

## CHAPTER – 25 CALORIMETRY

1. Mass of aluminium = 0.5kg,                      Mass of water = 0.2 kg  
 Mass of Iron = 0.2 kg                              Temp. of aluminium and water = 20°C = 297°k  
 Sp heat of Iron = 100°C = 373°k.              Sp heat of aluminium = 910J/kg-k  
 Sp heat of Iron = 470J/kg-k                      Sp heat of water = 4200J/kg-k  
 Heat gain =  $0.5 \times 910(T - 293) + 0.2 \times 4200 \times (343 - T)$   
 $= (T - 292) (0.5 \times 910 + 0.2 \times 4200)$       Heat lost =  $0.2 \times 470 \times (373 - T)$

∴ Heat gain = Heat lost

$$\Rightarrow (T - 292) (0.5 \times 910 + 0.2 \times 4200) = 0.2 \times 470 \times (373 - T)$$

$$\Rightarrow (T - 293) (455 + 8400) = 49(373 - T)$$

$$\Rightarrow (T - 293) \left( \frac{1295}{94} \right) = (373 - T)$$

$$\Rightarrow (T - 293) \times 14 = 373 - T$$

$$\Rightarrow T = \frac{4475}{15} = 298 \text{ k}$$

$$\therefore T = 298 - 273 = 25^\circ\text{C}.$$

The final temp = 25°C.

2. mass of Iron = 100g                              water Eq of calorimeter = 10g  
 mass of water = 240g                              Let the Temp. of surface = 0°C  
 $S_{\text{iron}} = 470\text{J/kg}^\circ\text{C}$                               Total heat gained = Total heat lost.

$$\text{So, } \frac{100}{1000} \times 470 \times (\theta - 60) = \frac{250}{1000} \times 4200 \times (60 - 20)$$

$$\Rightarrow 47\theta - 47 \times 60 = 25 \times 42 \times 40$$

$$\Rightarrow \theta = 4200 + \frac{2820}{47} = \frac{44820}{47} = 953.61^\circ\text{C}$$

3. The temp. of A = 12°C                              The temp. of B = 19°C  
 The temp. of C = 28°C                              The temp. of  $\Rightarrow A + B = 16^\circ$   
 The temp. of  $\Rightarrow B + C = 23^\circ$

In accordance with the principle of calorimetry when A & B are mixed

$$M_{CA} (16 - 12) = M_{CB} (19 - 16) \Rightarrow CA4 = CB3 \Rightarrow CA = \frac{3}{4} CB \quad \dots(1)$$

And when B & C are mixed

$$M_{CB} (23 - 19) = M_{CC} (28 - 23) \Rightarrow 4CB = 5CC \Rightarrow CC = \frac{4}{5} CB \quad \dots(2)$$

When A & c are mixed, if T is the common temperature of mixture

$$M_{CA} (T - 12) = M_{CC} (28 - T)$$

$$\Rightarrow \left( \frac{3}{4} \right) CB(T - 12) = \left( \frac{4}{5} \right) CB(28 - T)$$

$$\Rightarrow 15T - 180 = 448 - 16T$$

$$\Rightarrow T = \frac{628}{31} = 20.258^\circ\text{C} = 20.3^\circ\text{C}$$

\* \* \* \* \*