Investigate: Volume and Temperature

Purpose: In this activity, you will be looking at the relationship between *VOLUME* and *TEMPERATURE* of a gas.

Procedure:

1. Add between 50 and 100 heavy gas particles to your container.

2. In order to examine the relationship between only volume and temperature, we need to make sure that we keep the pressure of the box constant. Click the button at the top right set pressure as the constant parameter.

As soon as you set the pressure to constant, what happens to the little man next to the box? _____

_____

3. Click on the "Measurement Tools" button on the right side. Click on the Ruler. You can click and drag this ruler anywhere on the screen. The ruler measures in nanometers (nm) but we will pretend that this is a measurement of liters for the sake of our simulation. Measure the initial size of the box using the ruler and record your measurement with a unit of L instead of nm.

4. Adjust the temperature of the box by adding or removing heat. Make sure that the pressure of the box does not change! At each new temperature, record both the temperature and volume measurements. Record 5 total measurements.

5. After you have collected all of your data, complete the calculations and post lab questions.

Results:

Trials	Temperature (T)	Volume (V)	Calculate $k_1 = (VxT)$	Calculate $k_2 = \frac{V}{T}$
Trial 1				
2				
3				
4				
5				

** Graph your results in your lab journal as well. MAKE SURE THAT YOUR GRAPH USES AN ACCURATE SCALE! If you don't have a graph paper notebook, come get a piece of graph paper from me to glue into your lab book.

Post Lab Questions:

1. Using your data and graph, **describe** the relationship between temperature and volume.

2. Use Kinetic Molecular Theory to **explain** WHY this is the relationship between temperature and volume.

3. As the temperature gets colder and approaches 0 Kelvin, what happens to the volume of the gas?

4. Which k value remains consistent in the data table? k_1 or k_2

Note: the other k-value is worthless and proves nothing.

5. Looking at the labels of the data table columns, what does the important "k" value equal?

6. Let's call the Trial 1 set of data points V_1 and T_1 and the Trial 2 set of data points V_2 and T_2. Since all trials have roughly the same chosen k-value, set the k-values to equal each other. Write an appropriate equation using the variables V_1, T_1, V_2, and T_2.

This is Charles' Law between Volume and Temperature of a Gas. Learn it. Know it. Use it.

7. Use the equation derived in question #6 to answer the following question: A volume of gas occupying a space of 2.39 L at STP is raised to a temperature of 45.1 °C while pressure is kept constant. What is the new volume of the gas?