

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 = $0.2 \times 470 \times (373 - T)$
 $\therefore \text{Heat gain} = \text{Heat lost}$
 $\Rightarrow (T - 292) (0.5 \times 910 + 0.2 \times 4200) = 0.2 \times 470 \times (373 - T)$
 $\Rightarrow (T - 293) (455 + 8400) = 49(373 - T)$
 $\Rightarrow (T - 293) \left(\frac{1295}{94} \right) = (373 - T)$
 $\Rightarrow (T - 293) \times 14 = 373 - T$
 $\Rightarrow T = \frac{4475}{15} = 298 \text{ k}$
 $\therefore T = 298 - 273 = 25^\circ\text{C}.$ 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.
 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
 $M_{\text{CA}} (16 - 12) = M_{\text{CB}} (19 - 16) \Rightarrow CA4 = CB3 \Rightarrow CA = \frac{3}{4} CB \quad \dots(1)$
 And when B & C are mixed
 $M_{\text{CB}} (23 - 19) = M_{\text{CC}} (28 - 23) \Rightarrow 4CB = 5CC \Rightarrow CC = \frac{4}{5} CB \quad \dots(2)$
 When A & c are mixed, if T is the common temperature of mixture
 $M_{\text{CA}} (T - 12) = M_{\text{CC}} (28 - T)$
 $\Rightarrow \left(\frac{3}{4} \right) CB(T - 12) = \left(\frac{4}{5} \right) CB(28 - T)$
 $\Rightarrow 15T - 180 = 448 - 16T$
 $\Rightarrow T = \frac{628}{31} = 20.258^\circ\text{C} = 20.3^\circ\text{C}$

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