

CHAPTER OVERVIEW

1: Basics of Spectroscopy

Spectroscopy is the study of the absorption and emission of electromagnetic radiation by matter. Spectroscopy is an important tool that can be used to find the molecular structures, composition, and vibration frequencies of a substance. It can also be used to find the concentrations of reactants as functions of time to find the reaction intermediates. The defining characteristic of spectroscopy is interaction of light (electromagnetic spectrum) and matter. Knowledge of both is required to fully interpret the measured data.

- To the **Physical Chemist**, spectroscopy is the natural consequence of the application of the time-dependent Schrödinger equation to a well defined quantum mechanical system, which by definition has well defined quantized energy levels. Detailed knowledge of the underlying quantum mechanical description of the interaction of applied radiation and a desired sample is the primary goal of this class (*Theory*).
- To the **Analytical Chemist**, spectroscopy is a technique (or series of techniques) capable of providing either quantitative or qualitative analysis of unknown samples with the aid of instruments either complex or simple. Detailed knowledge of the operation and application of spectroscopic instruments is the primary goal of this class (*Application*).
- To the **Inorganic Chemist**, spectroscopy is a technique (or series of techniques) that provides useful and constructive interpretation of, often newly synthesized, compounds generated in the laboratory. Detailed knowledge of interpreting spectroscopic signals is the primary goal of this class (*Interpretation*).

Spectroscopy is the study of the interaction of radiation (Component 1) with matter (Component 2).

[1.1: Electromagnetic Radiation \(Component 1\)](#)

[1.2: Matter \(Component 2\)](#)

[1.3: Different types of Spectroscopy](#)

[1.4: Absorbance and Concentration](#)

[1.5: Multicomponent Samples](#)

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