

Name:

Gases: Properties and Laws

Learning Objectives:

TSW define four important properties of gases- pressure, temperature, volume, and amount of a substance.
TSW graphically analyze the relationships between the properties and define their proportional relationship.
TSW apply gas properties and laws to real life.

Assignment:

Tire pressures, sinus headaches, cabin pressure in airplanes, even hairspray bottles- all find their explanation in the properties and laws of gas molecules. Four important properties of gases- pressure, temperature, volume, and amount (in moles)- are used to define the behaviors of gas molecules. Using the **Gas Properties** simulation from the pHet program, you and your partner will first define each property and then compare the properties to one another.

1. Open the **Gas Properties** simulation on the University of Colorado's pHet website:
<http://phet.colorado.edu/en/simulation/gas-properties>
2. "Pump the Handle" to place gas molecules into the box.
3. Play around with the simulation and list the four things in the simulation you can change below.

4. Using the "Constant Parameter" section to the right of the simulation. Hold first volume constant. Adjust the amount of gas molecules and the temperature and observe what is happening to the pressure of the system.
5. Repeat the process above with "temperature" held constant.
6. How does the amount of gas molecules present affect the three properties above (pressure, volume, temperature)?

7. Using your observations and the simulation, predict the relationship between temperature and pressure (direct proportion or an indirect proportion).

8. Hold volume constant in the "constant parameter" section to the right.
9. Add heat to the system and record your new temperature and pressure in the chart below.

10. Repeat step 9 three more times recording your new temperature and pressure each time.

Pressure (atm)	Temperature (K)

11. Using your observations and the simulation, predict the relationship between volume and pressure (direct proportion or an indirect proportion).

12. Now hold temperature constant.

13. Adjust the volume by moving the man. Calculate your new volume by clicking on the “Measuring Tools” and checking the “Ruler” and “Layering tool” box. **(Assume the width of the box is 10 nm).**

14. Record your new volume and pressure in the chart below.

15. Repeat steps 13-14 three more times.

Pressure (atm)	Volume (nm ³)

16. Using your observations and the simulation, predict the relationship between temperature and volume (direct proportion or an indirect proportion).

17. Now hold pressure constant.

18. Choose to either add or remove heat. Calculate the new volume and record the new temperature and volume in the chart below.

19. Repeat step 18 three more times.

Volume (nm³)	Temperature (K)

20. Open the Excel on your computer and create three different graphs using the three data tables above. Copy the three graphs to the end of this document.

21. Do your graphs support your three predictions made in steps 7, 11, and 16? If not why?

22. Using your knowledge of everyday life, the book, and the internet, provide the real-world situations that describe the relationships you discovered for:

a.) pressure and temperature

b.) volume and pressure

c.) temperature and volume