

## CHAPTER OVERVIEW

### 3: Vibrational Spectroscopy

Infrared spectroscopy is the measurement of the interaction of infrared radiation with matter by absorption, emission, or reflection. It is used to study and identify chemical substances or functional groups in solid, liquid, or gaseous forms. It can be used to characterize new materials or identify and verify known and unknown samples. The method or technique of infrared spectroscopy is conducted with an instrument called an infrared spectrometer (or spectrophotometer) which produces an infrared spectrum.

Raman spectroscopy is a spectroscopic technique typically used to determine vibrational modes of molecules, although rotational and other low-frequency modes of systems may also be observed. Raman spectroscopy is commonly used in chemistry to provide a structural fingerprint by which molecules can be identified. Raman spectroscopy relies upon inelastic scattering of photons, known as Raman scattering. A source of monochromatic light, usually from a laser in the visible, near infrared, or near ultraviolet range is used, although X-rays can also be used. The laser light interacts with molecular vibrations, phonons or other excitations in the system, resulting in the energy of the laser photons being shifted up or down. The shift in energy gives information about the vibrational modes in the system. Infrared spectroscopy typically yields similar yet complementary information.

[3.1: Introduction to Vibrations](#)

[3.2: Polyatomic Molecules](#)

[3.3: Raman vs. IR Spectroscopies](#)

[3.4: Resonant Raman Spectroscopy](#)

[3.5: Classification of Normal Modes](#)

[3.6: IR and Raman Activity](#)

[3.7: Non-Fundamental Transations - Hot Bands, Combination Bands, and Fermi Resonances](#)

[3.8: Fourier Transform IR Spectroscopy](#)

[3.9: Spectra of Gases - Rovibronic Transitions](#)

---

This page titled [3: Vibrational Spectroscopy](#) is shared under a [CC BY-NC-SA 4.0](#) license and was authored, remixed, and/or curated by [Delmar Larsen](#).