

Lab Partners: _____

Introduction:

This brief but effective lab activity will reinforce the concepts involved in the relationships between pressure and volume. We have discussed this graphically as “PV Curves”. You will produce two such graphs and compare the results utilizing Vernier software and class computers.

Pressure/Volume Mini-Lab

$$\begin{aligned} 1 \text{ atmosphere} &= 760 \text{ mmHg} \\ &= 101.325 \text{ kPa} \\ &= 29.92 \text{ in of Hg} \\ &= 1.013 \text{ bar} \\ &= 14.696 \text{ psi} \end{aligned}$$

Procedure:

1. Plug in Go Link, Adaptor, and Pressure Sensor to the USB port of the computer.
2. Open Logger Pro.
3. Follow File → Open → Experiments → Physical Science w/ Computers → “32 Fun with Pressure”. Choose this file.
4. The Sensor Confirmation screen will appear. Check to see that the pressure sensor appears and the “USE” box is checked. Click OK at the bottom.
5. Under the Experiment menu, select Calibrate. Go link – Pressure sensor. Make sure the syringe is not attached and that the tube and sensor are open to the atmosphere. Click “Calibrate Now”. Under “Reading 1: enter 101.325 kPa. Click done on the lower right.
6. Now we’re ready to collect some data. Adjust the syringe to 20cc. Connect to the tube. Press green “Start Collection” button. After the initial 10 seconds, press and hold the plunger at 15cc for another 10 seconds. Continue this process for 10cc and 5 cc. After 40 seconds, release the plunger and let it return to the equalized state. After 60 seconds, record the volume in cc’s in the data table.
7. Complete the data table I. Click and drag to highlight the flat section of each volume one by one. This is determined by the 10-second intervals. Select the Analysis menu item and click on Statistics. This should impose a box on your graph. The average pressure will be recorded in data table. Repeat for all volumes.
8. Print two (2) graphs for each group. Deselect any statistics box remaining. . Circle above who has the graphs in the lab partner section.
9. Now, remove the syringe and adjust it to a volume of 5 ccs. Repeat 6, 7, and 8 but in reverse order. Pulling the plunger to 10cc, then 15cc, and 20cc. After 60 seconds again, please record the ending volume in cc’s in the table.
10. Sketch a simple P vs. V graph in the space next to each data table. Volumes in order as tested.

Data Table I**Ending volume 20cc – 5cc _____ cc**

Volume (cm³)	Pressure (kPa)
20	
15	
10	
5	

Data Table 2**Ending volume 5cc – 20cc _____ cc**

Volume (cm³)	Pressure (kPa)
5	
10	
15	
20	

Conclusion:

1. Compare or contrast the two graphs you produced. How do they compare to the two you sketched?
2. When the volume is increased, pressure _____. Conversely, when volume is decreased, pressure _____.
3. Assume there is no measurable heat loss or gain ($\Delta Q = \text{zero}$). What kind of PV curve are these examples of? (see notes)
4. In both cases, did the plunger return to its original position? Yes/NO (circle one) If not, were they the same distance away? _____ Explain.
5. What would two atmospheres feel like? How could you reproduce it or where could you experience this situation on our planet?
6. Research and define Boyle's Law.

