

GAS PRESSURE AND VOLUME RELATIONSHIPS

Name _____ Section _____

Log on to the Internet. Type the following address into the location-input line of your browser:

https://media.pearsoncmg.com/bc/bc_0media_chem/chem_sim/kmt/KMT.php

The simulation will open to an image of a volume of gas at a particular temperature and pressure in a container on a hotplate, which is quickly replaced with a new screen with an Overview page. You are welcome to read the Overview Page, and by clicking on the Learning Outcomes tab near the top of the display, you may read the Learning Outcomes Page. After reviewing these two pages click on the Experiment tab. When the screen changes the page will show two buttons: Run Demonstration button and Run Experiment button. You are welcome to click on the Run Demonstration button, but the instructions below are for the Run Experiment button. After clicking on the Run Experimental button the screen will look like Figure I.

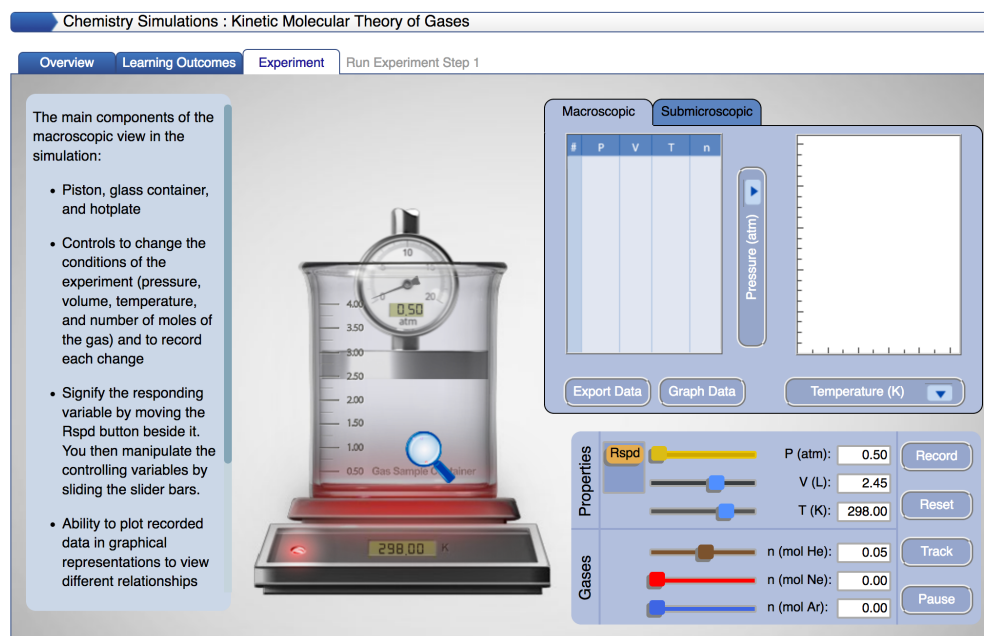


Figure I.

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

I. Data Collection

A. In the Experimental mode click on the submicroscopic table in the upper portion of the simulation screen. Observe the behavior of the particles and describe, in the space below, the activity you observe. Consider using some or all of the following terms in your description: particles, atoms, molecules, collisions, speed, energy, force.

B. In the lower right portion of the simulation screen, enable the tracking function and trace the path of a particle from one side of the screen to the other in the space below. Explain any changes in speed or direction that you observe.



C. Record the values for pressure, volume, and temperature on the digital read-outs in the lower right portion of the simulation window.

D. Observe fluctuating bars of the particle speeds graph. Relate what you see with the behavior of the particles in the submicroscopic view.

Click the Pause button and sketch and label the graph in the space below. Record the speed of the tracked particle and the average speed of all particles.

E. Resume the motion of the particles. Using the sliders for the variable Pressure and Volume, fix Pressure as a dependent (responding) variable by moving the button, if necessary. Change the volume of the container using the Volume slider bar and observe what happens to the pressure, as well as what happens in the submicroscopic view, of the system as the number of moles of gas and temperature of the gas are held constant.

i) Describe your observation about the relationship of pressure and volume. Also describe the behavior of the particles in the container as you change the Volume sliderbar.

ii) While changing the Volume sliderbar how is the average speed of the particles in the container affected? (Answer in a complete sentence.)

iii) While changing the Volume sliderbar does the temperature of the contents of the container change? (Answer in a complete sentence.)

iv) Provide an explanation, in terms of the particles and their behavior, that explains why the pressure changes as a result of changing the volume of the container.

F. Collect five additional observations of volume/pressure relationships and record all of your data in the following table.

Data Table

Pressure (atm)	Volume (L)
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____
_____	_____

II. Data Analysis:

What patterns are shown in these data? It might be helpful to graph the data. Try to come up with an algebraic equation that expresses the pattern you found.

III. Interpretation and Conclusions:

A. How are the pressure and volume of a gas sample related?

B. Mental Model - Draw a picture(s) that explains how the pressure and volume of a gas sample are related at the level of atoms and molecules, and that illustrates the observations you made in the experiment. In words, explain how your picture(s) illustrate(s) this relationship.

C. Using your data, predict the pressure of a gas sample at a volume of 100 liters. Show how you made your prediction.