D15 Rates CW and HW

Ch. 13 #31 The rate of the following reaction in aqueous solution is monitored by measuring the rate of formation of I_3^-. Data obtained are listed in the table.

$$S_2O_8^{-2} + 3\,I^- \rightarrow 2SO_4^{-2} + I_3^-$$

Experiment	Initial Concentration of $S_2O_8^{-2}$ (mol/L)	Initial Concentration of I^- (mol/L)	Initial Rate of (mol L^{-1} s^{-1})
1	0.038	0.0600	$1.4 * 10^{-5}$
2	0.076	0.0600	$2.8 * 10^{-5}$
3	0.076	0.1200	$5.6 * 10^{-5}$

a. Determine the order of the reaction with respect to each of the following reactants. Give the overall reaction order.
   (i) $S_2O_8^{-2}$ (ii) I^-
b. Write the expression for the rate law for the reaction as determined from the experimental data.
c. Determine the value of the rate constant for the reaction, clearly indicating the units.
d. What would be the initial rate of reaction if $[S_2O_8^{-2}]$ = 0.083M and $[I^-]$ = 1.115M?

Ch. 13 #32 The rate of the following reaction in aqueous solution is monitored by measuring the moles of Hg_2Cl_2 that precipitate per liter per minute. Data obtained are listed in the table.

$$2HgCl_2\,(aq) + C_2O_4^{-2} \rightarrow 2Cl^- + 2CO_2\,(g) + Hg_2Cl_2\,(s)$$

Experiment	Initial Concentration of $HgCl_2$ (mol/L)	Initial Concentration of $C_2O_4^{-2}$ (mol/L)	Initial Rate of (mol/ L^{-1} s^{-1})
1	0.105	0.15	$1.8 * 10^{-5}$
2	0.105	0.30	$7.1 * 10^{-5}$
3	0.052	0.30	$3.5 * 10^{-5}$
4	0.052	0.15	$8.9 * 10^{-6}$

a. Determine the order of the reaction with respect to $HgCl_2$, with respect to $C_2O_4^{-2}$, and overall.
b. Determine the value of the rate constant for the reaction, clearly indicating the units.
c. Write the expression for the rate law for the reaction as determined from the experimental data.
d. What would be the initial rate of reaction if $[HgCl_2]$ = 0.094M and $[C_2O_4^{-2}]$ = 0.19M?

The following are from CH 13 pp 567-568

#1 State two quantities that must be measured to establish the rate of a chemical reaction and cite several factors the affect the rate of a chemical reaction.

#2 Explain why the rate of disappearance of NO and the rate of formation of N_2 are not the same in the reaction **$2CO\,(g) + 2NO\,(g) \rightarrow 2CO_2\,(g) + N_2\,(g)$.**

#4 How does the rate of a reaction differ from the rate constant of the reaction. Can they ever be the same? Explain.

#7 The reaction **2A + B → C + 2D** is first order in A and first order in B. For this reaction

a. Rate of reaction = $k[A]^2[B]$
b. Rate of reaction = $k[A][B]$
c. Rate of disappearance of A = rate of disappearance of B
d. Rate of formation of C = **-** (rate of disappearance of B)

#25a&b In the reaction **A + 2B → C + 3D**, the rate of disappearance of B is $-6.2 * 10^{-4}$M/s.
What is a. the rate of disappearance of A? b. the rate of formation of D?

#26a&b In the reaction 2**A + 2B → C + 2D**, the rate of disappearance of a is $-2.2 * 10^{-4}$M/s.
What is a. the rate of disappearance of B? b. the rate of formation of C?

Think Pair Share: Rates

1. **What two things must be measured to be able to calculate the rate of a reaction?**

2. **What factors might increase the rate of a reaction?**

3. **Write the general rates for each species in the reaction below:**

$$aA + bB \rightarrow cC + dD$$

4. **How are rates of reactants and products different?**

5. **What is a rate law?**

6. **What is the order of a reactant in a reaction?**

7. **What is overall order?**