Light and Spectroscopy

Equipment

- Photometers, spectrometers, gratings
- Various light sources
- Light boxes and color filters

Objective

Physics Concepts

- Irradiance
- Spectroscopy

Experimental analysis

- Fit curves to data to determine mathematical relationships
- Recognizing the uncertainty in measurements

Conceptual (C-Level)

Given an ideal point source of light that radiates in all directions determine what shape you expect the irradiance as a function of radial distance to look like.

Graph the "ideal" spectrum (intensity as a function of λ and f) for the following:

- A blue object
- A red object
- A yellow object

Create a Venn diagram for color addition and another for color subtraction.

EXPLORATIONS:
Put on the diffraction glasses (also called "fireworks glasses") and observe different light sources.

Basic Lab (B-Level)

- Measure the irradiance as a function of distance.
  - What is a "Lux"?
  - Comment on the shape of your graph.
- Using the spectrometer, graph the spectra from three different spectral tubes [H, He, Ne, Hg].
  - Determine the expected spectra and compare with your results. NOTE: Consider referencing other sources for information on spectral lines.

  Danger High Voltage! The spectra tubes are powered by a high voltage source. Make sure the source is unplugged before changing tubes.

  Caution Fragile! The spectra tubes are fragile. Please handle the tubes by their ends. Please avoid getting oil (from your hands) on the tubes – especially the center thin region.

Advanced/Extended Lab Ideas (A-Level)

- Graph the spectra from other light sources.
  - Incandescent light bulb (try dimming it), candle, fluorescent light bulb…
- Graph absorption and/or transmission spectra for different solutions.
  - Chloroplasts
  - Concentration of creamer in water. Can you get a "red sunset"?
- What are you curious to investigate?