in Raman spectroscopy. 5

7. (a) Describe the basic principle, workings, and applications of atomic absorption spectroscopy. 10

(b) Discuss the merits and demerits of Raman spectroscopy. 5

Unit IV

8. (a) What is a reciprocal lattice ? Explain Bragg's law in reciprocal space. 8

(b) Explain the elementary treatment of structure factor and Fourier synthesis. 7

9. Describe the following : 7,8

(i) Anomalous scattering and its effects

(ii) Packing in crystals.