Learning Objectives for Acid-Base Equilibria

- To describe the assumption(s) that are generally used when strong, monoprotic acids (bases) are dissolved in water.
- To describe the conditions under which the contribution of H_3O^+ (OH^-) from the dissociation of water will be important in a solution containing a strong, monoprotic acid (base).
- To describe the rules for determining whether or not water dissociation will contribute greater than 5% of the total H_3O^+ (OH^-) concentration in a solution containing a strong, monoprotic acid (base).
- To calculate the pH, pOH, $[H_3O^+]_{tot}$, $[OH^-]_{tot}$, $[H_3O^+]_{water}$, and $[OH^-]_{water}$ in a solution containing a strong acid (base) given the initial concentration of the acid (base).
- To describe the conditions under which the contribution of H_3O^+ (OH^-) from the dissociation of water will be important in a solution containing a weak, monoprotic acid (base).
- To describe the rules for determining whether or not water dissociation will contribute greater than 5% of the total H_3O^+ (OH^-) concentration in a solution containing a weak, monoprotic acid (base).
- To calculate the pH, pOH, percent dissociation and equilibrium concentrations of all chemical species for the following types of solutions given initial concentration(s) and the value for K_a (K_b):
  - Weak, monoprotic acid (base) in water
  - Salt of a weak, monoprotic acid (base) in water
  - Weak, monoprotic acid (base) + salt of the weak, monoprotic acid (base) in water (i.e., buffer solution)
- To describe how the degree of dissociation of an acid (base) is related to the value of K_a (or K_b).
- To describe how the relative strengths of the conjugate bases of a series of acids can be evaluated using the values of K_a for the acids.
- To describe how the relative strengths of the conjugate acids of a series of bases can be evaluated using the values of K_b for the bases.
- To describe the “leveling effect”.
- To describe the conditions under which the contribution of H_3O^+ (OH^-) from the dissociation of water will be important in a solution containing a salt of a weak, monoprotic acid (base).
- To describe the rules for determining whether or not water dissociation will contribute greater than 5% of the total H_3O^+ (OH^-) concentration in a solution containing a salt of a weak, monoprotic acid (base).
- To determine whether an aqueous solution of a salt will be acidic, basic or neutral given values of K_a and K_b for conjugate acid-base pairs.
- To describe a "buffer solution”.

- To describe how either an acidic or basic buffer solution is prepared.
- To describe "buffer capacity".
- To describe the “common ion effect”.
- To describe, by using chemical equations and the Henderson-Hasselbalch equation, how a buffer solution (either acidic or basic) is able to resist large changes in pH when small amounts of either acid or base are added to the buffer solution.