KTG

① $P = \frac{1}{3}\frac{Nm}{V} C_{rms}^2$

② $P = \frac{1}{3}\frac{M}{V} C_{rms}^2$

③ $P = \frac{1}{3}\rho C_{rms}^2$

④ Wein's displacement

$$\boxed{\lambda_{max} \propto \frac{1}{T}}$$

$\therefore \lambda_{max} T = b$

$b = 2.898 \times 10^{-3}$ mK

⑤ Stefan's Baltzmann law

$$\boxed{\frac{Q}{t} = \sigma A T^4}$$

watt $= \frac{J}{s}$

σ : watt / m^2-k^4 $[M^1 L^0 T^{-3} K^{-4}]$

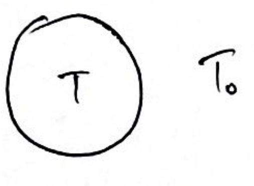
for perfectly Black Body

$$\boxed{P = \sigma A T^4} \quad \therefore e = 1$$

for other Body,

$$\boxed{P = e\sigma A T^4}$$

⑥



$T \rightarrow$ Body Temperature

$T_0 \rightarrow$ surrounding Temp.

$$\boxed{P = e\sigma A (T^4 - T_0^4)}$$

⑦ $k_b = \frac{R}{N_A}$ $R \rightarrow$ Universal gas const

⑧ $PV = nRT$ ⑨ $PV = Nk_BT$

Newton's law of cooling

$\Rightarrow \frac{d\theta}{dt} = k(\theta - \theta_0)$

Energy

$\rightarrow$ Average K.E of gas molecules $= \frac{3}{2}PV = \frac{3}{2}nRT$

$\rightarrow$ Averag K.E per unit mole $= \frac{3}{2}\frac{nRT}{n} = \frac{3RT}{2}$

$\rightarrow$ Average K.E per unit mass $= \frac{3RT}{2M}$

$\rightarrow$ " K.E per molecules $= \frac{3RT}{2N_A} =$

Degree of freedom:

$f \Rightarrow 3 \rightarrow$ monoatomic
$f \Rightarrow 5 \rightarrow$ diatomic
$f \Rightarrow 6 \rightarrow$ polyatomic

} rigid

Mean free path (λ)

$$\boxed{\lambda = \frac{1}{\sqrt{2}\pi d^2 (N/V)}} \qquad \boxed{\lambda = \frac{k_B T}{\sqrt{2}\pi d^2 P}}$$

where, $\rho = N/V$ of the gas

$N \rightarrow$ No. of molecules

$V \rightarrow$ Volume of gas

$d \rightarrow$ diameter of molecule

RMS : $\boxed{V_{rms} = \sqrt{\frac{3RT}{M_0}} = \sqrt{\frac{3P}{\rho}} = \sqrt{\frac{3}{2}k_B T}}$

No. of moles $\boxed{(n) = \frac{N}{N_A} = \frac{(m)}{(M_0)}}$ $(m) \rightarrow$ number of molecules; $(M_0) \rightarrow$ mass of 1 mole of gas

$C_{rms}^2 = \overline{C^2}$

$\sigma = 5.67 \times 10^{-8}\ Wm^{-2}K^{-4}$

$\frac{Q}{At} = \sigma T^4$

$\Downarrow$

Intensity of radiation

Note $\boxed{\rho = \frac{Pm}{KT}}$

Coefficient of Radiation

a) Coefficient of absorption (a) : $\boxed{a = \frac{Q_a}{Q}}$ → quantity absorbed / quantity incident on it

for perfectly Black Body, $a=1$.
for ordinary Bodies, $a<1$

b) Coefficient of reflection (r) $\boxed{r = \frac{Q_r}{Q}}$ → quantity reflected / → quantity incident on it.

c) Coefficient of transmission (t) : $\boxed{t = \frac{Q_t}{Q}}$ → quantity transmitted / → quantity incident on it.

\# $\boxed{a + r + t = 1}$

Athermanous ($t=0$)	Diathermanous
eg. water, wood, copper, Iron, LampBlack, water vapour etc.	eg. Glass, quartz, sodium chloride, hydrogen, oxygen, dry air, rocksalt etc.