Thursday July 7, 2016
Chem 104 – PLI 26
Chapter 14 (kinetics)

1. Please identify the following statements as either true or false:

   a) _____ Adding solute to a pure solvent widens the temperature range at which the solution is liquid.
   b) _____ The units of the rate constant, k, are the same for all order reactions.
   c) _____ The graph of reactant concentration vs. time is linear for all order reactions.
   d) _____ Radioactive decay is always a first-order process.
   e) _____ For first-order reactions, the reaction half-life is always $t_{1/2} = \frac{\ln 2}{k}$.
   f) _____ The order of a reaction with respect to a particular reactant is always that reactant's stoichiometric coefficient as written in the reaction.
   g) _____ The concentration of a catalyst can never appear in the rate equation.
   h) _____ A catalyst can increase the rate at which reactants are converted to products.
   i) _____ A catalyst can make a reaction more product favored.

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

3. Write an expression for the reaction rate law and calculate the value of the rate constant, *k* based on the following data. What is the overall order of the reaction?

$$2\ NO_{2\,(g)} + F_{2\,(g)} \longrightarrow 2\ NO_2F_{\,(g)}$$

[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

4. Please use the table below to determine the order of NOBr decomposition and the value of k:

Time (s)	[NOBr] (M)	ln[NOBr]	1/[NOBr]
10	0.50		
20	0.33		
30	0.25		
40	0.20		

5. The decomposition of XY is second order in XY and has a rate constant of 7.02×10^{-3} 1/M•s at a certain temperature:

   a) How long will it take for the concentration of XY to decrease to 12.5% of its initial concentration when the initial concentration is 0.100 M?

   b) How long will it take for the concentration of XY to decrease to 12.5% of its initial concentration when the initial concentration is 0.200 M?

   c) If this were a first order reaction, how would your calculations differ? Please explain briefly.

   d) If the initial concentration of XY is 0.052 M, what is the concentration of XY after 64 s?