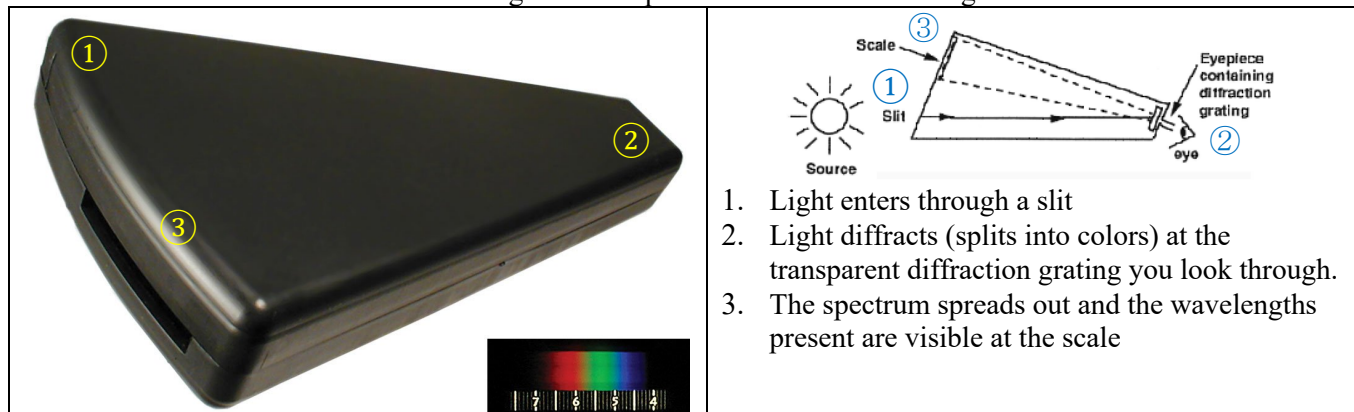


Gas Discharge Tubes, Spectroscopes & Emission Spectra

In the activity, *Electron Energy and Light*, Model 2 instructs you to use a spectroscope to observe the emission spectra of hydrogen and helium from gas discharge tubes. It was through one such experiment that Niels Bohr, in 1913, developed the first quantum energy model for the existence of electrons in atoms. In order to understand the activity, here are the details of this experiment.

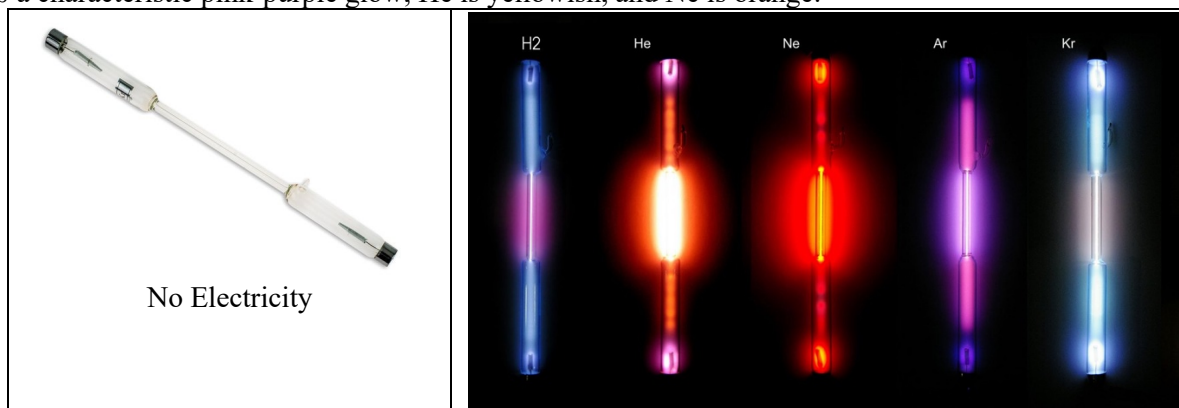
A. Spectroscopes

A spectroscope is a device that “analyzes” light by splitting it into its constituent wavelengths. A spectroscope like the ones used in class is shown below along with the spectrum seen from white light:



B. Gas Discharge Tubes

Gas discharge tubes (which are simplified versions of a neon light) have a very low pressure of a gas (or vapor of a liquid such as Hg) that glow with a unique color for each element when electricity is passed through the tube. H_2 emits a characteristic pink-purple glow, He is yellowish, and Ne is orange:



C. Emission Spectra

When a white-light source such as the sun or an incandescent light bulb is passed through the spectroscope, a *continuous spectrum* of colors like the rainbow (ROYGBIV) is seen, as in the example with the spectroscope. However, with the elemental gas discharge tubes, a *line spectrum* consisting of individual colors separated by regions of no light is seen. Below are the spectra for H_2 (top) and He (bottom):

