Dr. Casagrande's Chemistry 1 Final Exam Review Sheet 3

Chapter 17: Reaction Rates

- Relate rates of chemical reactions to collisions between particles.
- Describe a reaction energy diagram and identify the activation energy and the activated complex (transition state).
- Identify the factors we have observed that affect the rates of chemical reactions.
- Explain the affect of a catalyst and inhibitor.
- Lab: Rates of Reactions.

Chapter 18: Chemical Equilibrium

- Explain what a reversible reaction is and write the equation for a reversible reaction.
- Recognize and describe the characteristics of a system at equilibrium.
- Write equilibrium expressions (K_{eq}) for systems that are at equilibrium (remember no solids and liquids).
- Calculate equilibrium constants from concentration data.
- Reading: What's so Equal about Equilibrium?

Chapter 19: Acids and Bases

- Identify the physical and chemical properties of acids and bases.
- Classify solutions as acidic, basic, or neutral based on the relative levels of $[H^+]$ and $[OH^-]$.
- Recall the Arrhenius (A) and Brønsted (B) models for acids and bases: acids provide (donate) H^+ ions (A & B) and bases either provide OH^- ions (A) or accept an H^+ from an acid (B).
- Identify the hydrogen atom in a polar bond that is ionized.
- ~~Determine whether an acid is mono-, di-, or triprotic.~~
- Identify the acid, base, conjugate acid, and conjugate base in a reaction.
- Relate the strength of an acid or base (strong or weak) to its degree of ionization (fully or partially ionized) and its other properties, such as electrical conductivity.
- Write an acid ionization (dissociation) reaction equation ~~and write the acid ionization constant expression for it~~.
- Compare the strengths of weak acids or bases from the values of their acid or base ionization constants (K_a or K_b).
- Explain how the strength of an acid or base relates to its strength as an electrolyte.
- Given the $[H^+]$ or $[OH^-]$, calculate the other from $K_w = [H^+][OH^-] = 1.0\times10^{-14}$.
- Given the $[H^+]$ calculate pH or given the $[OH^-]$ calculate pOH.
- Classify solutions as acidic, neutral, or basic based on their pH.
- Given pH or pOH, determine the other from pH + pOH = 14.
- Describe what an acid-base neutralization reaction is.
- Explain how neutralization reactions are used in acid-base titrations, and recall the vocabulary and setup of a titration from the class lab.
- Write a neutralization reaction for a given acid-base system and determine the concentration of one of the solutions given its volume and the volume and concentration of the other.
- Describe the dangers of hydrofluoric acid and the general treatment for accidental exposure
- Describe the causes and effects of acid rain and explain what has been done to reduce it.
- Labs: Acid Rainbow Demo; Invisible Fire; Titration of Vinegar; Acid Rain

General Skills from First Semester

- Be able to use Table A to convert between any two units (i.e. J / kJ, L / mL)
- Mole conversions, density, naming and formulas of compounds

Chapter 18 Problem

1. For the reaction, $2\ H_2S\ (g) \rightleftharpoons 2\ H_2\ (g) + S_2\ (g)$,
   a. Determine the equilibrium constant expression, K_{eq}, for this reaction.

   b. Given $[H_2S] = 0.193$ M, $[H_2] = 0.0035$ M, and $[S_2] = 0.0035$ M at equilibrium, calculate the value for K_{eq}.

Chapter 19 Problems

2. For following reaction, **circle the H^+ being transferred and draw an arrow** from the acid to the base *in the reactants* and **label** the acid (**A**), the base (**B**), the conjugate acid (**CA**), and the conjugate base (**CB**).

$$CO_3^{2-}\ (aq) \quad + \quad H_2O\ (l) \quad \rightleftharpoons \quad HCO_3^-\ (aq) \quad + \quad OH^-\ (aq)$$

3. A solution has $[H^+] = 1.0\times10^{-8}$ M. Determine the pH, $[OH^-]$, and pOH of this solution. Is this solution acidic, basic, or neutral?

4. What is the pOH of a solution with $[OH^-] = 3.8 \times 10^{-10}$ M? What are the $[H^+]$ and pH of this solution? Is it acidic, basic, or neutral?

5. Write the *balanced* neutralization equation for RbOH and malic acid, $H_2C_4H_4O_5$.

6. In a titration, 30.0 mL of KOH solution is neutralized by 13.85 mL of 0.600 M HI solution.
   a. Determine the number of moles of KOH neutralized in the reaction

   b. Determine the concentration of the KOH solution

Answers to Chapter Problems
Chapter 18: #1. $K_{eq} = [H_2]^2[S_2]/[H_2S]^2 = 1.15\times10^{-6}$
Chapter 19: #2. A: H_2O; CB: OH^-; B: CO_3^{2-}; CA: HCO_3^{2-}; #3. pH = 8, $[OH^-] = 1.0\times10^{-6}$ M, Basic; pOH = 6; #4. pOH = 9.42, $[H^+] = 2.6\times10^{-5}$ M, pH = 4.58, Acidic; #5. 2,1,→ $RbC_4H_4O_5$ (aq) + $2H_2O$ (*l*); #6a. mol KOH = 0.00831 mol, #6b. $M_{KOH} = 0.277$ M