

constant or also called as the ebullioscopic constant. Molal elevation constant K_b have the unit that is equivalent to $K \text{ kg mol}^{-1}$.

Suppose that m_1 and m_2 are the masses of solvent and solute while the molar masses of solute is equal to M_2 and the solvent is equal to M_1 , then the molality is equivalent to;

$$m = \frac{\frac{m_2}{M_2}}{\frac{m_1}{1000}} = \frac{1000 \times m_2}{M_2 \times m_1}$$

By put the value of molality in the boiling of elevation equation then;

$$\Delta T_b = \frac{k_b \times 1000 \times m_2}{M_2 \times m_1}$$

$$M_2 = K_b \times 1000 \times m_2 / \Delta T_b \times m_1$$

So, by knowing the others quantities we can calculate the molar mass of solute of the elevation of boiling point equation.

❖ Example:

Pure liquid have the boiling point that is equivalent to 353.23 K. When dissolve the 2.70 g of the non-volatile solute in to the liquid (90g), then solution' boiling point increased to 354.11 K. Calculate the molar mass of the solute? By using the value of K_b of liquid that is equal to $2.53 \text{ K kg mol}^{-1}$.

Since that;

$$T_b^0 = 353.23 \text{ K}$$

$$T_b = 354.11 \text{ K}$$

$$m_2 = 2.70 \text{ g}$$

$$K_b = 2.53 \text{ K kg mol}^{-1}$$

$$\text{and } m_1 = 90 \text{ g}$$

Elevation of boiling point is equivalent to;

$$\begin{aligned} \Delta T_b &= T_b - T_b^0 \\ &= 354.11\text{K} - 353.23\text{K} = 0.88 \end{aligned}$$