

LESSON
58
LAB

Feeling Under Pressure

Boyle's Law

Name _____

Date _____ Period _____

Purpose

To observe and quantify the relationship between gas pressure and gas volume.

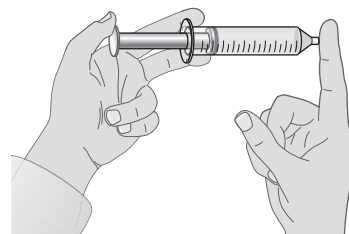
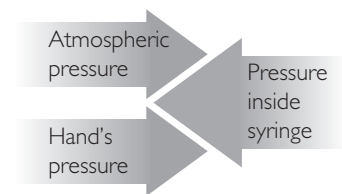
Part I: Observing Pressure

Materials

- 50 mL plastic syringe

Procedure

1. Start the plunger at 50 mL. Cover the tip of the syringe with your fingertip. Be sure to make a good seal.
2. Push the plunger until it reads 40 mL.
3. Continue to cover the tip with your finger. Apply more pressure until the inside volume reads 30 mL, then 20 mL, and so on.



Analysis

1. What did you experience when you pushed in the plunger from 40 mL to 30 mL, and then from 30 mL to 20 mL?
2. Are you able to push the plunger all the way in? Explain why or why not.
3. Explain why the number of air molecules in the syringe doesn't change but the volume does.


Part 2: Weight Versus Volume Data

Materials

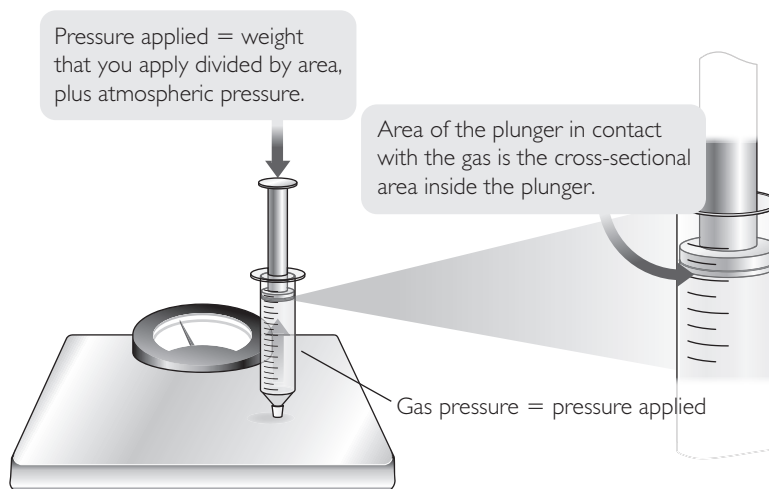
- 50 mL plastic syringe with cap screwed on tight
- bathroom scale

Procedure

Safety Instructions

 The cap on the tip of the syringe should always be pointed down, away from eyes. Wear safety glasses.

1. Start with the syringe at 50 mL. Make sure the cap is on tight.
2. Hold the syringe vertically with the tip on top of a bathroom scale.
3. Follow these steps:
 - One person should depress the plunger by a few milliliters.
 - A second person should read the exact volume.
 - A third person should read the number of pounds that is exerted on the bathroom scale.
 - Everyone should record the volume and weight data in a table like the one shown.
 - Repeat these steps for at least five different volumes. Depress the plunger a little more each time. Be sure to include a reading where you depress the plunger as far as you can.



Data

Trial	Volume (mL)	Weight, or force, you apply (lb)	Pressure you apply (lb/in ²)	Atmospheric pressure (lb/in ²)	Total pressure (lb/in ²)
1				14.7 lb/in ²	
2				14.7 lb/in ²	
3				14.7 lb/in ²	
4				14.7 lb/in ²	
5				14.7 lb/in ²	
6				14.7 lb/in ²	

Analysis

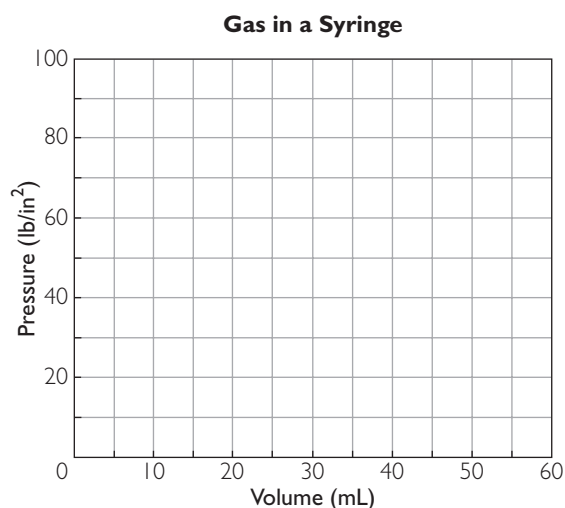
1. The number of pounds on the bathroom scale is related to the pressure inside the syringe. Explain why.

2. Estimate the cross-sectional area inside the syringe in square inches.

Cross-sectional area inside the syringe: _____.

Calculate the pressure you applied in pounds per square inch. Enter these values in the "pressure you apply" column.

3. The atmosphere is also applying a pressure on the gas in the syringe. This pressure is equal to 14.7 lb/in^2 . Add 14.7 lb/in^2 to the pressure you apply to obtain the total pressure on the gas. Enter these values in the last column.
4. Plot the total pressure in pounds per square inch versus volume on the graph and connect the points with a curve.
5. What happens to the gas pressure as the volume of the gas decreases?



6. **Making Sense** Using today's observations, explain how the pressure and volume of a gas change in relation to each other as each one increases or decreases.

7. **If You Finish Early** Create a graph of P versus $1/V$. What is the outcome? What does the graph tell you about the relationship between gas pressure and volume?