

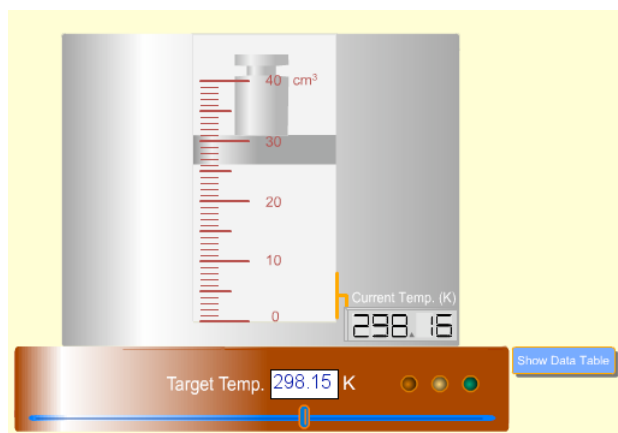
Volume Temperature Relationships

Name _____ Lab Section _____

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

I. Data Collection:

- A. Go to <http://cheminfo.chem.ou.edu/~mra/home.html> and open the Volume/Temperature Simulation. Your screen should look like the figure.



The apparatus represents a container that is filled with a gas. The gas is confined in the container by a movable weight. The volume of the gas can change with temperature so that the pressure on the gas exerted by the weight remains constant. The temperature can be changed by using the slide bar under the target temperature box. You can expose a table that shows the temperature and volume data you collect by clicking on the ‘Show Data Table’ box.

B. Open the “Show Data Table” window. Using the slider bar, increase the temperature of the gas container. Describe what you observe happening.

C. When the temperature in the container reaches the target temperature record the volume and temperature data in the table below. Collect 5 more data points for temperatures between 450 and 75 K. Convert the temperature to °C.

Volume mL	Temperature K	Temperature °C

II. Data Analysis and Interpretation

A. Plot the temperature (°C) of the air sample vs. its volume (mL) and determine the equation of the line. Record your results below. Include the graph in your report. (If you have a straight line you can use the equation for a straight line ($y = mx + b$). If the line is a curved line you can test to see if the plot is a power function ($y = x^2$) or a logarithmic function ($y = \log x$). This can be made easier if you are using a graphing or data analysis program like Excel™. Your instructor can show you how to do this.)

B. Write an algebraic equation showing the relationship between temperature and volume of the air sample ($V=?$). This relationship is known as Charles' Law. If the volume of the gas sample you are studying were lowered to zero mL, what would its temperature be, in both °C and K?

C. What could be done to lower the temperature below that in section II.B.?

D. Mental Modeling: At the level of atoms and molecules, what factors cause a change in the volume as the temperature is changed? What happens to these atoms/molecules when the temperature is lowered to the temperature that you calculated in II.B.?