Date:- 21.11.24 TENDER HEART HIGH SCHOOL ; SEC-33B, CHD

Answer Key

Sub:- PHYSICS

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Ch-11(b) Numericals (Latent heat) Page-1

Practice Assignment with Ans. key

Q1. A metal ball of mass 400g and at 600°C is placed on a block of ice, when 428g of ice melts. If the specific heat capacity of the metal ball is 0.6 J/g/°C, calculate Sp. latent heat of ice.

Ans :- Heat gained by the ice to melt = mL_{ice}

$= 428 \times L$

Heat lost by the metal Ball = $mc\Delta T$

$= 400 \times 0.6 \times 600$

As Heat Lost = Heat gained

$400 \times 0.6 \times 600 = 428 \times L$

$L = \frac{144000}{428}$ J/g = 336.4 J/g

Q2 :→ Calculate the amount of ice, which is sufficient to cool 150 g of water, contained in a vessel of mass 50g at 30°C, such that final temperature of mixture is 5°C

[Sp. heat capacity of water ⇒ 0.4 J/g/°C

[Sp. Latent heat of ice is 336 J/g]

Heat gained by ice = $mL = m \times 336$

Heat gained by water to form ice = $mc\Delta T$

$= m \times 4.2 \times 5 = 21m$

Total heat gained = $336m + 21m = 357m$

Heat lost by Water at 30°C = $mc\Delta T$

" " " = $150 \times 4.2 \times 25$

" " " " " = 15750 J

Heat lost by Vessel at 30°C = $mc\Delta T$

$= 50 \times 4.2 \times 25$

$= 500$ J

Total Heat lost = (15750 + 500) J

$= 16250$ J

So Heat lost = Heat gain

$357m = 16250$ J

m (mass of Ice) $= \frac{16250}{357}$

$= 45.52$ g Ans

Q3:→ Calculate the total amount of Heat energy required to melt 200g of ice at 0°C to water at 100°C.

[(Sp. latent heat of ice = 336 J/g
(Sp. Heat Capacity of water = 4.2 J/g/°C]

Ans:→ $\Delta t = 100 - 0 = 100$°C , $m = 200$g , $L_{ice} = 336$ J/g

$Q_1 = mL = 200 \times 336 = 67200$ J

$Q_2 = mc\Delta T = 200 \times 4.2 \times 100$

$Q_2 = 84000$ J

Therefore total heat = $Q_1 + Q_2$

$= 67200 + 84000$

$\Rightarrow 151200$ J Ans

Qy 250g of water at 30°C is present in a Copper vessel of mass 50g. Calculate the mass of ice required to bring down the temperature of the vessel and its contents to 5°C

[Specific heat of fusion of ice = 336000 J/kg
Sp. heat Capacity of Cu Vessel = 400 J/kg/°C
Sp. heat Capacity of water = 4200 J/kg/°C

Ans By the principle of Calorimetry;

Heat Gained = Heat Lost

$m \times 336 + m \times 4.2 \times 5 = 250 \times (4.2)(30-5) + 50 \times 0.4\,(30-5)$ ——(1)

[∵ Heat lost = (mass of water × Sp. heat of water × ΔT) + (mass of Copper vessel × Sp. heat of vessel × ΔT)

as Sp. heat of Copper vessel

$= 400$ J/kg/°C

or $\frac{400}{1000}$ J/g/°C

$= 0.4$ J/g/°C

Sp. heat of water = 4200 J/kg/°C

$= \frac{4200}{1000}$ J/kg/°C

$= 4.2$ J/g/°C

from Equation (1)

So $(336m + 21m) = (250 \times 105) + (50 \times 10)$

$$357m = 26250 + 500$$

$$m = \frac{26750}{357}$$

$$\boxed{m = 74.9 \text{ gm}}$$