V. Aqueous Equilibria: Acids and Bases.

E. pH and other calculations for weak acids and bases.
   1. Weak acids. Acid dissociation equilibria, $K_a$ expression, type 1 ($K_a$ from conc. & pH) & 2 (pH from conc. & $K_a$) calculations, assumption, Finklea’s 10% rule.
   2. Weak polyprotic acids. Limit to diprotic weak acids, two dissociation equilibria, $K_{a1}$ & $K_{a2}$ expressions, type 3 (pH, $[H_2A]$, $[HA^-]$, $[A^{2-}]$ from conc. & $K_a$’s) calculation.
   3. Weak bases. Base dissociation equilibria, $K_b$ expressions, type 2’ (pH from conc. & $K_b$) calculation.
   4. Relationship between $K_a$ and $K_b$ for a conjugate acid/base pair. Hydrolysis rxn. of anion of weak acid, $K_a$-$K_b = K_w$ for conjugate acid-base pair, pH of salt sol’ns given conc. and $K_a$ or $K_b$.

F. Factors that affect acid strength. Patterns for binary acids and oxoacids.

VI. Applications of Aqueous Equilibria.

A. Neutralization reactions. Definition, calculation of K for neutralization reaction.

B. The common ion effect. Le Chatelier’s Principle, qualitative effect (increase? decrease?) of common ion on pH.

C. Buffer solutions. Definition, H-H equ. ($pH = pK_a + \log([\text{base}]/[\text{acid}])$), type 4 (pH of buffer given composition), type 5 (pH change after adding strong acid or base), and type 6 calculations (preparation of a buffer).

D. pH titration curves. Definitions (sample, titrant, titration curve), choice of best indicator.
   (a) Strong acid-strong base. Calculate $V_{eq}$, pH at (1) $V = 0$, (2) $0 < V < V_{eq}$, (3) $V = V_{eq}$, & (4) $V > V_{eq}$.
   (b) Weak acid - strong base or weak base - strong acid. Calculate $V_{eq}$, pH at (1) $V = 0$, (2) $0 < V < V_{eq}$, and (3) $V = V_{eq}$.
E. Solubility equilibria.

1. Solubility product. Solubility equilibria, $K_{sp}$ expression.

2. Calculations using solubility equilibria. Type 1 ($K_{sp}$ from conc. in saturated sol’n) & type 2 calculations (molar solubility from $K_{sp}$).

3. The common ion effect. Qualitative effects (adding common ion, including $H^+$ or $OH^-$; adding ligand; amphoterism), type 3 calculation (molar solubility in the presence of a common ion), assumption, Finklea’s 10% rule, type 3’ (molar solubility of $OH^-$ salt in a buffer).

4. Selective precipitation. Ion Product & type 4 calculation (will a ppt. form when 2 sol’ns are mixed?), type 5 calculation (will a metal ion precipitate in a solution of known pH saturated with $H_2S$?).