General Chemistry II

RR #3

1. **Calculate the freezing point and boiling point of each aqueous solution, assuming complete dissociation of the solute. For water K_b=0.512 ˚C/m and K_f=1.86 ˚C/m.**
   - **a 0.100 m K_2S in water**
   - **b 21.5 g of $CuCl_2$ in 4.50 x 10^2 g of water**
   - **c 5.5% $NaNO_3$ by mass in water**
2. **How many grams of glucose per liter should be used for an intravenous solution that is isotonic with the 7.65 atm osmotic pressure of blood at body temperature 37.0˚C?**

3. **Denali is the tallest mountain in North America at 6.168 km (20,237 ft). At the summit, the atmospheric pressure is on average 289.1 Torr. You plan to boil 2.00 L of water to cook some pasta. Assuming complete dissociation, how many grams of NaCl do you need to add to your water to have it boil at 100˚C? K_b is 0.512 ˚C/m and the boiling point of water at this altitude is 75˚C. Water's density is 1 g/mL.**

4. **What is the vapor pressure of the pure solvent if the vapor pressure of a solution of 10.0 g of glucose in 100.0 g of ethanol is 55 mmHg?**

5. **The osmotic pressure of a solution containing 5.87 mg of an unknown protein per 10.0 mL of an unknown protein per 10.0 mL of solution is 2.45 mmHg at 28˚C. Find the molar mass of the unknown protein.**

6. **For the following reaction at 856°C: $2NH_3 \rightarrow N_2 + 3H_2$ the average rate of disappearance of NH_3 over the time period from t= 0 to t = 4186 s is found to be $1.50*10^{-6}$ M s^{-1}.**
    a. **The average rate of formation of H_2 over the same time period is:**

    b. **The average rate of composition of N_2 is:**

    c. **The average rate of reaction is:**

7. **A reaction in which A, B, and C react to form products is first order in A, second order in B, and zero order in C.**
    a **Write a rate law for the reaction**
    b **What is the overall order of the reaction?**
    c **By what factor does the reaction rate change if [A] is doubled and the rest stay constant?**
    d **By what factor does the reaction rate change if [B] is doubled and the rest stay constant?**
    e **By what factor does the reaction rate change if [C] is doubled and the rest stay constant?**
    f **By what factor does the reaction rate change if all three concentrations are doubled?**
    g **What are the units of the rate constant, k, for the reaction (assume the relevant time unit is in seconds)?**

8. **The data below were collected for this reaction: $2NO_2(g) + F_2(g) \rightarrow 2NO_2F(g)$**

$[NO_2]$ (M)	$[F_2]$ (M)	Initial Rate (M/s)
0.100	0.100	0.026
0.200	0.100	0.051
0.200	0.200	0.103
0.400	0.400	0.411

Write an expression for the reaction rate law and calculate the value of the rate constant, k. What is the overall order of the reaction?