Study Guide for Exam #2, Ch. 16-17

Chem1B, General Chemistry II

MEMORIZE

- List of strong acids/bases
- $K_w = 1.0 \times 10^{-14} = [H_3O^+][OH^-] = K_a \times K_b$ (for conjugates)
- $pH = -\log[H_3O^+]$; $pOH = -\log[OH^-]$; $14.00 = pH + pOH$
- percent ionization = $\frac{[H^+]\text{at equilibrium}}{[HA]\text{initial}} \times 100$ or $\frac{[OH^-]_{\text{at equilibrium}}}{[B]_{\text{initial}}} \times 100$
- $pH = pK_a + \log([\text{conj. base}]/[\text{acid}])$ or $pOH = pK_b + \log([\text{conj. acid}]/[\text{base}])$

Chapter 16: Acid-Base Equilibria

I. Acids and Bases (16.1-2, 5): Be able to identify Arrhenius/Brønsted-Lowry acids/bases and their conjugates. Know the difference between strong acids/bases and weak, and memorize the former. Know to arrange acids/bases by strength, stability of their conjugate, percent ionization, or pH/pOH.
Examples, Ch. 16: 17-22, 25-28, 107

II. The pH Scale (16.3-4): Be able to calculate the $[H_3O^+]$, $[OH^-]$, pH, and pOH of a solution from just one of the four. Know how to calculate the pH/pOH for a strong acid/base solution.
Examples, Ch. 16: 30-32, 39-42, 45-48

III. Dissociation Constants (16.6-9): Be able to predict the equilibria present with weak acids/bases in aqueous solution. Know how to use the appropriate K_a/K_b expression to determine the pH/pOH or percent ionization of an aqueous solution of a weak acid or base. Know when simplifying assumptions can be made. Know how to determine the pH/pOH of a salt solution that contains one or more conjugates of a weak acid/base.
Examples, Ch. 16: 53-70, 75-78, 83-84, 89-90, 110, 113

Chapter 17: Additional Aspects of Equilibria

I. The Common Ion Effect (17.1): Know how to calculate the pH/pOH of a mixture of weak and strong electrolyte containing a common ion.
Examples, Ch. 17: 15-18

II. Buffer Solutions (17.2): Know how to use the Henderson-Hasselbalch Equation to calculate pH, [conjugate base], or [acid] given the any two for any buffer solution. Be able to use stoichiometry to determine the change in pH to a buffer due to the addition of a strong acid or strong base.
Examples, Ch. 17: 21-28, 76-77, 81, 87, 89

III. Titrations (17.3): Be able to calculate the pH during a strong acid-strong base or weak acid-strong base titration before, at, and after equivalence point given different volumes of titrant added.
Examples, Ch. 17: 41-46, 82, 85

IV. Solubility Equilibria (17.4-6): Know how to use the K_{sp} for a given compound to calculate the molar solubility, whether alone, in the presence of common ions, at different pH levels, or in the presence of a Lewis base to form a complex ion. Know how to use the values of Q versus K_{sp} to determine whether a compound will precipitate or not.
Examples, Ch. 17: 49-56, 59-61, 63-68, 91, 95-99