Chemistry 141 Name

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Quiz 10a (20 points) May 15, 2013

All work must be show to receive credit. Remember, significant figures are important!

Data $∆T\_{f}=iK\_{f}m, ∆T\_{fb}=iK\_{b}m, P\_{vap}=P\_{solvent}X\_{solvent}, π=iMRT, $

$$R=0.0821 {L atm}/{mol K}=62.4 {L torr}/{mol K=8.31{J}/{mol K}, } K\_{f, water}=1.86{K}/{m}, $$

1. (20 points) A solution of sodium chloride with a density of 1.0639 g/mL freezes at –5.42oC. Determine the following:
	1. What is the molality of the sodium chloride solution?

$$∆T\_{f}=iK\_{f}m$$

$$m=\frac{∆T\_{f}}{iK\_{f}}=\frac{5.42 K}{\left(2\right)\left(1.86 K/m\right)}=1.46 m NaCl$$

Get 2.91 m if forget that sodium chloride dissociates.

* 1. What is the mass percent sodium chloride in the solution?

$$\%=\left(\frac{mass NaCl}{mass solution}\right)×100=\left(\frac{0.0853 g NaCl}{1.0853 g soln}\right)×100=7.86\% NaCl $$

$$\frac{1.46 mol NaCl}{1 kg water}×\frac{1 kg water}{1000 g water}×\frac{58.443 g NaCl}{1 mol NaCl}=\frac{0.0853 g NaCl}{1 g water}\rightarrow \rightarrow \frac{0.0853 g NaCl}{1.0853 g soln}$$

 Get 0.170 g NaCl/1.170 g soln if forget *i*, 14.5 % NaCl

* 1. What is the molarity of the sodium chloride solution?

$$M=\frac{mol NaCl}{L soln}=\frac{7.86 g NaCl}{100 g soln}×\frac{1 mol NaCl}{58.443 g NaCl}×\frac{1.0639 g soln}{1 mL soln}×\frac{1000 mL soln}{1 L soln}=1.43 M NaCl$$

 Get 2.63 M NaCl if forget *i* = 2.

* 1. What is the osmotic pressure of the solution in atm at 25oC?

$$π=iMRT=\left(2\right)\left(\frac{1.43 mol NaCl}{L}\right)\left(\frac{0.0821 L atm}{mol K}\right)\left(298 K\right)=70.0 atm$$

 Get 64.3 atm if forget *i* = 2.