

## Chapter 3 Lesson 3: The Behavior of Gases

\*When studying Gases, you need to think of it in terms of Volume, Temperature and Pressure.

1. **Volume:** the amount of space that matter fills.
  - a. Measured in different units.
    - $\text{cm}^3$
    - mL
    - L
  - b. The volume of a gas is the volume of its container.
2. **Temperature:** the measure of the average energy of motion of the particles of matter.
  - a. All atoms and molecules are constantly moving.
  - b. How much the atoms and molecules are moving depends upon the state of matter and how much thermal energy it has.
  - c. The faster the particles are moving, the greater their energy and the higher the temperature.
3. **Pressure:** force of the outward push divided by the area of the walls of the container.
  - a. Gas particles are in constant motion, therefore, they collide with one another and with the walls of their container.
  - b. Gas pressure is measured in units called pascals (Pa) or kilopascals (**kPa**).
    - $1 \text{ kPa} = 1,000 \text{ Pa}$
  - c. Higher pressure is due to the greater number of gas particles per unit volume in the object than the surrounding air outside of the object.
    - **Example:** a fully inflated basketball will have higher pressure inside the ball than the outside.
  - d. If there's a hole in an object filled with gas (like a balloon), the pressure inside the ball is greater, therefore the gas particles would collide more inside and escape through the hole than the gas particles outside would enter.
    - This would happen until the pressure inside drops till it is equal to the pressure outside.
4. **Charles's Law:** When the temperature of a gas is increased at constant pressure, its volume increases. When the temperature of a gas is decreased at constant pressure, its volume decreases.
  - a. Focuses on the relationship between **Temperature & Volume**

- b. **Graphing Charles's Law** – It would show a directly proportional relationship between temperature (x axis) measured in **kelvins (K)** and volume (y axis) measured in mL.
  
5. **Boyle's Law:** When the pressure of a gas at constant temperature is increased, the volume of the gas decreases. When the pressure is decreased, the volume increases.
  - a. Relationship between **Pressure** and **Volume**
  - b. Graphing Boyle's Law – Inversely Proportional relationship between Volume (x axis) in mL and Pressure (y axis) measured in kPa.
    - As you increase the volume of the gas, the pressure decreases because it has more space to move around.
    - The graph would show a downward curved slope with decreasing steepness as volume increases.