

Boyle's Law Lab

Pre-lab Questions

1. Express Boyle's Law in words.
2. Now write a mathematical equation to express Boyle's Law.
3. What about the gas remains the same, is constant, in Boyle's Law?

Procedure

1. Prepare the Gas Pressure Sensor and an air sample for data collection.
 - Plug the pressure sensor into Channel 1 of the CBL2.
 - Use the link cable to connect the CBL2 System to the TI Graphing Calculator. Firmly press in the cable ends.
 - Pick up the syringe and move the piston so that the leading edge of the inside black ring (see Figure 2 below) is on the 10.0 mL line.
 - Carefully screw the syringe onto the Gas Pressure Sensor.
2. Turn on the CBL2 unit and the calculator. Start the DATAMATE program and proceed to the MAIN MENU.
3. Set up the calculator and CBL2 for a pressure sensor and calibration (in atmospheres).
 - Select SET UP from the MAIN MENU. The CBL2 should recognize the Gas Pressure Sensor.
 - Select CH1 and then...
 - Select ATM from the PRESSURE UNITS menu.
4. Set up the calculator and CBL2 for data collection.
 - Select MODE from the SET UP Menu.
 - Select EVENT WITH ENTRY.
 - Select 1-OK to return to the MAIN MENU.
5. Collect the pressure versus volume data. It is best for one person to take care of the gas syringe and for another to operate the calculator. Pay attention to the on-screen instructions.
 - Select START
 - Move the piston to position the front edge of the inside black ring (see *Figure 1*) at the 5.0mL line on the syringe. Hold the piston firmly in this position until the pressure value displayed on the calculator screen stabilizes.
 - When the pressure reading has stabilized, press **ENTER** on the calculator. Type in the gas volume (in mL) on the calculator. Press **ENTER** to store this pressure-volume data pair.

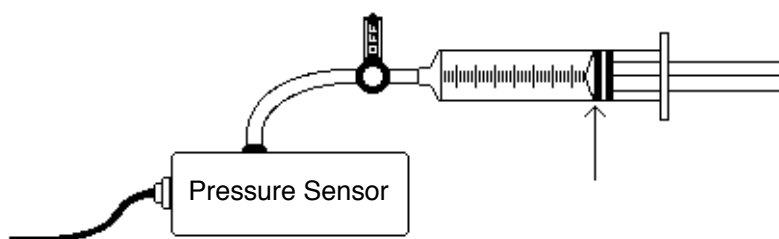


Figure 1

6. Repeat the Step 5 procedure for volumes of 7.5, 10.0, 12.5, 15.0, 17.5, and 20.0 mL.
7. Select **STO** when you have finished collecting data. As you move the cursor right or left, the volume (X) and pressure (Y) values of each data point are displayed below the graph. Record the pressure (round to the nearest 0.1 atm) and volume data pairs in your data table.

DATA AND CALCULATIONS

Volume (mL)	Pressure (atm)	Constant, k (P·V)
5.0		
7.5		
10.0		
12.5		
15.0		
17.5		
20.0		

Post-Lab Questions

1. Graph your data on a full page using a computer to plot your data.
2. How *constant* were the values for k you obtained in the table above? Good data may show some minor variation, but the values for k should be relatively constant.
3. From the shape of the curve in the plot of pressure versus volume, do you think the relationship between the pressure and volume of a confined gas is direct or inverse? Explain your answer.
4. Based on your data, what would you expect the pressure to be if the volume of the syringe was increased to 40.0 mL. Explain or show work to support your answer.
5. What would happen to (a) your pressure readings if the syringe had a small leak and (b) what would this do to the value of your constant, k?