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The Spectrometer

The purpose of this lab is to learn about spectrometers by studying a simple one then using it to study the spectra of a light bulb, a fluorescent bulb and elemental gas tubes.

1. Introduction

A spectrometer consists of three basic elements:
1) a slit to form a narrow beam of light
2) a diffraction grating or prism to split the beam into its component colors
3) a scale to determine the wavelength of these "lines".

When you hold your spectrometer so that light from a light source passes through the slit, you should see the spectrum of the light source superimposed on top of the scale. By noting the scale readings that correspond to different lines in your spectrum, you can determine the corresponding wavelength and energy.

2. The construction of a spectrometer

We will use a simple one-piece spectrometer for this activity. Examine your spectrometer carefully, and identify the slit, the diffraction grating and the wavelength-energy scale. Draw a careful sketch showing these three parts of the spectrometer as well as where you look and where the light source being studied should be located.

3. Using your spectrometer to study the spectrum of a hot solid

The spectrum of a hot solid object:
For the incandescent bulb, each color of light actually corresponds to a range of wavelengths and energies instead of a single wavelength. Write down your description of the spectrum of the incandescent bulb:

Now, measure the wavelength and energy range that corresponds to each color of light in your spectrum. Note: in contrast to bright line spectra, each color of light in a continuous spectrum covers a broad range of wavelengths. Record your results in the following table:

Color	Energy in eV	Wavelength in nm

4. Using your spectrometer to study the spectra of hot gasses

Now, use your spectrometer to study the spectra of several hot gases: the gas in a fluorescent bulb and the elemental gas in at least three different gas tubes.

Describe the spectrum of the gas in the fluorescent bulb:

Now, measure the individual wavelengths of several of the brightest spectral lines that you see in the spectrum of the fluorescent bulb. Record your results in the following table:

Color	Energy in eV	Wavelength in nm

Describe the spectra of the elemental gas in the gas bulb **including what the gas is**:

Now, measure the individual wavelengths of several of the brightest spectral lines that you see in the spectrum. Record your results in the following table:

Color	Energy in eV	Wavelength in nm

Describe the spectra of another elemental gas in one of the gas bulbs **including what the gas is**:

Now, measure the individual wavelengths of several of the brightest spectral lines that you see in the spectrum. Record your results in the following table:

Color	Energy in eV	Wavelength in nm

Describe the spectra of another elemental gas in one of the gas bulbs **including what the gas is**:

Now, measure the individual wavelengths of several of the brightest spectral lines that you see in the spectrum. Record your results in the following table:

Color	Energy in eV	Wavelength in nm