## Derivation of Gas Equation:—

From kinetic theory,

$$P = \frac{1}{3}\rho c^2$$

$$P = \frac{1}{3}\frac{m}{V}c^2$$

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

Let us consider one gram molecule of a gas at an absolute temperature T. The mean energy of the molecules

$$= \frac{1}{2}mc^2$$

$$= \frac{1}{2}Nmc^2$$

$$\therefore PV = \frac{1}{3}Nmc^2$$

$$= \frac{2}{3}N \cdot \frac{1}{2}mc^2$$

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Mean kinetic energy of a molecule

$$= \frac{1}{2} M c^2$$

$$= \frac{3}{2} KT$$

$$\therefore PV = \frac{2}{3} N \cdot \frac{3}{2} KT$$

$$PV = NKT$$

But

$$N \times K = R$$

$$\therefore PV = RT$$

This equation is called perfect gas equation.

In this gas equation,

$$PV = RT$$

P is in dyne/cm$^2$

$R = 8.31 \times 10^7$ erg/gm mol - k

T is in k

V = the volume in cc per gram molecule.