SCH 4U
J. Kropac

Unit 4 Review

- What is meant by the term dynamic equilibrium?
- What are the three types of equilibria we covered in class?
- What does Keq describe? Using Keq, how would you know when products are favored? Reactants?
- What happens to a systems in equilibriums when: The concentration of reactants is increased, the concentration of products is increased, the concentration of reactant is decreased, temperature is increased, temperature is decreased, a catalyst is added, pressure is increased, volume is increased.
- Know what the hundred rule is and when to apply it.
- What is reaction quotient? How can it help you determine the direction of the reaction?
- What does Ksp stand for? How can it be used to determine if a precipitate will form?
- List properties of both acids and bases.
- What is Arrhenius' definition of an acid? Bronsted-Lowry?
- What does the term amphoteric mean?
- Do strong acids ionize completely in water? What about weak acids?
- What salts may be acidic in water? Basic?
- What is a buffer and how do they work?
- What does K_a stand for and how does it relate to the strength of an acid. K_b?
- What is titration? What are the products of titration always going to be?
- Describe how to identify the equivalence point.

Skills

- Be able to write a K_{eq} expressions
- Calculate K_{eq} using a variety of methods (initial concentration, partial pressures, ICE table)
- Use the quadratic formula to solve for equilibrium concentration.
- Use K_{sp} to solve for the equilibrium concentration of various ions.
- Use solubility to solve for K_{sp}
- Calculate pH using pOH or concentration of hydrogen
- Calculate percent ionization
- Calculate K_a and K_b using pH and initial concentration

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Practice Problems:

In a 5 L flask, 0.1 mols of $N_{2(g)}$ and 0.3 moles of $NH_{3(g)}$ was recorded. If $K_{eq}=3.1 \times 10^{-2}$, what is the concentration of $H_{2(g)}$ at equilibrium?

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

$Br_{2(g)}$ and $Cl_{2(g)}$ establish an equilibrium to form BrCl. The K_{eq} for this reaction is 28.8. If 8.0 mol of $Br_{2(g)}$ and 8.0 mol of $Cl_{2(g)}$ are initially placed into a 2 L flask, what is the concentration of BrCl at equilibrium?

$$Br_{2(g)} + Cl_{2(g)} \rightleftharpoons 2BrCl_{(g)}$$

9.8 mol of $N_2O_{4(g)}$ was initially placed into an 8 L flask and was allowed to come to equilibrium. If the K_{eq} for the equation is 8.9×10^{-11}, what is the equilibrium concentration of $NO_{2(g)}$?

$$N_2O_{4(g)} \rightleftharpoons 2NO_{2(g)}$$

At a single point it time, it was determined that a reaction contained 0.3 M N_2, 0.5 M H_2, and 1.0 M NH_3. If K_{eq} for the reaction is 50, is the reaction at equilibrium when the measurements were taken?

$$N_2 + 3H_2 \rightleftharpoons 2NH_3$$

The solubility of silver sulfide, Ag_2S is 3.0×10^{-3} M. What is the K_{sp} of silver sulfide dissolving in water?

The K_{sp} of NaCl is 1.38. What is the equilibrium concentration of chloride ions in a saturated solution?

What is the pH of a solution containing 3.0 M H_3O^+ ions?

What is the pOH of a solution containing 3.0×10^{-4} M H_3O^+ ions?

Propanoic acid is a weak acid. If 1.0 M solution has a pH of 3.8, calculate the percent ionization of propanoic acid.

$$CH_3CH_2COOH \rightleftharpoons CH_3CH_2COO^- + H_3O^+$$

Pyridine, C_5H_5N, is a weak base. If 0.38 M solution has a pH of 10.98, what is the percent ionization of pyridine?

$$C_5H_5N \rightleftharpoons C_5H_5N^+ + OH^-$$

50 mL of 1.0 M LiOH is titrated with 1.3 M HF. Calculate the pH after the addition of 35 mL of HF.

$$LiOH + HF \rightarrow LiF + H_2O$$