

EFFECT OF TEMPERATURE AND PRESSURE ON THE VOLUME OF A GAS

Effect of pressure on a fixed volume of a gas: [at constant temperature] **BOYLE's Law**

- Since the temperature is held constant, the kinetic energy of the particles is also held constant.
- Decreasing the volume of a gas will increase its pressure. When molecules collide, they create pressure. When the molecules are closer together, they collide more frequently. Hence less volume more collisions more pressure.
- If the volume of given mass of a gas is reduced to half of its original volume. The same number of particles will have half space to move.
- As a result, the number of molecules striking the unit area of the walls of the container at given time will get doubled of the pressure will also get doubled.
- Increasing the volume of a gas will decrease its pressure. When molecules collide, they create pressure. When the molecules are further apart than before, they collide less frequently. Hence more volume causes lesser frequent collisions and hence lesser pressure.
- Alternatively, if the volume of a given mass of a gas is doubled at constant temperature, same number of molecules will have double space to move. Thus, number of molecule striking the unit area of the walls of container at a given time will become one half of original value. Thus, pressure will also get reduced to half of original pressure.
- This indicates that the volume and the pressure of a gas are inversely proportional.
- $V \propto \frac{1}{P}$ [Temperature=Constant]

Effect of temperature on a fixed volume of a gas: [at constant pressure] CHARLE's Law

- Here the volume is directly proportional to the temperature.
- As the temperature increases, the volume also increases.
- When the temperature is increased, the kinetic energy of the molecules increases. This increases the rate of collision and causes an increase in pressure. If the dimension of the container is increased the molecules will move a larger distance before collision. This maintains the rate of collision and keeps the pressure constant.
- As the temperature decreases, the volume also decreases.
- When the temperature is decreased, the kinetic energy of the molecules decreases. This decreases the rate of collision and causes a decrease in pressure. If the dimension of the container is decreased the molecules will move a shorter distance before collision. This maintains the rate of collision and keeps the pressure constant.
- $V \propto T$ [Pressure=Constant]