



STD 10– FIRST BELL – CHEMISTRY – CLASS-12

Chapter – 2

GAS LAWS AND MOLE CONCEPT

Relationship between Volume and Temperature

Experiment: 1

Materials : Balloon, water, bottle, vessel, flame.

Procedure : Fix the balloon at the mouth of the bottle. Allow the bottle to heat in a water bath.

Observation : Volume of the balloon increases. When temperature is increased, the kinetic energy of the molecules also increases. Hence the volume of gas molecules expand.

Conclusion :

- **Charles' Law:** At constant pressure, the volume of a definite mass of a gas is directly proportional to the temperature in Kelvin scale. If V is volume and T is temperature, Then $\frac{V}{T}$ will be a constant.
- **Kelvin Scale:** Kelvin (K) is the SI unit of temperature. Other units are degree Celsius & degree Fahrenheit.

EXPERIMENT: 2 (TO PROVE Charles' Law)

Materials : Dry bottle with rubber lid, An empty refill tube of a ball pen without nib, Ink, Warm water, ice water.

Procedure : Fix the empty refill through the rubber lid. Insert a drop of ink into the lower end of the tube and close the bottle with the lid. Dip this arrangement in warm water. Then keep this arrangement in ice water.

Observation : The ink drop rises when the bottle placed in warm water.
The ink drop moves in downward direction when the bottle kept in ice water.

Conclusion : **Charles' Law:** At constant pressure the volume of a definite mass of a gas is directly proportional to its temperature on Kelvin scale.

$$\frac{V}{T} = A \text{ constant}$$

Complete the Table

Volume V	Temperature T in kelvin scale	$\frac{V}{T}$
546 mL	273	$\frac{546}{273} = 2$
600mL	2
640mL	320
660 mL	330K

Situations related to Charles' Law

- The size of the inflated balloons used for celebrations increases and burst in sun.
- The tyres of the vehicles parked in sun have more chance to puncture.

Relationship between Volume and Number of Molecules

Experiment

Material : Balloon

Procedure : Inflate the balloon. Allow the air to flow out from the balloon slowly.

Observation : The volume of the balloon increases when the balloon is inflated Because the number of air molecules increases. When the air is removed from the balloon its volume decreases.

Conclusion :

- **Avagadro's Law:** At constant temperature and pressure the volume of a gas is directly proportional to the number of molecules.

Situations related to Avagadro's Law

- Inflating of balloon.
- The filling of air in the tyres of vehicles.
- Filling of air in air bed.

HOME WORK

1. At constant pressure, the volume of gas is 500L at 300K. What is the volume of the gas if temperature is increased to 600K.

-
2. Certain data regarding various gases kept under the same conditions of temperature and pressure are given below.

Gas	Volume (L)	No. Of molecules
Nitrogen	10L	X
Oxygen	5L	$\frac{X}{2}$
Ammonia	10L
Carbon dioxide	2x

- a) Complete the table.
b) Which gas law is applicable here?

Prepared by:

Sakeena T
HST PS
Iringannur HSS Calicut
