Spectra Lab

ASTR/PHYS 1060, The Universe, Sept. 12

Emission Line Spectra

Record down the spectrum that you see through your glasses in each of the three by copying the observed spectrum onto the plots below. Use dark lines to indicate the bright bars of light you see through the gratings.

Hydrogen:

Violet Blue Green Yellow Red

Neon:

Violet Blue Green Yellow Red

Mercury:

Violet Blue Green Yellow Red

These gases have their electrons excited by running an electric current through the tube. When these electrons change energies, they emit light at specific wavelengths. This creates *emission* lines in the observed spectrum. Please discuss these questions with your group:

1) Draw a wavelength scale on the plot for Hydrogen. Is the wavelength shortest to the left or right? The optical part of the spectrum extends from about 350 to 700 nm.

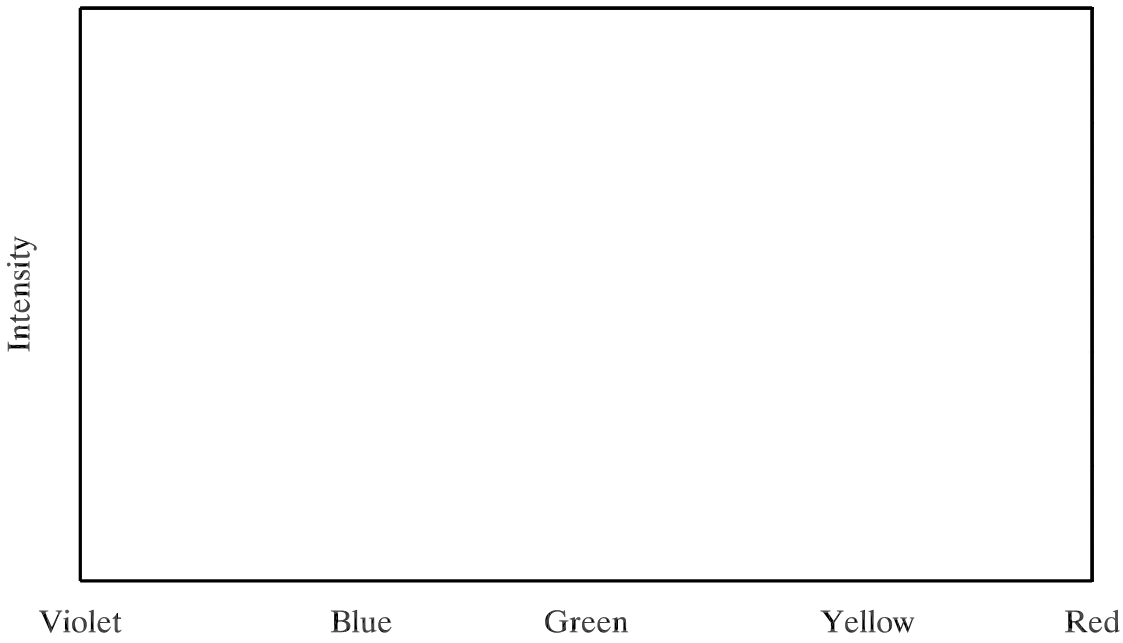
2) If you observed a cloud of excited gas out in the universe, how might you figure out what elements are in the gas cloud?

3) Why do different atoms have different emission line spectra?

4) Which atom had the most lines? Why do you think this is?

Blackbody (Thermal) Emission

On the plot below draw *two different lines*: one representing the spectrum of the bulb at very low temperature and the other at very high temperature. Label the two lines. The lines should indicate where the spectrum is brightest and faintest (your lines should be curves).



Please discuss these questions with your group:

1) As the temperature increases is there more or less total light?

2) As the temperature increases, what happens to the overall (average) color of the light?

3) As the temperature increases, does the intensity of some of the spectrum decrease?

Absorption Line Spectra

The spectrum of a star is like a white light that passes through a cool cloud of gas as it reaches us. The gas absorbs specific wavelengths of the blackbody spectrum. In class we have a special light bulb that is filled with a Neodymium Oxide gas that acts in a similar way to the sun's atmosphere. *Draw a third line on the spectrum above showing the spectrum of this lamp.*

4) What causes us to see absorption lines in this case, instead of emission lines?

5) If a gas cloud between us and a star had the same temperature as the star, what kind of spectrum would we see? Would the cloud produce emission lines, absorption lines, a mixture of both, or no lines? Why?