(4) Grahm's Law of Diffusion :-

If M is the total mass of a gas, then the Kinetic gas equation,

$$PV = \frac{1}{3} mnc^2 \text{, reduces to—}$$

$$PV = \frac{1}{3} Mc^2$$

$$\text{or } c^2 = \frac{3PV}{M} = \frac{3P}{\frac{M}{V}} = \frac{3P}{D} \qquad \left[\frac{M}{V} = \text{Density}\right]$$

$$\text{or } c^2 = \frac{3P}{D}$$

$$c = \sqrt{\frac{3P}{D}} \quad \text{——— (1)}$$

Where D is the density of the gas, We know that the rate of diffusion (r) of a gas Varies with the mean velocity (C), ($\because r = \frac{c}{t}$)

from the above eqn (1)

$$c \propto \sqrt{\frac{1}{D}} \quad \text{where P is Constant}$$

Thus the rate of diffusion of a gas is inversely proportional to the squre root of density of the gas at constant Pressure.

This is the Grahm's law of diffusion.

(5) Dalton's Law of Partial Pressure :-

Let n_1 molecules each of mass m_1 of a gas A are taken in a Container of volume V. Then the Pressure P_a for the gas is given by Kinetic gas Eqn.

$$P_a = \frac{m_1 n_1 c_1^2}{3V}$$

Similarly for gas B,

$$P_b = \frac{m_2 n_2 c_2^2}{3V}$$

If both the gases are present in the same Containers, then total Pressure,

$$P = \frac{m_1 n_1 c_1^2}{3V} + \frac{m_2 n_2 c_2^2}{3V}$$

$$= P_a + P_b$$

Similarly for n gases, the total Pressure,

$$P = P_a + P_b + P_c + \cdots\cdots P_n$$

This is Dalton's Law of Partial Pressure.

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