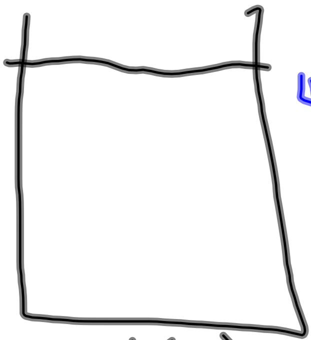


NaCl(aq)

$X_{NaCl} = 4.24 \times 10^{-2}$

molality = ?

$$X_{NaCl} = \frac{\#\text{ mol NaCl}}{\#\text{ mol NaCl} + \#\text{ mol } H_2O}$$

$X_{NaCl} = 4.24 \times 10^{-2}$; # mol NaCl = 4.24×10^{-2} mol

mol NaCl + # mol H_2O → 1 mol

1.0000 mol NaCl + H_2O

− 0.0424 mol NaCl

0.9576 mol H_2O

$$\text{molality} = \frac{\#\text{ mol NaCl}}{\#\text{ kg } H_2O} = \frac{4.24 \times 10^{-2}\text{ mol}}{}$$

It is left to the student to finish this problem.

Colligative Properties

1. Vapor Pressure Lowering

→ 2. Boiling point Elevation

→ 3. Freezing Point Depression

$$\Delta T_b = T_b - T_b^o$$

$$|\Delta T_f| = T_f^o - T_f$$

$$\Delta T_b = K_b \cdot c_m$$

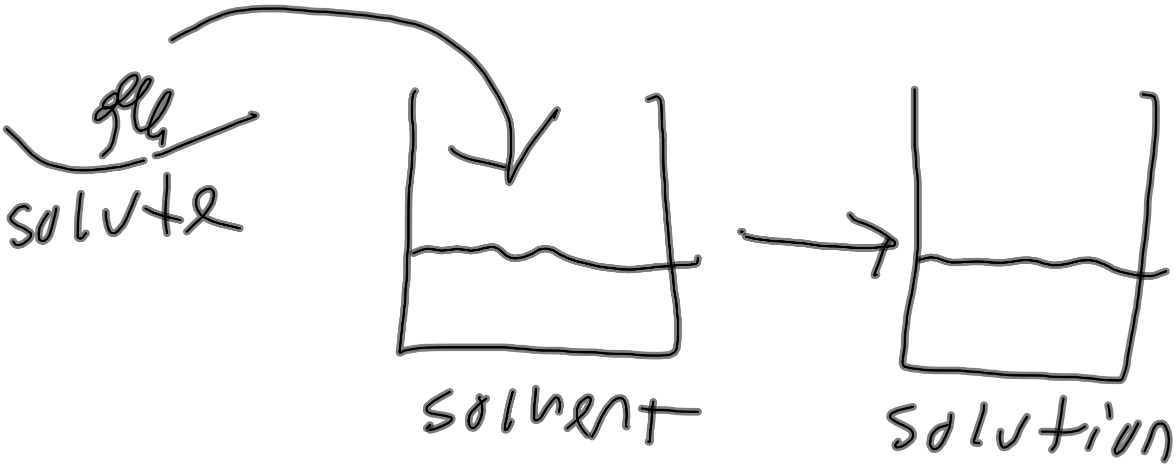
$$|\Delta T_f| = K_f \cdot c_m$$

For non-electrolytes ($i = 1$)

For electrolytes

$$\Delta T_b = i K_b \cdot c_m$$

$$|\Delta T_f| = i K_f \cdot c_m$$



A 0.514g solute dissolves in 15.41 g of cyclohexane to produce a solution that freezes at 4.87°C. The normal freezing point of cyclohexane is 6.55°C and its freezing point depression constant is 20.0 $\frac{°C}{m}$. What is the molecular weight of the solute? (Assume the solute does not ionize and is non-volatile)

$$MWT = \frac{\text{mass in g}}{\#\text{ mol}} = \frac{0.514g}{}$$

$$|\Delta T_f| = K_f \cdot C_m$$

↓ solve for molality

$$C_m = \frac{|\Delta T_f|}{K_f} = \frac{1.68°C}{20.0 \frac{°C}{m}}$$

$$|\Delta T_f| = T_f^{\circ} - T_f$$

$$= 6.55°C - 4.87°C$$

$$= 1.68°C$$