Pressure Volume Relationships
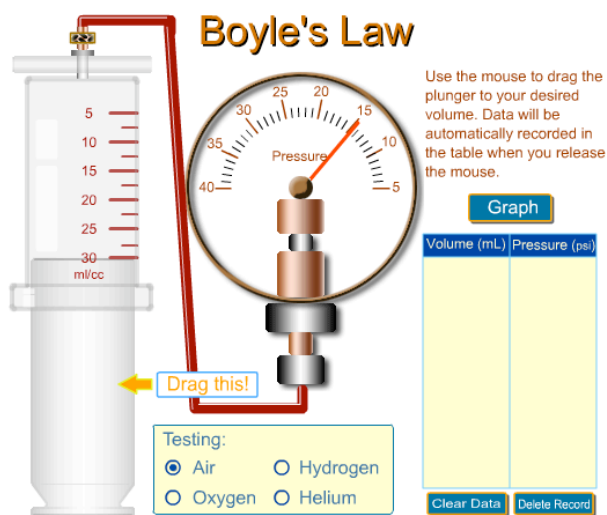
Name_____   Lab Section_____

Problem Statement: How are pressure and volume of a gas sample related?

I. Data Collection:

    A. Go to http://cheminfo.chem.ou.edu/~mra/home.html and open the Pressure/Volume Simulation. Your screen should look like the figure.

    The apparatus represents a syringe that can be filled with four different gases. The gas volume can be changed by click/dragging the piston to compress the gas.

B. Click the button to the left of the Air gas. Drag/click the piston of the syringe to compress the gas as much as possible. Release the mouse button and then click on the piston as it returns to its original position eight times. Record the data you collected in the table below. Convert the pressure units to atm.

Volume mL	Pressure psi	Pressure atm

II. Data Analysis and Interpretation

A. Plot the volume (mL) of the air sample vs. its pressure (atm) and determine the equation of the line. Record your results below. Include the graph in your report. (If you have a straight line you can use the equation for a straight line ($y = mx + b$). If the line is a curved line you can test to see if the plot is a power function ($y = x^2$) or a logarithmic function ($y = \log x$). This can be made easier if you are using a graphing or data analysis program like Excel™. Your instructor can show you how to do this.)

B. Write an algebraic equation showing the relationship between volume and pressure of the air sample. This relationship is known as Boyle's Law. If the volume of the sample of air you are studying was expanded to 50 mL, what would its pressure be?

C. Mental Modeling: At the level of atoms and molecules, what factors cause a change in the pressure as the volume is changed?

III. Data Collection:

A. Repeat the experiment in section I, using hydrogen instead of air. Record the data you collected in the table below. Convert the pressure units to atm.

Volume mL	Pressure psi	Pressure atm

B. Repeat the experiment in section I, using oxygen instead of air. Record the data you collected in the table below. Convert the pressure units to atm.

Volume mL	Pressure psi	Pressure atm

C. Repeat the experiment in section I, using helium instead of air. Record the data you collected in the table below. Convert the pressure units to atm.

Volume mL	Pressure psi	Pressure atm

IV. Data Analysis and Interpretation

A. Plot the volume (mL) of the gas samples of hydrogen, oxygen, and helium vs. their pressures (atm) on the same graph as you plotted for the air sample. How are the graphs and algebraic equations for these four gases related?

B. Mental Modeling: At the level of atoms and molecules, account for the relationship between these four gases?

V. Conclusions:

   A. How do the differences in molar mass effect the pressure volume relationship between the four gases?

   B. Write an algebraic equation that relates the pressure volume relationship for all four of these gases.