CHM 112 Solutions Chapter 11 Extra Credit Name _____key_____

1. Give an example of each of the following types of solutions:

   (a) a gas in a liquid

   (b) a gas in a gas

   (c) a solid in a solid

2. Indicate the most important types of intermolecular attractions in each of the following solutions:

   (a) NO(*l*) in CO(*l*) dipole-dipole

   (b) $Cl_2(g)$ in $Br_2(l)$ dispersion

   (c) HCl(*aq*) in benzene $C_6H_6(l)$ dispersion

   (d) Methanol $CH_3OH(l)$ in $H_2O(l)$ H-bond

3. Heat is released when some solutions form; heat is absorbed when other solutions form. Provide a molecular explanation for the difference between these two types of spontaneous processes.

4. Ethylene glycol ($HOCH_2CH_2OH$) is miscible in water in all proportions. Explain why.

Very similar IMFs make for an ideal solution.

5. Methanol not soluble in hexane, but heptanol is soluble. Why? Look up the structures and determine the intermolecular forces for all three molecules. Draw the structures and show how each would interact.)

6. Which of the following pairs is more likely to be soluble in water **and Why**? (list the intermolecular forces involved)

   a) HBr or I_2

   b) $CHCl_3$ or NaCl

   c) $(CH_3)_3N$ or NH_3

   d) He or Nitrogen (N_2)

7. 125 g of NaCl is dissolved in 750. grams of water. What is the molality, mass percent and mole fraction of NaCl in this solution?

2.85 m 14.3 % mole fraction NaCl = .0488

8. Calculate the percent by mass, mole fraction of H_2SO_4 and molality of an 18.0 Molar solution of H_2SO_4(aq) given that the density of the solution is 1.84 g/mL.

Mole fraction H_2SO_4 = 95.9 %

237 m

9. Commercial Ammonia is 28% NH_3 by mass. It has a density of 0.90 g/ml. Calculate the molarity of this solution.

14.8 M

10. How many grams of NaCl are needed to lower the freezing point of the 500. g of water by 10.00 °C?

78.6 g NaCl

11. How many grams of nonvolatile compound B (molar mass= 97.80 g/mol) would need to be added to 250.0 g of water to produce a solution with a vapor pressure of 23.756 torr? The vapor pressure of water at this temperature is 42.362 torr.

1064 g

12. The freezing point depression of a 0.10 *m* solution of HF(aq) solution is -0.201 °C. Calculate the van't Hoff Factor for HF in this solution. Is HF a strong acid?

i = 1.08

13. Ethylene glycol ($C_2H_6O_2$) is used in many anti-freeze mixtures. How many grams of Ethylene glycol must be added to 4.00 L of water so that the resulting solution freezes at -30. °C? (K_f for water = 1.86 °C /*m*)

4000 g

14. Which aqueous solution is likely to have a higher boiling point, 0.50 *m* KBr or 0.50 *m* Na_2SO_4? Why?

Because i = 3

15. The freezing point of a solution that contains *1.00 g* of an unknown compound dissolved in *10.0 g of benzene* is found to be 2.07 °C. The freezing point of pure benzene is 5.48 °C. The molal freezing point depression constant of benzene is 5.12 °C/molal. What is the molar mass of the unknown compound?

150 g/mole

16. What is the osmotic pressure (at 25°C) of seawater? It contains approximately 35.0 grams of NaCl per liter. (Seawater contains other stuff, but we'll ignore it.)

29.3 atm

17. Look up the Osmotic Pressure in your blood and discuss why sea water will kill you if you drink it. (I know that it is more to do with kidneys than blood… but that is too much biology for this worksheet.)