Gas Laws Poster

# Task: Make a poster about gas laws

Using your knowledge from the gas laws simulation activity on the laptops and the demos that we will do, create a poster (with one other person or independently) that summarizes the gas laws we have learned about.

Your poster must include:

* Pressure vs temperature relationship
  + Graph of this general trend
  + Real life example explained or a captioned picture to explain relationship
  + Corresponding equation
* Pressure vs volume relationship
  + Graph of this general trend
  + Real life example explained or a captioned picture to explain relationship
  + Corresponding equation
* Volume vs temperature relationship
  + Graph of this general trend
  + Real life example explained or a captioned picture to explain relationship
  + Corresponding equation
* Compare and contrast ideal vs real gases (in terms of pressure, volume, and temperature)
* List components of Kinetic Molecular Theory
* Combined Gas Law Equation (label the variables P, V, and T)
  + Trick for remembering gas law relationships

# Information you will need for your poster…

# Ideal Gases

Ideal gas, or perfect gas, is the theoretical substance that helps establish the relationship of four gas variables, [p](http://chemwiki.ucdavis.edu/Physical_Chemistry/Physical_Properties_of_Matter/Phases_of_Matter/Gases/Gas_Pressure)ressure (P), volume (V), the amount of gas (n), and temperature (T). It has characteristics described as follow:

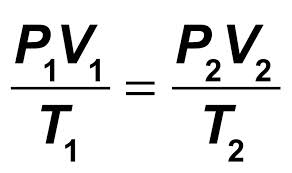
1. The particles in the gas are extremely small, so the gas does not occupy any spaces (no volume).
2. The ideal gas has constant, random and straight-line motion.
3. No forces between the particles of the gas. Particles only collide elastically with each other and with the walls of container

# Real Gases

Real gas, in contrast, has real volume and the collision of the particles is not elastic, because there are attractive forces between particles. As a result, the volume of real gas is much larger than of the ideal gas, and the pressure of real gas is lower than of ideal gas. All real gases tend to have ideal gas behavior at **low pressure and relatively high temperature**.

# Kinetic Molecular Theory

# Combined Gas Law

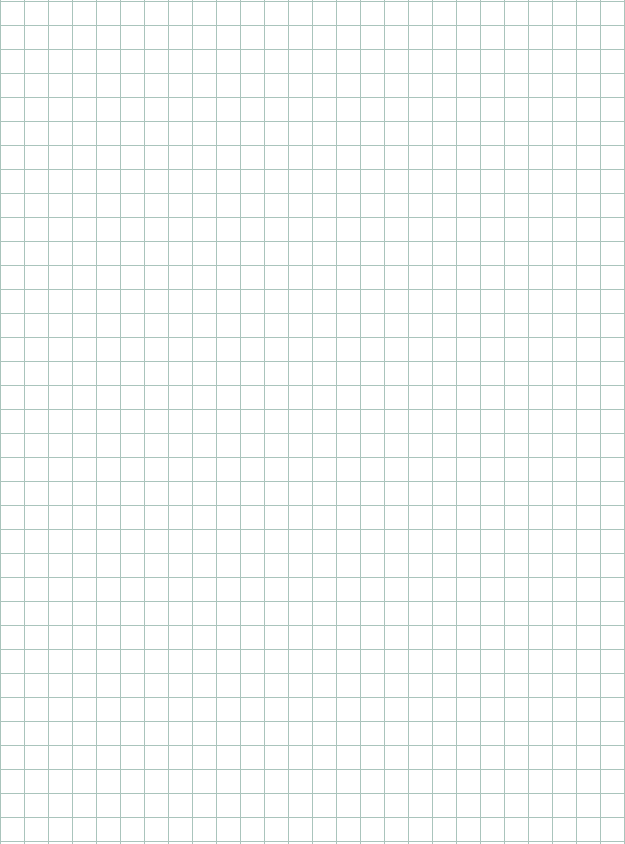
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Combined Gas Law

**CLASS GOALS**: Gather and analyze data about the relationships in gases between:

* Pressure and volume
* Temperature and volume
* Pressure and temperature

**RELATIONSHIP 1: PRESSURE AND VOLUME**

1. Make a prediction: As the pressure of a gas decreases, I expect volume to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. Observe what happens in the simulation with temperature constant.
3. Conclusions: Write a statement that describes the relationship between pressure and volume for gases. Draw a line that represents that relationship on the graph of pressure versus volume.

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Volume

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Pressure

**RELATIONSHIP 2: TEMPERATURE AND VOLUME**

1. Make a prediction: As temperature decreases, I expect volume to \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.
2. You will use a balloon to help visualize this relationship. Are balloons filled with a solid, liquid, or gas?

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

1. Use a controlled experiment to test how temperature affects balloon size. Partially blow up a balloon and measure its circumference (at its widest point) using string and a ruler (cm). This is your control.

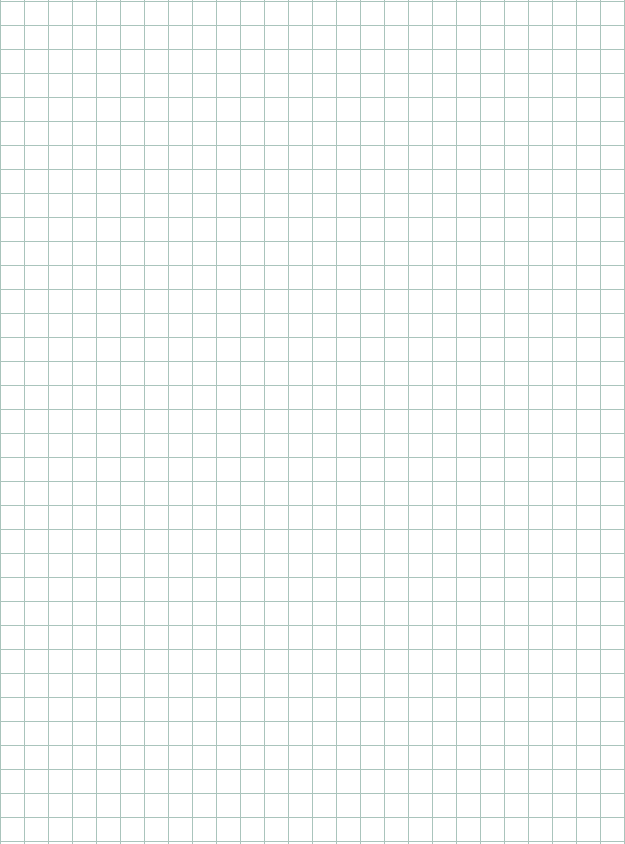
Control circumference (room temperature): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm

1. Carefully place the balloon on top of the boiling water (in the steam). **You SHOULD NOT try to submerge the balloon in the water!!** Try to measure the circumference after a minute or so of exposure to heat.

Hot circumference (high temperature): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm

1. Carefully transport the balloon to an ice bath. Hold the balloon in the ice water. Wait a few minutes and measure the circumference once more.

Cold circumference (low temperature): \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ cm

1. Conclusions: Write a statement that describes the relationship between temperature and volume for gases. Draw a line that represents that relationship on the graph of temperature versus volume.

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Volume

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Temperature

**APPLICATION**: What about the relationship between pressure and temperature?

In terms of pressure, explain what is happening to the particles in popcorn kernels when heat is added.

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**PREDICT**: In terms of pressure and temperature, what do you believe will happen if I…

1. heat up a near-empty can of Coke (with only a small amount of water inside) and then
2. quickly cool it in ice water?

I predict that while heating, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

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I predict that after quickly cooling, \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

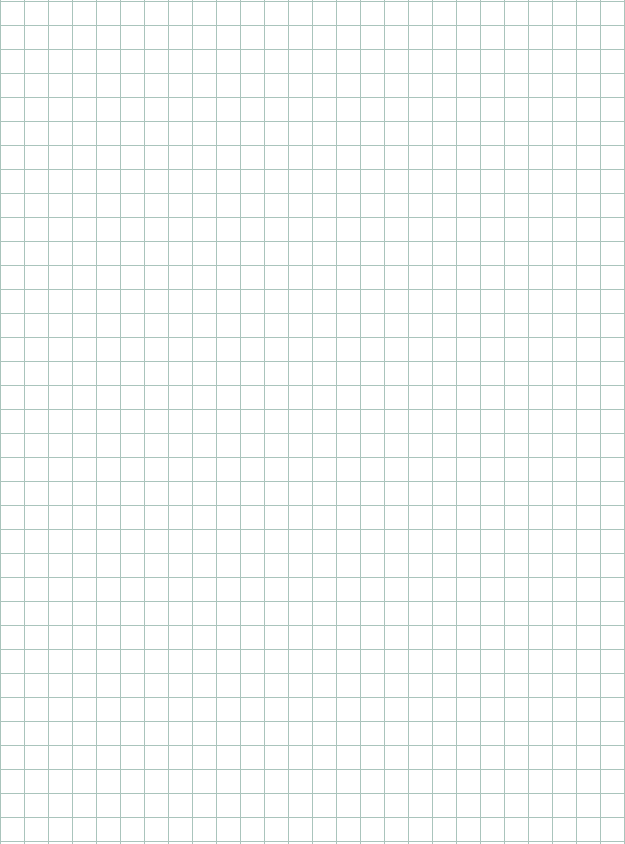
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**OBSERVE**: What did you see happen?

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**EXPLAIN**



When temperature increased, the pressure inside the can

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

When temperature decreased, the pressure inside the can

\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.

Pressure

Temperature

|  |  |
| --- | --- |
| **Variables** | **Relationship** |
| Pressure and temperature | When pressure decreases, temperature \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_.  —decrease pressure 🡪 |

Make sure Ms. Eng shows you the shortcut to remembering these relationships: PTV using hole-punched paper!