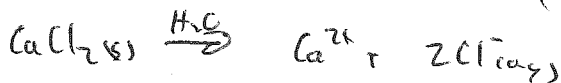


① solute CaCl_2 solvent H_2O

$$\Delta T_f = ?$$

$$K_f = \frac{1.86^\circ\text{C}}{m}$$

$$m = \frac{\text{mol CaCl}_2}{\text{kg H}_2\text{O}} = \frac{\left(2.2 \text{ lbs CaCl}_2 \times \frac{454\text{g CaCl}_2}{1 \text{ lb CaCl}_2} \times \frac{1 \text{ mol CaCl}_2}{110.98\text{g CaCl}_2} \right)}{\left(800.5 \times \frac{1\text{kg}}{1000\text{g}} \right)} = 11 m$$



$$i = 3$$

$$\Delta T_f = \left(\frac{1.86^\circ\text{C}}{m} \right) (11 m) (3) = 61^\circ\text{C}$$

$$T_{\text{orig}} - \Delta T_f = T_{\text{new}}$$

$$0^\circ\text{C} - 61^\circ\text{C} = \boxed{-61^\circ\text{C}}$$

② solute = NaCl

solvent = H_2O

$$\Delta T_b = 106 - 100 = 6^\circ\text{C}$$

$$K_b = \frac{0.52^\circ\text{C}}{m}$$

$$m = ?$$

$$i = 2$$

$$m = \frac{\Delta T_b}{K_b} = \frac{6^\circ\text{C}}{\frac{0.52^\circ\text{C}}{m} (2)} = 5.8 m$$

$$m = \frac{\text{mol}}{\text{kg}}$$

$$\text{mol} = m \cdot \text{kg}$$

$$= \left(\frac{5.8}{1} \frac{\text{mol}}{\text{kg}} \right) (5.0 \text{ kg})$$

$$\text{mol} = 29 \text{ mol NaCl}$$

$$29 \text{ mol NaCl} \times \frac{58.44\text{g NaCl}}{1 \text{ mol NaCl}} = \frac{1695}{2000\text{g}} \text{ NaCl}$$

③ solute = adrenaline
solvent = CCl₄

$$\frac{\Delta T_b}{K_b} = \frac{K_b \cdot m}{K_b}$$

$$m = \frac{.49^\circ\text{C}}{5.02^\circ\text{C}/m} = .0976 m$$

$$\Delta T_b = .49^\circ\text{C}$$

$$K_b = 5.02^\circ\text{C}/m$$

m =

$$\log \cdot m = \frac{m \cdot \text{kg}}{\text{kg}} = \left(36.0\% \times \frac{1 \text{ kg}}{100\%}\right) \left(\frac{.0976 \text{ mol}}{\text{kg}}\right)$$

$$m \cdot \text{kg} = .00351 \text{ mol}$$

$$\text{molar mass} = \frac{.64 \text{ g}}{.00351 \text{ mol}} = \frac{.64 \text{ g}}{3.51 \times 10^{-3}} = \frac{182 \text{ g/mol}}{180}$$

④ solute = C₂H₆O
solvent = H₂O

Assume 100g sample

25g C₂H₆O

75g H₂O

$$m = \frac{\left(25 \text{ g C}_2\text{H}_6\text{O} \times \frac{1 \text{ mol}}{46.07 \text{ g}}\right)}{.075 \text{ kg}} = 5.3 m$$

$$i = 1$$

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

$$= \left(\frac{.52^\circ\text{C}}{m}\right) (5.3 m) (1)$$

=

$$T_{\text{org}} + \Delta T_b = T_{\text{new}}$$

$$102.8^\circ\text{C}$$

$$\Delta T_f = K_f \cdot m \cdot i$$

$$= \left(\frac{1.86^\circ\text{C}}{m}\right) (5.3 m) (1)$$

$$= 9.9^\circ\text{C}$$

$$T_{\text{org}} - \Delta T_f = T_{\text{new}}$$

$$-9.9^\circ\text{C}$$

No