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 o f 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 again = 0.5 × 910(T – 293) + 0.2 × 4200 × (343 –T)
   = (T – 292) (0.5 × 910 + 0.2 × 4200) Heat lost = 0.2 × 470 × (373 – T)
   ∴ Heat gain = Heat lost
   $\Rightarrow$ (T – 292) (0.5 × 910 + 0.2 × 4200) = 0.2 × 470 × (373 – T)
   $\Rightarrow$ (T – 293) (455 + 8400) = 49(373 – T)
   $\Rightarrow (T - 293)\left(\frac{1295}{94}\right) = (373 - T)$
   $\Rightarrow$ (T – 293) × 14 = 373 – T
   $\Rightarrow T = \frac{4475}{15} = 298$ k
   ∴ T = 298 – 273 = 25°C. The final temp = 25°C.
2. mass of Iron = 100g water Eq of caloriemeter = 10g
   mass of water = 240g Let the Temp. of surface = 0°C
   S_{iron} = 470J/kg°C Total heat gained = Total heat lost.
   So, $\frac{100}{1000} \times 470 \times (\theta - 60) = \frac{250}{1000} \times 4200 \times (60 - 20)$
   $\Rightarrow 47\theta - 47 \times 60 = 25 \times 42 \times 40$
   $\Rightarrow \theta = 4200 + \frac{2820}{47} = \frac{44820}{47} = 953.61°C$
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°
   The temp. of $\Rightarrow$ B + C = 23°
   In accordance with the principle of caloriemetry when A & B are mixed
   M_{CA} (16 – 12) = M_{CB} (19 – 16) $\Rightarrow$ CA4 = CB3 $\Rightarrow CA = \frac{3}{4}CB$ …(1)
   And when B & C are mixed
   M_{CB} (23 – 19)= M_{CC} (28 – 23) $\Rightarrow$ 4CB = 5CC $\Rightarrow CC = \frac{4}{5}CB$ …(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
   $\Rightarrow T = \frac{628}{31} = 20.258°C = 20.3°C$

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