Chemistry – Gas Laws Name \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

 Period \_\_\_\_\_\_\_\_\_ Date \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Gay-Lussac’s Law Computer Activity

Follow instructions from your teacher to access and open the *Gas Properties Simulation*. Or you can go to <http://phet.colorado.edu/simulations/> and find the simulation link in the “Chemistry” simulations.

In this activity, you will be looking at the pressure and temperature, so you do not need the ruler tool.

First, you need to add a gas to your container. Click on the handle of the pump, and add ONE PUMPFUL of gas to your container. Locate the “Gas in Chamber” data on the right.

How many gas particles did you add to your container? \_\_\_\_\_\_\_\_\_\_\_\_

What type of gas did you add? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Describe the motion of the particles: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Change the gas to 100 molecules of the HEAVY species by manually setting this in the right box.

Gay-Lussac’s Law looks at the relationship between temperature and pressure when there is a constant. You must set your container to constant volume. Click on the Volume button in the ”Constant Perameters” on the upper right corner. This should lock your volume at a constant value.

As soon as you select constant volume, what happens to the box? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

You are going to adjust the temperature of the container by adding or removing heat using the *Heat Control* under the container. The temperature is found above the container.

What units is temperature in the container? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Using your book or your notes, determine the relationship between Kelvin and Celsius.

 \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

The pressure gauge is found on right side of the container. What units is the pressure measured in? \_\_\_\_\_\_\_\_

Increase the temperature (add heat to your container. How does this affect the motion of the particles in your container? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

What happens to the number of collisions between the molecules and the container wall? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

How does this change affect the pressure of the container? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Fill in the following chart by selecting various temperatures. (For example 150 K, 300 K, 600 K, etc.) . Record the pressure on the pressure gauge. Include units.

Calculate the values as indicated in the other columns.

|  |  |  |
| --- | --- | --- |
| Trials | Temperature (T) | Pressure (P) |
| Trial 1 | 300 K |  |
| 2 |  |  |
| 3 |  |  |
| 4 |  |  |
| 5 |  |  |
| 6 |  |  |

Which variable did you control (independent)? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Which variable is the dependent variable? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Graph Pressure vs. Temperature in the following graph. Use proper scaling. Label the graph appropriately. Graph the line of best fit.

|  |  |  |  |  |  |  |  |  |  |  |  |  |
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Looking at your data and graph, describe the relationship between temperature and pressure.

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As the temperature gets colder and approaches 0 Kelvin, what happens to the motion of the particles?

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What happens to the pressure of the container? \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

**This is Gay-Lussac’s Law: P1T2 = P2T1**

We can use this formula (**P1T2 = P2T1**) to predict the pressure (P2) or temperature (T2) of any gas. Use this formula to complete the following calculations. When doing these calculations, it is necessary for the pressure to have the same units. Show your work.

1. If a gas has a pressure of 1.69 atm at a temperature of 300 K, what will the pressure change to if the container is cooled to 100 K?
2. If a gas has a pressure of 715 mm Hg at the temperature of 500 K, what will the pressure change to if the container is heated to 900 K? What is this pressure in atm?
3. On the side of aerosol cans, there is warning against heating the container. If the gas inside the container is at a pressure of 5.9 atm at room temperature (22° C), what will the pressure of the can be if the can is heated to 100° C? *Remember to convert to Kelvin.*
4. If a container of gas has a temperature of 290 K and a pressure of 1.85 atm, to what temperature would you have to heat the container to achieve a pressure of 4.75 atm?