Questions for Review

Chem 1C Exam #2, Spring 09, Lingwood

1. For each transition metal complex, give the charge on the transition metal center and either the name or the formula of the compound.
    a. $K_4[Cu(CN)_6]$
    b. $[Cu(NH_3)_5(OH)]NO_3$
    c. sodium tetrahydroxozincate(II)
    d. dichlorobis(ethylenediamine)cobalt(III) chloride

2. Which types of isomerism could the following compounds display?
    a. $[FeBrCl(en)_2]Cl$
    b. $Ca[Fe(NO_2)_4(en)]$

3. How many unpaired electrons are in the following? Assume all complex ions have an octahedral or tetrahedral geometry.
    a. $Ca_2[Fe(NO_2)_6]$
    b. $Ca[Mn(NO_2)_4]$
    c. $Mg_2[FeBr_6]$

4. Which of the complex ions below absorbs the shortest wavelength of light?
    $Mg_2[FeBr_6]$ $Ca_2[Fe(NO_2)_6]$ $[Fe(NH_3)_5(OH)]NO_3$

5. An aqueous solution of glycerol (MW=92.02g/mol) was made by dissolving 45.3g of glycerol in 110.0 mL of water. The resulting volume was 118.3 mL. Assume the density of water is 1.000 g/mL. Calculate the molarity, molality and mole fraction of glucose in this solution.

6. What is the solubility of O_2 in water at 25°C when the partial pressure of oxygen above the water is 2.00 atm? The Henry's law constant of O_2 is 4.34×10^4 atm at 25°C, and give your answer in terms of the mole fraction of oxygen.

7. What is the vapor pressure of the solution in problem 5 at 25°C? The vapor pressure of pure water at 25°C is 23.76 torr.

8. What is the boiling point, and freezing of the solution in problem 5? Also calculate the osmotic pressure at 25°C. Glycerol is a non-electrolyte. Water: K_f = 1.86 °C kg/mol, K_b = 0.51 °C kg/mol

9. You mix ethanol and pentane together, and the resulting solution feels cold to the touch.
    a. Is this an ideal solution?
    b. If this is a non-ideal solution, does it display a positive or negative deviation from Raoult's law?
    c. What is the sign of $\Delta H_{solution}$ for this mixture?

10. You have a 0.25 molal, 0.20 molar aqueous solution of sodium sulfate, Na_2SO_4. What is the boiling point, freezing point and osmotic pressure (at 20°C) of the solution? Assume complete dissociation of the soluble salts. Water: K_f = 1.86 °C kg/mol, K_b = 0.51 °C kg/mol