a) What colors do you see in the spectrum of light given off by hydrogen gas?

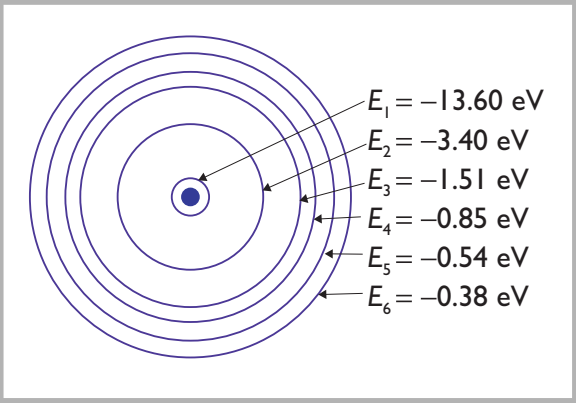
b) Make a colored diagram in your *Active Chemistry* log of what you see inside the spectroscope. Make sure to draw and label the colors in the proper order and spacing between them that you observe.

2. When you observed the spectrum of light given off by hydrogen gas, you probably saw three or four distinct lines, each having a different color. The color of light is a measure of its energy. The colors closer to red in the spectrum have the least energy and the colors closer to violet have the greatest energy.

   a) List the colors that you observed from lowest energy to highest energy.

3. In 1913, Niels Bohr, a Danish physicist, tried to explain the line spectrum of hydrogen. He hypothesized that the electron in the hydrogen atom is allowed to have only certain amounts of energy. These energy levels would be orbits in which the electron in hydrogen could circle the nucleus of hydrogen.

   The diagram shows a sketch of some of the possible orbits of the hydrogen electron with their corresponding energies.



   a) Think of the energy values as being on a number line. Which orbit has the greatest energy?

   b) Which orbit has the least energy?

4. Bohr believed that an electron in a higher energy level would give off light when it jumps to a lower energy level. The amount of energy in the light would be the difference in these energy levels. When an electron jumps from E_2 to E_1, the amount of energy in the light would be $E_2 - E_1 = (-3.4) - (-13.6) = +10.2$ units of energy. Note that E_2 has a larger energy than E_1 (that's because $-3.4 > -13.6$).

   Calculate the amount of energy in the light when an electron jumps from the following energy levels.

   a) E_3 to E_1 c) E_4 to E_2

   b) E_3 to E_2 d) E_5 to E_2

5. Picture the electron in orbit about the nucleus of the hydrogen atom as Bohr did. Allowing the electron to have only certain amounts of energy would mean that the electron could be allowed in orbits of only certain distances from the nucleus. As the electron "jumps" from one energy level to another, it behaves something like a ball falling down a flight of uneven stairs. It is allowed to rest only on one of the steps, nowhere in between.

   a) Every possible jump corresponds to light of a different energy. How many different energies of light can be emitted from hydrogen when the electron jumps down to E_1 from E_2, E_3, E_4, E_5, and E_6?

   b) How many different energies of light can be emitted from hydrogen when the electron jumps down to E_2 from E_3, E_4, E_5, and E_6?