Lab #11
Make-Up

Name: _____ Date: _____ Pd: _____

## Spectroscopy/Flame Test Virtual Lab

*Log into a computer and navigate to the following website: wait for instructions to move on!
http://www.trschools.com/staff/g/cgirtain/Weblabs/spectrolab.htm

Introduction:
Spectroscopy is the analysis of light spectra and the way in which light interacts with matter. When light is analyzed it is commonly separated into its component colors. The light source is directed on a slit and the "beam" of light is separated using a prism or grating.

The reason that the images are lines is that the light from the lamp is focused on a narrow slit. The illustration shows the separation of a light beam into its component colors (see website for illustration).

Each color has a characteristic wavelength. The wavelength is the distance between the beginning and end of a complete cycle of the light wave or the distance from one crest to the next. The crest is the tallest part of a wave and the trough is the lowest point of a wave. All colors of light travel at the same speed, 300,000 kilometers/ second. The animation shows how a prism separates photons of red light from photons of blue light. The photons of different colors fall in different positions on the color spectrum. The position is determined by the wavelength. Blue light has shorter wavelength in the range of 400 nanometers (nm). Red light has longer wavelength and is lower in energy than blue light. The wavelength of red light corresponds to the range of 700 to 600 nm (see website for animation).

Three types of spectra: see the website for the picture of each spectrum

1. Continuous Spectrum- produced by a glowing solid, liquid, or gas under certain conditions. This spectrum consists of a continuous set of emission lines side by side, with no gaps, and appearing as a smooth transition of all colors from red to violet.
2. Dark-Line Spectrum / Absorption Spectrum- produced when a cooler gas lies between the observer and an object emitting a continuous spectrum. The cooler gas absorbs specific wavelengths of radiation passing through it. This spectrum appears as a continuous spectrum of all colors with a number of gaps or dark lines throughout it.
3. Bright-Line Spectrum / Emission Spectrum- produced by a glowing gas which radiates energy at specific wavelengths characteristic of the element or elements composing the gas. This spectrum consists of a number of bright lines against a dark background. Different elements produce different spectra. These different spectra are called the atomic spectra and are unique enough to be thought of as a finger print of the element (see Part 2 below).

Procedure:
Part I: Flame test for known elements
1. Click on each element to view the flame test. Record the color in your data table.
2. Click on the two unknown elements to view the flame test. Record.
3. Identify the unknowns by comparing the color to the known element flame tests. Record.

Part II: Emission line spectra for selected elements
1. Click to view the emission tube for each element. Click on the emission spectrum for each element.
2. Sketch the emission spectrum with colored pencils on your lab sheet. Include the wavelength on your sketch (400-700 nm).

Data Collection: Part I: Flame Test

| Known elements | ------- |
|---|---|
| ELEMENT | FLAME COLOR |
| Barium | |
| Calcium | |
| Sodium | |
| Rubidium | |
| Potassium | |
| Lithium | |
| ------ | ------- |
| Unknown #1 | |
| Unknown #2 | |

Part II: Emission Spectrums

| ELEMENT | EMISSION SPECTRUM: Use colored pencils |
|---|---|
| Sodium | |
| Neon | |
| Mercury | |
| Helium | |

Analysis:

1. How do the emission spectra of each element compare in terms of colors and line positions? Are they identical? What is similar? What is different?

2. What is the element with the greatest number of clearly visible emission lines (Na, Ne, Hg, He)? Fewest?

3. Compare the flame test to the emission spectrum for sodium.

4. What is the longest wavelength in the continuous spectrum (in nanometers)? Shortest?

5. What color of light has the lowest amount of energy (frequency)? Highest?

- Answer these as best as you can.