

# SPECTROSCOPY

A **spectrometer** is used to determine the wavelength composition of light.

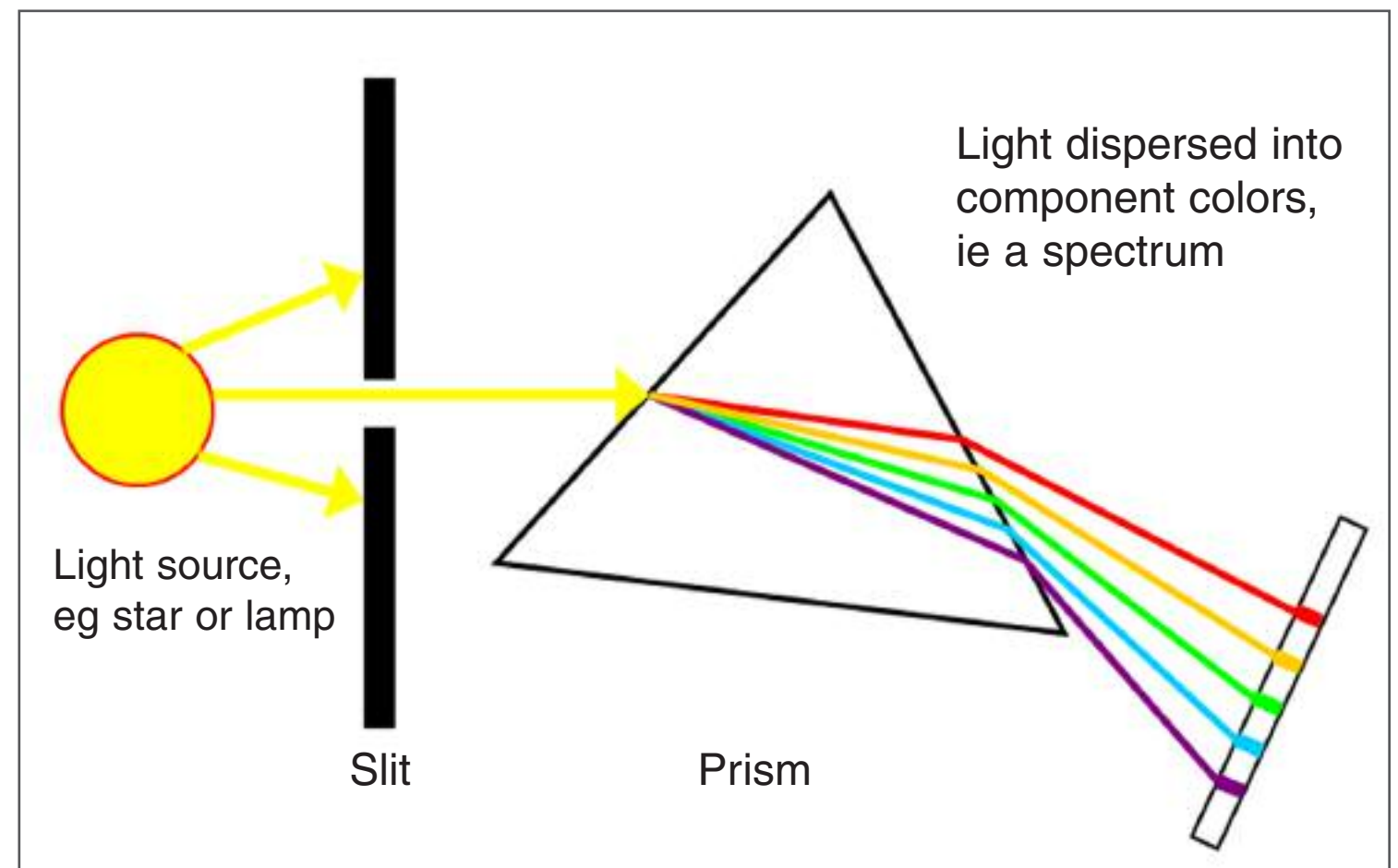
This particular model would have been used in the early 20th century.

Hot materials emit light: think of a Blacksmith's red hot iron, our sun, or a light bulb's filament. This light actually is composed of many different wavelengths ("spectrum"). Take a look at the 'Spectrum Analysis' poster, to see the range of wavelengths that make visible light.

In a spectrometer, these emitted light waves enter the front through a slit and then pass through a lens which gathers the light rays into a thin organized set of parallel rays. These rays then pass through a prism where refraction occurs, dispersing the rays (see diagram).

Since the refraction is stronger for shorter wavelengths, the red components are affected less than the blue components, leading to a spread-out of the spectrum.

After passing through the prism, these rays are projected onto a screen and appear as lines in different colors. By analyzing the layout of these emission line spectra, the material which emitted the light can be identified, since all materials emit a unique electromagnetic spectrum.



Dispersion of light through a prism



Prism inside the spectrometer

Try to identify the gases used in the light sources of the exhibit with the spectrometer!

- (1) Turn on the lamps, using the timer dial on the front of the display case.
- (2) Look through the eye piece of the spectrometer, and position it in front of one of the two lamps to either side of the light bulb.
- (3) Scan through the spectrum of lines using the dial to your right.
- (4) Compare the lines with the spectra displayed on the 'Spectrum Analysis' poster, and find the match!
- (5) Finally, compare these lines to the continuous emission spectrum of the central light bulb, caused by a white hot tungsten filament.