

Answer on Question # 60285 - Chemistry - General Chemistry

Compute the boiling point of this solution: $1.00 \cdot 10^2 \text{ g}$ $\text{C}_{10}\text{H}_8\text{S}_2$ (1,5-NAPHTHALENEDISULFONIC ACID) in $1.00 \cdot 10^2 \text{ g}$ H_2O (NONIONIZING SOLUTE)

Solution

The solution contains 100 g of $\text{C}_{10}\text{H}_8\text{S}_2$ (molar mass is $M(\text{C}_{10}\text{H}_8\text{S}_2) = 192.3005 \text{ g/mol}$) and 100 g of a solvent. The boiling point elevation is proportional to the molality of a solution according to an equation

$$\Delta T = K_b m$$

where m is the molality of solution (the number of moles of solute per kilogram of a solvent);

K_b is the ebullioscopic constant of water $K_b(\text{water}) = 0.512$.

$$m = \frac{g_{\text{solute}}}{M_{\text{solute}} g_{\text{solvent}}} = \frac{100}{192.3 \cdot 0.1} = 5.2 \frac{\text{mol}}{\text{kg}};$$

The boiling point elevation is

$$\Delta T = 0.512 \cdot 5.2 = 2.66^\circ \text{C};$$

As the boiling point of pure water is 100°C , the boiling point of the solution given is 102.66°C .

Answer: 102.66°C .