KINEMATIC VISCOSITY: It is defined as the ratio between dynamic viscosity and density of fluid. It is denoted by symbol ϑ (nu)

$$\vartheta = \text{viscosity/ density}$$

$$\vartheta = \mu / \rho$$

The unit of kinematic viscosity is m2 /sec

NEWTONS LAW OF VISCOSITY

It states that the shear stress (τ) on a fluid element layer is directly proportional to the rate of shear strain. The constant of proportionality is called the co- efficient of viscosity .It is expressed as:

$$\tau = \mu \, (du/dy)$$

VARIATION OF VISCOSITY WITH TEMPERATURE

- Temperature affects the viscosity.
- The viscosity of liquids decreases with the increase of temperature, while the viscosity of gases increases with the increase of temperature.
- The viscous forces in a fluid are due to cohesive forces and molecular momentum transfer.

Conti..

- In liquids cohesive forces predominates the molecular momentum transfer, due to closely packed molecules and with the increase in temperature, the cohesive forces decreases resulting in decreasing of viscosity.
- But, in case of gases the cohesive forces are small and molecular momentum transfer predominates with the increase in temperature, molecular momentum transfer increases and hence viscosity increases.

The relation between viscosity and temperature for liquids and gases are:

i) For **liquids** $\mu = \mu_0 \dfrac{1}{1+\alpha t+\beta t^2}$

Where, μ = Viscosity of liquid at t c in Poise.

μ_0 = Viscosity of liquid at o c

α and β are constants for the Liquid.

For Water, $\mu_0 = 1.79 \times 10^{-3}$ poise, $\alpha = 0.03368$ and $\beta = 0.000221$

The above equation shows that the increase in temp. The Viscosity decreases.

ii) **For gases** $\mu = \mu_0 + \alpha t - \beta t^2$

For air $\mu_0 = 0.000017$, $\alpha = 0.056 \times 10^{-6}$, $\beta = 0.118 \times 10^{-9}$

The above equation shows that with increase of temp. The Viscosity increases.