Visible Absorption

A spectrometer is a device that measures the intensity of light as a function of wavelength. The Ocean Optics spectrometer consists of a light source, a sample cell, a diffraction grating that spreads incoming light into different wavelengths and a detector.

\[ I_o = \text{Intensity of incident light on the sample} \quad I = \text{Intensity of light exiting the sample} \]

The fraction of light that reaches the detector is \( I/I_o \) which can be used to calculate how much light the sample absorbed. Absorbance, \( A = - \log \left( \frac{I}{I_o} \right) \). Absorbance has no units.

When using cuvet: Wipe fingerprints off of cuvet. Make sure there are no bubbles in cuvet. The cuvet has two sides that are optically clear and two that are frosted. Put the cuvet in the spectrophotometer so that light from the source passes through the clear sides.

The graph setup on the computer screen shows wavelength on the horizontal axis and absorbance on the vertical axis.

Solution does NOT absorb the wavelength associated with its color. Blue solution does not absorb blue light, absorbs red. Ect…
BEER’S Law:

\[ A = e \cdot C \]

Absorbance increases proportionally as the concentration increases. The slope depends on the wavelength and the molecule that is absorbing the light. The best wavelength to measure absorbance is the peak.

Example: \( e = 12.1 \text{ M}^{-1} \) for CuSO\(_4\) at 800nm when using Molarity.
So 0.0500 M CuSO\(_4\) solution has an absorbance of 0.605
0.0250 M CuSO\(_4\) solution has an absorbance of 0.302.