

# **Fundamentals of Molecular Spectroscopy**

## **1. Introduction:-**

- 1.1 Characterization of Electromagnetic Radiation
- 1.2 The Quantization of Energy
- 1.3 Regions of the Spectrum
- 1.4 Representation of Spectra
- 1.5 Basic Elements of Practical Spectroscopy
- 1.6 Signal-to-Noise: Resolving Power
- 1.7 The Width and Intensity of Spectral Transitions

## **2. Microwave Spectroscopy:-**

- 2.1 The Rotation of Molecules
- 2.2 Rotational Spectra
- 2.3 Diatomic Molecules
- 2.4 Polyatomic Molecules
- 2.5 Techniques and Instrumentation

## **3. Infra-Red Spectroscopy:**

- 3.1 The Vibrating Diatomic Molecule
- 3.2 The Diatomic Vibrating-Rotator
- 3.3 The Vibration-Rotation Spectrum of Carbon Monoxide
- 3.4 Breakdown of the Born-Oppenheimer Approximation : the Interaction of Rotations and Vibrations
- 3.5 The Vibrations of Polyatomic Molecules
- 3.6 The Influence of Rotation on the Spectra of Polyatomic Molecules
- 3.7 Analysis by Infra-Red Techniques
- 3.8 Techniques and Instrumentation

## **4. Raman Spectroscopy:-**

- 4.1 Pure Rotational Raman Spectra
- 4.2 Vibrational Raman Spectra
- 4.3 Polarization of Light and the Raman Effect

4.4 Structure Determination from Raman and Infra-Red Spectroscopy

4.5 Techniques and Instrumentation

**5. Electronic Spectroscopy of Atoms:-**

5.1 The Structure of Atoms

5.2 Electronic Angular Momentum

5.3 Many-Electron Atoms

5.4 The Angular Momentum of Many-Electron Atoms

**6. Electronic Spectroscopy of Molecules:-**

6.1 Electronic Spectra of Diatomic Molecules

6.2 Electronic Structure of Diatomic Molecules

6.3 Electronic Spectra of Polyatomic Molecules

6.4 Techniques and Instrumentation

**7. Spin Resonance Spectroscopy:**

7.1 Nuclear Magnetic Resonance Spectroscopy: Hydrogen Nuclei

7.2 Nuclear Magnetic Resonance Spectroscopy: Nuclei other than Hydrogen

7.3 Techniques and Instrumentation

7.4 Electron Spin Resonance Spectroscopy