Sem-2

Paper-2

Kinetic gas equation

The equation which gives the relation ship between Pressure, volume, mass of molecule, number of molecule and average speed of molecules is called Kinetic gas equation.

i.e $\boxed{PV = \frac{1}{3} mn\bar{v}^2}$ where P = Pressure, V = Volume of Container.

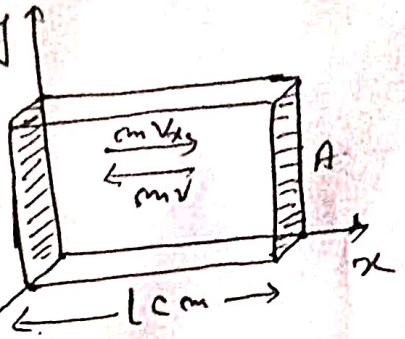
m = Mass of molecules

n = No of molecules

$\bar{v}$ = Average speed of molecules

Derivation :-

Consider a gas taken in Cubical Container of l cm Side. Gases molecules moves in all direction with no loss of Kinetic energy because Collisions are elastic.



Gas in a Cubical Container

$$\boxed{\bar{v}^2 = \bar{v}_x^2 + \bar{v}_y^2 + \bar{v}_z^2} \quad \text{--- (1)}$$

Momentum of gases molecules from A to B or B to A in x direction is mv_x

So Change in momentum in one Collision $= mv_x - (-mv_x) = 2mv_x$.

No of Collision in x direction in one second $=$

$$\frac{\text{Distance travell from A to B in one Second}}{\text{Total distance travell from A to B or B to A}}$$

$$\pm \frac{v_x}{l+l} = \frac{v_x}{2l}.$$

So The Change in momentum for $\frac{v_x}{2l}$ Collision due to on face A $=$

$$2mv_x \times \frac{v_x}{2l} = \frac{2mv_x^2}{2l} = \frac{mv_x^2}{l}$$

$\therefore$ Change in momentum for $\frac{v_x}{2L}$ Collision due to on face B $= \frac{mv_x^2}{L}$

Continued