RADIATION CONDUCTION

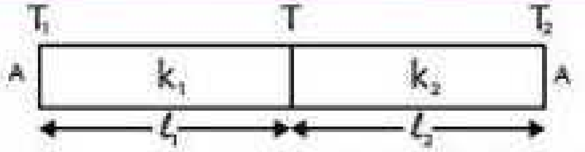
Law of Heat Transfer

The rate at which heat is transfered or conducted through a substance is directly proportional to the

(i) Area of the surface (A) perpendicular to the flow of heat.

(ii) Temperature gradient $\frac{\Delta T}{x}$ along the path of heat transfer.

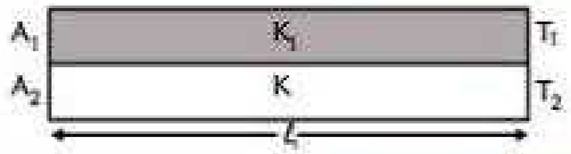
Slabs in Parallel and Series



$\frac{dQ}{dt}$ = constant

T = veries

$$k_{eq} = \frac{l_1 + l_2}{\frac{l_1}{K_1} + \frac{l_2}{K_2}}$$



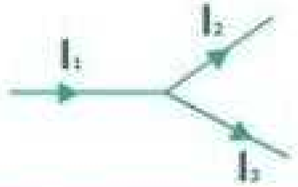
$\frac{dQ}{dt}$ = different

T = same

$$K_{eq} = \frac{K_1A_1 + K_2A_2}{A_1 + A_2}$$

Junction Law

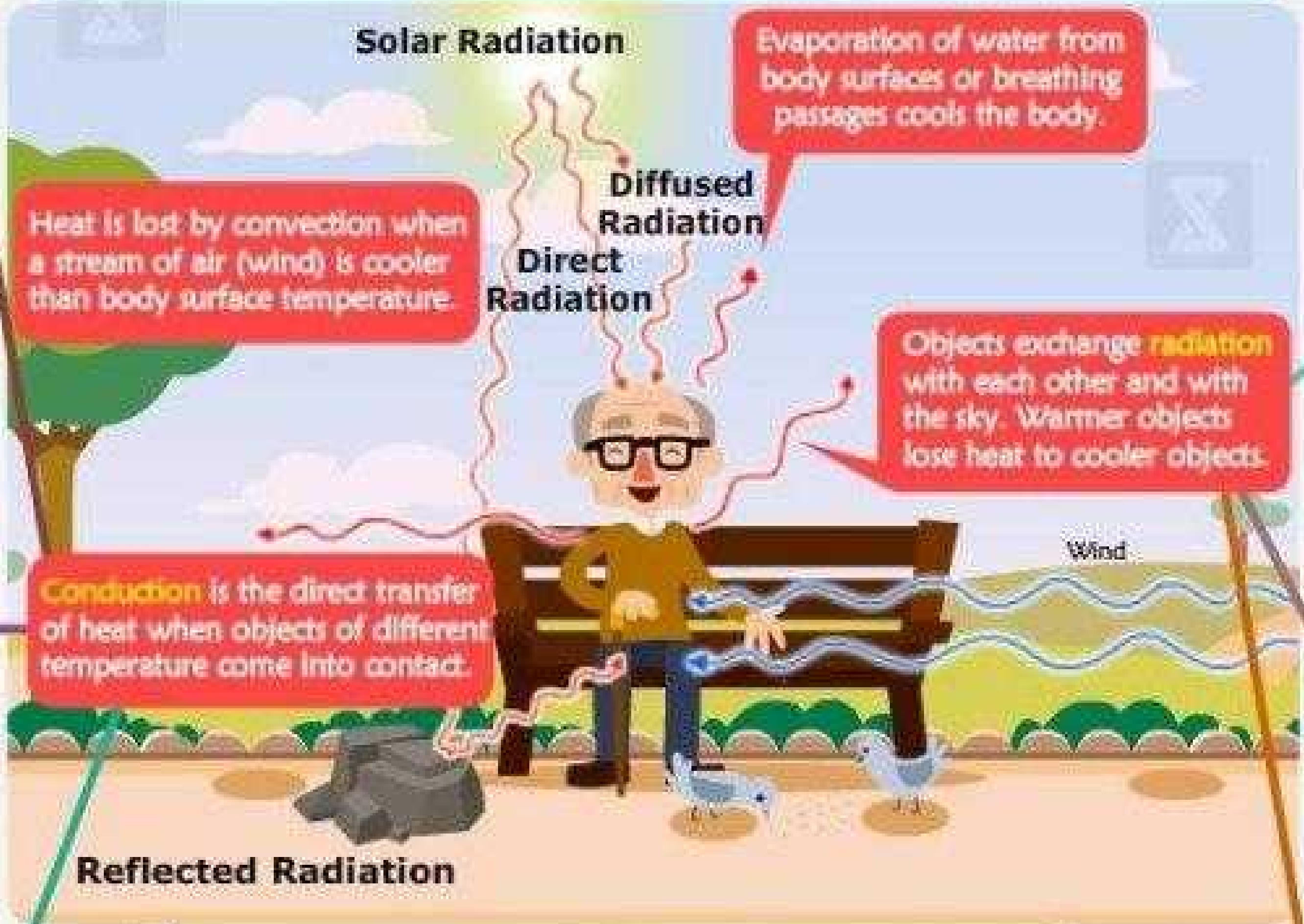
Rate of heat flow entering = Rate of heat flow exiting



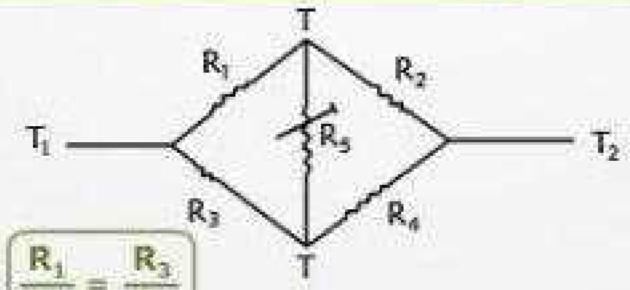
$$I_1 = I_2 + I_3$$

Kirchoff's Law

$$\text{Emissive power of black body} = \frac{\text{Emissive power of body}}{\text{Absorptive power of body}} = \text{Constant}$$



Wheatstone Ridge



if $\frac{R_1}{R_2} = \frac{R_3}{R_4}$

⟹ No heat flow through thermal resistance (R_5)

Stefan's Law

(i) Emissive power of a black body is proportional to fourth power of Absolute temperature.

$$E = \sigma T^4$$

σ = Stefan- Boltzmann Constant

(ii) Emissive power of body due to heat transfer from body to surrounding.

$$E = e\sigma(T^4 - T_s^4)$$

e = Emissivity

Newton's Law of Cooling

For small temperature difference, rate of cooling due to radiation is proportional to temperature difference.

$$-\frac{dT}{dt} \propto \Delta T$$

Wein's Displacement Law

Wavelength corresponding to maximum intensity of emission decreases with increase in temperature of black body.

$$\lambda_m \propto \frac{1}{T} \text{ or } \lambda_m T = \text{Constant}$$