Rod is fixed at end – $0°C \rightarrow \text{length} = L_0$

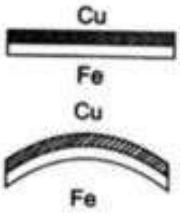
Thermal stress $\rightarrow \sigma_\theta$ or $\sigma_t = Y\epsilon_t$

$$\sigma_t = Y\alpha t$$

Rod will exert a force on rigid support

$$F = \sigma . A = Y\alpha tA$$

Bimetallic Strip:



If heated equally

$$\alpha_{Cu} > \alpha_{Fe}$$

$$\Delta L_{Cu} > \Delta L_{Fe}$$

Length of Cu strip will be compared to Fe strip

Anomalous behaviour of water

$$0°C \text{ to } 4°C \rightarrow temp\ increase \rightarrow vol\ decrease \rightarrow density\ increase$$

$$4°C \text{ to } 100°C \rightarrow temp\ increase \rightarrow volume\ increase \rightarrow density\ decrease$$

At $4°C$, Volume of water is minimum, Density of water is maximum

HEAT AND CALORIMETERY

Gram Specific Heat: It is the amount of heat energy required to raise the temperature of 1g mass by 1°C

$$Q = m.s.\Delta T$$

$$S_{ice} = 0.5\frac{cal}{gm°C}$$

$$S_{water} = 1\ \frac{cal}{gm°C}$$

$$S_{stream} = 0.48 \approx 0.5\ \frac{cal}{gm°C}$$

Heat Capacity: The amount of heat energy required to raise of m gram substance by 1°C

$$S = ms \text{ or } C = mc$$

Latent heat of fusion: The amount of heat energy required to charge 1 gm solid into 1 gm liquid at its freezing point

$$L_{f(ice)} = 80\ cal/gm$$

$$L_{ice} = 80\ cal/gm$$

Latent heat of vaporization: The heat energy required to convert 1 gm liquid into 1 gm mass at its boiling point

$$L_{steam} = 540\ cal/gm$$

Latent heat: heat required to change the state of a substance of unit of mass at constant temperature.

Phase change –

$$ice\ (H_2O_{(s)}) \xrightarrow{\Delta} water\ H_2O_{(l)} \xrightarrow{\Delta} steam\ H_2O_{(g)}$$

Water equivalent: The mass of water which requires the same amount of heat energy as required by the substance to raise the temperature by same amount

Law of Mixing – Principle of Calorimetery

$$Heat\ given = Heat\ Taken$$

$$Heat\ lost = Heat\ gain$$

$$Heat\ Gain + Heat\ loss = 0$$

Modes of Transfer Heat

Conduction: Only solids. HE is transferred from one molecule to other due to collision & without actual transfer of molecules

Convection→ Liquid & gas, Molecules are in motion

Radiations → Universal (Always Occurs)

Rate of heat flow → Rate of flow of heat

$$H = KA\frac{dt}{L}$$

$$\left(\frac{L}{KA} = R_H = Thermal\ Resiatnce\right)$$

$$K = constant = Thermal\ condcutivity$$