

Which of the following is the amount of ice that will separate out in cooling a solution containing 50 gm of ethylene glycol in 200 gm water to -9.3°C . (K_f for water = $1.86\text{ K mol}^{-1}\text{Kg}$)

- (A) 0 gm (B) 200 gm (C) 161.29 gm (D) 38.71 gm

Solution

$$\Delta T_f = \frac{1000 K_f W}{MW'}$$

Since freezing point is 0°C , $\Delta T_f = 9.3^{\circ}\text{C}$

$$\therefore 9.3 = \frac{1000 \times 1.86 \times 50}{62 \times W'} \quad \left(\text{M for ethylene glycol } \begin{array}{c} \text{CH}_2\text{OH} \\ | \\ \text{CH}_2\text{OH} \end{array} = 62 \right)$$

$$\therefore W' = 161.29\text{ gm}$$

Here W' is the mass of water. Since, 200 gm of water was taken, $200 - 161.29 = 38.71\text{ gm}$ would solidify.

Hence, (D)