Behaviour of Gases

1. Boyle's law : At constant temperature, the volume of a definite mass of a gas is inversely proportional to pressure.

$V \propto 1/p$ (at constant T) or, $V = K \cdot 1/p$

$pV = K$ (where K is a constant)

$p_1V_1 = p_2V_2$

2.Charle's law : At constant pressure, the volume of a definite ma s of a ga is directly proportional to absolute temperature.

i.e. $V \propto T$ (at constant p) or, $V = K \cdot T$ or, $V/T = k$

$\therefore V_1/T_1 = V_2/T_2$

3. Gay-Lussac's law : At constant volume he pr sure f given mass of a gas is directly proportional to the temp in Kelvi

$p \propto T$ (at constant V) or, $p = K \cdot T$

or, $p/T = K \therefore p_1/T_1 = p_2/T_2$

4. Avogardo's gas law : A constant mperature and pressure the volume of a gas is directly proportional to e number of molecules.

$V \propto n$ (at constant T & p)

5. Idea gas e uation $pV = nRT$ is called ideal gas equation. Where

p = Pressur l me

n = numb r of m le T = temperature in Kelvin.

R = gas const nt

= 0.0821 lit atm K^{-1} mol^{-1}

= 8.314 J K^{-1} mol^{-1}

= 1.987 cal K^{-1} mol^{-1}

6. S.T.P. & N.T.P. :

S.T.P. — Standard temperature and pressure.

N.T.P. — Normal temperature and pressure.

At S.T.P., for 1 mole gas

V = 22.4 litre = 22400 ml

p = 1 atm = 76 cm of Hg = 760 mm of Hg

T = 273 K

Diffusion of gases : The process of intermixing of gases irrespective of the density relationship and without the effect of external agency is called diffusion of gases.

In a gas, the molecules are far separated and the empty space among the molecules are very large. Therefore the molecules of one gas can move into the empty spaces or voids of the other gas and vice-versa. This leads to diffusion.

Dalton's law of partial pressure : It states that If two or more gases which do not react chemically are enclosed in a vessel, the total pressure of the gaseous mixture is equal to the sum of the partial pressure that each gases which exert pressure when enclosed separately in the same vessel at constant temperature.

Let p1, p2 and p3 be the pressure of three non-reactive gases when enclosed separately. Let total pressure be p then p = p1+p2 + p3