

7.4 Gas Laws

There are three gas laws:

1. Boyle's Law
2. Charle's Law
3. Pressure Law

Boyle's Law

Boyle's Law states that

The volume of a fixed mass of a gas is inversely proportional to the pressure at a constant temperature.

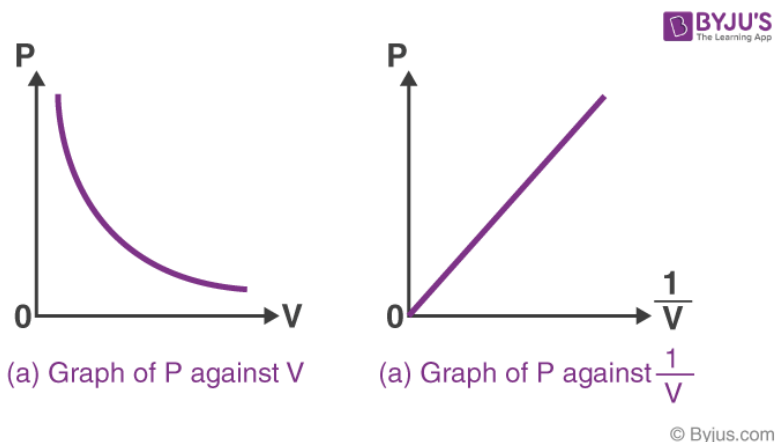
$$P \propto 1/V$$

$$P_1 V_1 = P_2 V_2$$

Kinetic Theory

- When molecules are placed in a container and since they always move in a random motion, they collide with the wall of the container and also between themselves and every time they exert force, pressure is generated.
- When the volume of the container is reduced, the rate at which the molecules hit the walls of the container increases and so the pressure increases. When the volume of the container is increased, the rate at which the molecules hit the walls of the container reduces and so the pressure decreases.

Variation of Pressure and Volume



Charle's Law

Charle's Law states that

The volume of a fixed mass of a gas at constant pressure is directly proportional to its absolute temperature.

$$\frac{V_1}{T_1} = \frac{V_2}{T_2}$$

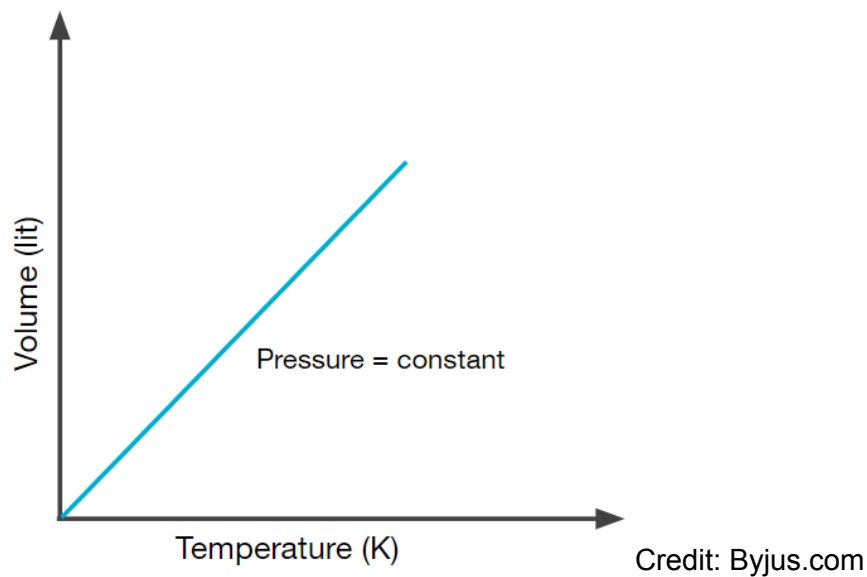
$$T \propto V$$

Note: Temperature must be expressed in Kelvin (K)

Kinetic Theory

- When temperature increases, the kinetic energy of the molecules move far from one another occupying a bigger space hence increasing the volume.

Variation of Pressure and Volume



Pressure Law

Pressure Law states that

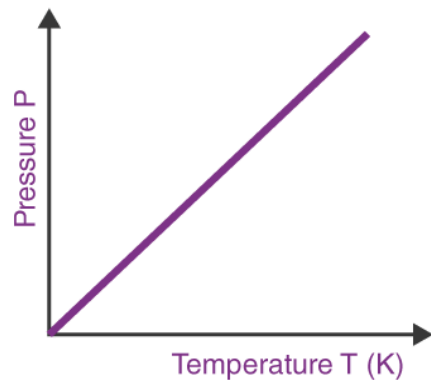
The pressure of a fixed mass of a gas at constant volume is directly proportional to its absolute temperature.

$$P \propto T$$

$$\frac{P_1}{T_1} = \frac{P_2}{T_2}$$

Kinetic theory:

- As the temperature increases, the kinetic energy of the gas molecules increases, causing them to move rapidly causing them to collide with the walls of the container exerting force on the walls of the container causing an increase in pressure.



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