Sem - 2

Paper - 2

Dependence of Pressure and temperature on viscosity of gas :→

(i) Effect of Pressure on viscosity of gas :→

∵ Relation between mean free path and Co-efficient of viscosity $= \eta = \frac{1}{3} d V_{av} \lambda$ —(i).

where d = density of gas

V_{av} = Average velocity.

λ = Mean free path.

or $\eta = \frac{1}{3} \frac{m \times N \times V_{av}}{1 cm^3} \times \frac{1}{\sqrt{2}\,\pi\sigma^2 \cancel{N}}$ $\left(\because \lambda = \frac{1}{\sqrt{2}\,\pi\sigma^2 N}\right)$

$$\boxed{\eta = \frac{1}{3} \frac{m V_{av}}{\sqrt{2}\,\pi\sigma^2 cm^3}}$$

So Co-efficient of viscosity is independent of Pressure.

(ii) Effect of temperature on viscosity of gas :→

$\because \eta = \frac{1}{3} \frac{m V_{av}}{\sqrt{2}\,\pi\sigma^2 cm^3} = \frac{1 \times m \times V_{av}}{3\sqrt{2}\,\pi\sigma^2 cm^3}$

or $\eta \propto V_{av}$ or $\eta \propto \sqrt{T}$ $(\because V_{av} \propto \sqrt{T})$

or $\eta = \frac{\eta_0 \sqrt{T}}{\left(1 + \frac{C}{T}\right)}$ where η_0 & c are Constant

So. Co-efficient of viscosity is directly Proportional to temperature.