

## Short Communication on Gas Laws

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### SHORT COMMUNICATION

#### Kinetic Molecular Theory of Gases

States that gas particles are in constant motion and it shows a perfectly elastic collision. This can also explain both of -Boyle's and Charles Laws. Also, the kinetic molecular theory of gases is a model that helps scientist understand the physical properties of gases at a molecular level. Gases consist of particles that are in constant random motion. With the kinetic energy the particles are always moving and they do collide with each other. While most of the gas is occupied by nothing but empty space, gas has low density. Since the kinetic particles are always moving most scientists want to calculate the speed that they are going to they came up with a formula.

$$E_k = \frac{1}{2} mu^2$$

Where, m is the mass and u is the speed.

#### Ideal Gas Law

Defined as one in which all collisions between atoms or molecules are perfectly elastic and in which there are no intermolecular attractive forces. An ideal gas law is characterized by three major identities which are pressure, volume, and absolute temperature. Just like with kinetic molecular theory of gas there is a formula that goes with ideal gas law.

- P = pressure
- V = volume
- T = absolute temperature
- n = number of moles
- R = universal gas constant = 8.3145 J/mol K
- N = number of molecules
- k = Boltzmann constant =  $1.38066 \times 10^{-23} \text{ J/K} = 8.617385 \times 10^{-5} \text{ eV/K}$

Ideal could be viewed as arising from the kinetic pressure of the gas particles that collide with each other and the walls of the container according to Newton's Laws.

#### Real Gas vs. Ideal Gas

The main difference between real and ideal gas is that ideal gas is theoretical, while really isn't. Real gas actually has a small volume, an ideal gas has no real volume. An ideal gas is said to have a particle to particle with no mass. Real gas has small attractive forces while ideal has no attractive forces, and their collision is elastic. The pressure of a real gas is much weaker than ideal gas because of the lack of attractive forces that are held back when colliding. There's also a difference in the formula between real gas and ideal gas.

$$PV = nRT$$

#### Boyle's Law

Boyle's Law which is also called Mariotte's Law is a relation concerning the compression and expansion of a gas at a constant temperature. This Law is also represented from the Kinetic Molecular Theory which assumes a perfect ideal gas [1]. This law formulated by the physicist Robert Boyle in 1662, states that the pressure of a given quantity of gas varies inversely with its volume at a constant temperature, in equation form,  $PV = k$ , a constant. An easier way of saying it is this is a law stating that the pressure of a given mass of an ideal gas is inversely proportional to its volume at a constant temperature.

#### Charles Law

The Charles Law is a law that's the statement that the volume occupied by a fixed amount of gas is directly proportional to its absolute temperature if the pressure remains constant. Just like Boyle's Law, Charles Law comes from the Kinetic Molecular Theory, which is under an assumption of the ideal gas. Its measurements show that at constant pressure the thermal expansion of real gases, at sufficiently low pressure and high temperature, conforms closely to Charles's law. Charles Law was first suggested by the French physicist, J.-A.-C. Charles, about 1787 and was later placed by the chemist Joseph-Louis Gay-Lussac. The formula for Charles Law.

$$V_1/T_1 = V_2/T_2$$

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## Dalton's Law of Partial Pressure

Dalton's Law is used to determine the individual pressures of gases in a mixture. The Dalton's Law states that the total pressure of a mixture of gases is equal to the sum of the partial pressure of the competent gas.

This Law was stated by the English chemist John Dalton in 1801. If there is still a problem with understanding, the law states that in a mixture of non-reacting gases, the total pressure exerted is equal to the sum of the partial pressures of the individual gases.

## Graham's Law of Effusion

Graham's Law of Effusion is the process that occurs when a gas is permitted to escape its container through a small opening.

While there's effusion there's also diffusion which is the process of slowly mixing two gases together. Graham's Law states that gases move from a higher to lower concentration at the same conditions of temperature.

## REFERENCES

1. Miller FA. Some stamps related to the kinetic molecular theory of gases. *J Chem Educ.* 1986;63:85.