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Transport Phenomena
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According to kinetic theory of gases, the molecules of a gas are moving constantly in all directions with all possible velocities. The molecules possess mass, momentum as well as energy which they carry with them while moving from one region of the gas to another. The molecules of the gas thus serve as carriers or transporters of mass, momentum and energy from one region to another.

In the steady or equilibrium state of a gas, the transport of any of these physical quantities in one direction is just balanced by an equal transport of the same quantity in the reverse direction and thus there is no net transport in any direction. But some gradient of velocity, temperature or density is maintained due to chaotic motion of its molecules it tends to mitigate the gradient. In the first case the molecules of the faster layer transport momentum to the slower layer, tending to destroy the relative motion between layers. This gives rise to exertion of viscous force between layers. The viscous force per unit area is given by

$$F = \eta \frac{dv}{dz}$$ where η = Coeff. of viscosity

$\frac{dv}{dz}$ = velocity gradient.

In the second case energy is transported by the molecules from the region of higher temperature to the region of lower temperature, tending to equalize the temperature of the region. This gives rise to conduction of heat by a gas.

The rate at which heat is conducted is given by

$$Q = K \cdot \frac{dT}{dz}$$, where K = Coeff. of Conduction

& $\frac{dT}{dz}$ = Temp. gradient.

In the third case the molecules of the gas move from region to higher concentration to the region of lower concentration to destroy the density gradient. This gives rise to diffusion. The rate of diffusion of molecules is given by

$$v = -D \frac{dn}{dz}$$, where D = Coeff. of diffusion

$\frac{dn}{dz}$ = Concentration gradient

Thus viscosity, Conduction and diffusion represent the transport of momentum, energy and mass respectively. These phenomena are collectively called transport phenomena.