This is BCE#11.

I recommend you print out this page and bring it to class. Click here to show a set of five BCE11 student responses randomly selected from all of the student responses thus far in a new window.

John , here are your responses to the BCE and the Expert's response.

1. A solution is prepared by mixing 6.00 grams of $C_6H_{12}O_6$ with 35.0 grams of H_2O.

a) Calculate the mol of glucose that are dissolved in water.

0.0333 mol $C_6H_{12}O_6$

mol $C_6H_{12}O_6$ = 6.00 gram $C_6H_{12}O_6$ * (1 mol $C_6H_{12}O_6$/180 grams $C_6H_{12}O_6$) = 0.0333 mol

b) Calculate the molality (glucose) of the solution.

0.952 molal $C_6H_{12}O_6$

molality $C_6H_{12}O_6$ = mol $C_6H_{12}O_6$ / kg solvent = 0.0333 mol $C_6H_{12}O_6$/0.035 kg H_2O) = 0.952 molal

c) Is glucose an electrolyte or a nonelectrolyte when dissolved in water?

non electrolyte

Glucose is a nonelectrolyte. Since glucose is a covalent substance it does not dissociate in water. So the van Hoff factor is 1 (i = 1).

d) Calculate the ideal freezing point of this solution. (NOTE: $k_f(H_2O) = 1.86\ °C\ m^{-1}$ and $\Delta T_f = K_f * m$)

-1.77 °C

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

$\Delta T_f = 1 \cdot 0.952 \text{ molal} \cdot 1.86 \text{ °C m}^{-1}$

$\Delta T_f = 1.77 \text{ °C}$

$T_f = -1.77 \text{ °C}$

e) Calculate the ideal boiling point of this solution. (NOTE: $k_b(H_2O) = 0.512 \text{ °C m}^{-1}$ and $\Delta T_b = K_b * m$)

100.487 °C

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

$\Delta T_b = 1 \cdot 0.952 \text{ molal} \cdot 0.512 \text{ °C m}^{-1}$

$\Delta T_b = .487 \text{ °C}$

$T_b = 100.487 \text{ °C}$

2. A solution is prepared by mixing 3.85 grams of $Ca(NO_3)_2$ in 150. grams of H_2O. Calculate the ideal freezing point and the ideal boiling point of the solution. (NOTE: $k_f(H_2O) = 1.86 \text{ C m}^{-1}$ and $k_b(H_2O) = 0.52$)

mol $Ca(NO_3)_2$ = 3.85 gram $Ca(NO_3)_2$* (1 mol $Ca(NO_3)_2$/164 grams $Ca(NO_3)_2$) = 0.0235 mol $Ca(NO_3)_2$

molality $Ca(NO_3)_2$ = mol $Ca(NO_3)_2$/ kg solvent = 0.0235 mol $Ca(NO_3)_2$/0.150 kg H_2O) = 0.157 molal $Ca(NO_3)_2$

$Ca(NO_3)_2$ is a electrolyte. Since $Ca(NO_3)_2$ is an ionic substance it will dissociate in water. The van Hoff factor is 3 (i = 3) because $Ca(NO_3)_2$behaves in the following way when added to water,

$Ca(NO_3)_2(s)$ -----> $Ca^{2+}(aq) + 2NO_3^-(aq)$

freezing point	boiling point

-0.873 °C	100.24 °C
$\Delta T_f = i \cdot m \cdot k_f$	$\Delta T_b = i \cdot m \cdot k_b$
$\Delta T_f = 3 \cdot 0.157$ molal $\cdot$ 1.86 °C m^{-1}	$\Delta T_b = 3 \cdot 0.157$ molal $\cdot$ 0.512 °C m^{-1}
$\Delta T_f = 0.873$ °C	$\Delta T_b = .241$ °C
$T_f = -0.873$ °C	$T_b = 100.241$ °C

3. Calculate the molar mass of phenol if 0.588 grams of this compound when dissolved in 25.0 g of cyclohexane, changes the freezing point of cyclohexame by 5.04 °C. (NOTE: k_f(cyclohexane) = 20.2 °C m^{-1})

94 g mol^{-1}

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

5.04 °C = 1 $\cdot$ m $\cdot$ 20.2 °C m^{-1}

m = 5.04 °C / 20.2 °C m^{-1} = 0.250 molal

mol phenol = 0.0250 kg * (0.250 mol phenol/1 kg cyclohexane) = 0.00625 mol phenol

molar mass of phenol = 0.588 grams phenol/0.00625 mol phenol = 94.1 g mol^{-1}

6. Is there anything about the questions that you feel you do not understand? List your concerns/questions.

nothing

7. If there is one question you would like to have answered in lecture, what would that question be?

nothing