CHEM 1474
Quiz #2
Spring 2011 (Buckley)

1. (8 points) Complete each of the following.

a. Arrange the following solutions in order of increasing boiling point (from lowest to highest). If two or more have the same boiling point, please indicate which those are and where their position is in the list.

0.15 m Ba(NO$_3$)$_2$  0.10 m C$_6$H$_{12}$O$_6$  0.20 m NaCl  0.15 m HCl

b. Arrange the following solutions in order of decreasing vapor pressure (highest to lowest). If two or more have the same vapor pressure, please indicate which those are and where their position is in the list.

0.20 m SrBr$_2$  0.15 m Rb$_2$SO$_4$  0.25 m C$_2$H$_6$O$_2$  0.10 m KBr

c. Arrange the following solutions in order of increasing osmotic pressure (lowest to highest). If two or more have the same osmotic pressure, please indicate which those are and where their position is in the list.

0.05 M C$_6$H$_{12}$O$_6$  0.05 M C$_{12}$H$_{22}$O$_{11}$  0.04 M NaCl  0.01 M Na$_2$SO$_4$

d. Arrange the following solutions in order of decreasing freezing point (highest to lowest). If two or more have the same freezing point, please indicate which those are and where their position is in the list.

Solution 1 is 0.10 m in NaCl and 0.10 m in C$_6$H$_{12}$O$_6$
Solution 2 is 0.05 m in BaBr$_2$ and 0.05 m in KBr
Solution 3 is 0.05 m in Ca(NO$_3$)$_2$ and 0.10 m BaBr$_2$
2. (9 points) 15.0-g of CCl₄ are dissolved in 175.0-g of benzene (C₆H₆). For benzene, the normal boiling point is 80.1 °C and \( K_b = 2.53 \, °C/m \); normal freezing point is 5.5 °C and \( K_f = 5.12 \, °C/m \); and the vapor pressure at 25 °C is 100 torr. Show your work.

a. What is the boiling point of the solution?

b. What is the freezing point of the solution?

c. What is the vapor pressure of the solution at 25 °C?

3. (5 points) A mass of 0.397-g of a nonelectrolyte solute are dissolved in 48.7-g of CCl₄. The freezing point depression of the solution is 2.85 °C. What is the molar mass of the solute? \( K_f \) for CCl₄ is 29.8 °C/m.