Cereal Box Spectroscope **Name ________________**
Student Sheet

Create a lab report in your lab notebook. Begin with the title, hypothesis and materials. Write the procedure in your own words as we discuss the steps in class. Also, record your data, analysis and conclusion.

Materials:

1 cereal box	Black construction paper
Scissors	Tape
Ruler	Diffraction grating

Procedure:

1) Construct a spectroscope:
    i) Cut the top flaps off of the box.
    ii) Cut a 2cm x 2cm hole out of the bottom of the box about 2 cm in from the side.
    iii) Cut out 2- 10cm x 2cm strips of black construction paper and tape parallel so that there is a 2mm slit between them. Tape this slit on the top of the open cereal box so that it is directly in line with the hole on the bottom of the cereal box.
    iv) Cover the rest of the top of the open box with a piece of notebook paper.
    v) Next, create holders for the diffraction grating by cutting out 2- 12cm x 2cm strips of black construction paper and taping them on either side of the small hole on the bottom of the box. Be sure the strips are loose enough to slide the diffraction grating in and out.

2) View white light (classroom lights) with your spectroscope. Tell your partner where you see the different emission lines on the notebook paper. Your partner can then mark each line with his/her pencil. Be sure to make nice neat, accurate lines and to label the color each pencil line represents. You may use colored pencils for this step.
3) Now, you need to re-tape your notebook paper so you can view another color of light. Carefully un-tape the notebook paper and slide it so that a blank section of paper covers the top of the box. Re-tape the paper.
4) View the light from the gas tubes your teacher has displayed with your spectroscope. Tell your partner where you see the different emission lines on the notebook paper. Your partner can then mark each line with his/her pencil. Be sure to make nice neat, accurate lines and to label the color each pencil line represents. You may use colored pencils for this step.
5) Repeat step 3 so you can record data for the last color of light.
6) Repeat step 4.

Data Analysis

1) Each emission line you saw has a property called its wavelength (λ). The prominent violet line has a wavelength of 436 nm. The prominent green line has a wavelength of 546 nm. Find the difference between these two wavelengths in nm (546-436). Now, measure the difference between the violet emission line and the green emission line you drew in your white light spectrum. We can find out how many nanometers are represented by each millimeter on our notebook paper if we divide our two numbers (nm/mm). This is your conversion factor for finding the wavelengths of the other emission lines.

2) Measure the distance in millimeters from the violet line to all of the other emission lines. For each of your spectra.

3) Convert the wavelengths (λ) of the different colored emission lines from millimeters to nanometers by multiplying your mm distance by your conversion factor you calculated in step 1 and adding 436nm. (we must add 436nm because that is where we measured from)

4) Calculate the frequencies (v) of each of the emission lines. Use the wave equation $v=c/\lambda$, where $c=2.998 \times 10^{17}$nm/s (2.998×10^{8} m/s)

5) Calculate the energy (E) of a quantum of light for each of the frequencies (v) calculated in step 4 by using the equation $E = h \times v$, where $h = 6.626 \times 10^{-34}$ J·s.

Smile!☺ You're done calculating (for now). It is time to write your conclusion. Be sure to include a discussion of the accuracy of your hypothesis with respect to your data. Also, discuss your data analysis and any possible sources of error.