(Kinetic Theory of Gases)

Ideal Gas equation $\mathbf{PV = \mu RT}$

Gas Constant $R = 8{\cdot}31$ Joule/Mole-K

Pressure Of An Ideal Gas $P = \frac{1}{3}\rho \bar{v}^2$

$$\mathbf{P = \frac{2}{3} E}$$

Where $E\ (= \frac{1}{2}\rho \bar{v}^2)$ is Kinetic Energy per unit Volume (root-mean-square velocity) $v_{r.m.s.} = \sqrt{\left(\frac{3\,RT}{M}\right)}$

$$\therefore \quad \boxed{v_{r.m.s.} \propto \sqrt{T}}$$

So , at temperature T , For two gases with atomic weight M_1 and M_2 $\Rightarrow$ $\boxed{\dfrac{v_{1\,r.m.s.}}{v_{2\,r.m.s.}} = \sqrt{\left(\dfrac{M_2}{M_1}\right)}}$

Average Kinetic Energy of ideal gas molecule

K.E. of 1 gram molecule $E = \frac{1}{2} M \bar{v}^2$ $\because \bar{v}^2 = \frac{3RT}{M}$

$$\therefore E = \frac{1}{2} M \left(\frac{3RT}{M}\right) = \frac{3}{2} RT$$

K.E. of 1 molecule $E = \frac{(3/2)RT}{N} = \frac{3}{2}\left(\frac{R}{N}\right)T = \frac{3}{2}kT$

$k = R/N$ is a Contant Known **Boltzman Constant**

$$average\ speed\ \bar{v} = \sqrt{\frac{8kT}{\pi m}} = \sqrt{\frac{8RT}{\pi M_o}}.$$

where $M_o = mN_A$ is the molecular weight.

Most Probable Speed $$v_p = \sqrt{\frac{2kT}{m}} = \sqrt{\frac{2\mathbf{RT}}{M_o}}$$

Boyle's Law	$\mathbf{P} \propto \dfrac{1}{\mathbf{V}}$	$\mathbf{PV}$ = Constant
Charle's Law	$V \propto T$	**P** is Constant
Vander wall equation for real gases	$\left(\mathbf{P} + \dfrac{\mathbf{a}}{\mathbf{V}^2}\right)(\mathbf{V} - \mathbf{b}) = \mathbf{RT}$	

[redacted]

Graham's law of diffusion

rate of diffusion of two gases $\mathbf{r_1}$, $\mathbf{r_2}$ dinsity of gas ρ_1 , ρ_2

then $$\boxed{\frac{r_1}{r_2} = \sqrt{\frac{\rho_2}{\rho_1}}}$$