

Name_____ Period__ Date_____

Lab: Boyle's Law

One thing that you have already learned about gases is that as temperature increases, the average speed of the particles increases. They collide harder and more often and thus push away from each other, causing the volume to increase. Charles' Law states: with pressure held constant, temperature and volume vary directly. A graph of volume vs. temperature would be a straight line, passing through the origin. You have probably come to appreciate that pressure and volume do not vary directly; as the pressure on a gas sample increases, the volume decreases. Think about pushing in on the plunger of the closed-end syringe: the more pressure you apply, the smaller the volume gets. Boyle's Law states: with temperature held constant, pressure and volume vary inversely. In this lab, you will examine this inverse relationship by subjecting a sample of air to a variety of pressures. You will also use data you collect to determine the air pressure in the room.

Materials:

Soda bottle, 2-L
Tire Valve

Syringe, 12-mL
Pressure gauge

Air compressor

Procedure:

1. Obtain a pressurized soda bottle. Note that inside the bottle is a closed-end syringe with a trapped volume of air. Remove the cap from the tire valve extending from the bottle cap and put it in a safe location.
2. Use the ball on the back of the pressure gauge to push down slightly on the center of the valve stem until the piston in the syringe just barely starts to move. Observe how this change in pressure affected the volume of air in the syringe.
3. Use the pressure gauge to take a pressure reading of the bottle. To do this, press the gauge quickly and firmly against the valve stem (hard!), allowing the incremented bar to shoot out freely from the open end. If you accidentally block the bar, press it in and try it again. Also, do not press the gauge lightly against the stem (this causes a whistling sound). This will just let air out and will not give an accurate pressure reading. This measurement must be quick and deliberate. Record the pressure, measured to one decimal place, in the table below. *This first reading should be in the high 40's- if it is too high, take another reading (which should be a bit lower than the first) - if it is too low, ask your teacher to pressurize the bottle more.*
4. Now take a precise volume reading of the air inside the syringe. Make sure you are reading it correctly and estimating one decimal place. Record this volume in the table below, alongside the corresponding pressure value.

5. Again, use the ball on the back of the gauge to press down lightly on the center of the valve stem to let some more air out. This time hold it down long enough to make the volume of the air change by about 0.5 mL. Reset the pressure gauge by sliding the bar back inside, then repeat steps 3-4. *Pay attention to the how the values are changing. If you notice something irregular, try taking another pressure reading.*
6. Repeat Step 5 until you have at least 7 pairs of data that follow an obvious pattern. If you see points that don't seem correct, you may ask your teacher to partially re-pressurize your bottle to redo one of your collections.

Data:

	Gauge Pressure (psi)	Volume (mL)
	Both measured to one decimal place	
1		
2		
3		
4		
5		
6		
7		

