

CHAPTER OVERVIEW

13: Molecular Spectroscopy

Spectroscopy generally is defined as the area of science concerned with the absorption, emission, and scattering of electromagnetic radiation by atoms and molecules, which may be in the gas, liquid, or solid phase. Visible electromagnetic radiation is called light, although the terms light, radiation, and electromagnetic radiation can be used interchangeably. Spectroscopy played a key role in the development of quantum mechanics and is essential to understanding molecular properties and the results of spectroscopic experiments. It is used as a “stepping stone” to take us to the concepts of quantum mechanics and the quantum mechanical description of molecular properties in order to make the discussion more concrete and less abstract and mathematical.

[13.1: The Electromagnetic Spectrum](#)

[13.2: Rotations Accompany Vibrational Transitions](#)

[13.3: Unequal Spacings in Vibration-Rotation Spectra](#)

[13.4: Unequal Spacings in Pure Rotational Spectra](#)

[13.5: Vibrational Overtones](#)

[13.6: Electronic Spectra Contain Electronic, Vibrational, and Rotational Information](#)

[13.7: The Franck-Condon Principle](#)

[13.8: Rotational Spectra of Polyatomic Molecules](#)

[13.9: Normal Modes in Polyatomic Molecules](#)

[13.10: Irreducible Representation of Point Groups](#)

[13.11: Time-Dependent Perturbation Theory](#)

[13.12: The Selection Rule for the Rigid Rotor](#)

[13.13: The Harmonic Oscillator Selection Rule](#)

[13.14: Group Theory Determines Infrared Activity](#)

[13.E: Molecular Spectroscopy \(Exercises\)](#)

13: Molecular Spectroscopy is shared under a [CC BY-NC-SA 4.0](#) license and was authored, remixed, and/or curated by LibreTexts.