Concepts and calculations related to Exam #2

Chapter 6.
      1. Expression of equilibrium constant and manipulation of it
      2. Le Châtelier's principle and using it to predict the direction of a shift of an equilibrium.
      5. Definitions of strong acids/bases and weak acids/bases. Conjugate acid and base pair.
      6. Physical meanings of K_w, K_a and K_b. The relationships among them.

Chapter 8.
      1. The effect of ionic strength on acid dissociation, pH of water, and solubility of a precipitate.
      2. Ionic atmosphere and ionic strength. You are required to memorize the equation for ionic strength.
      3. Activity and activity coefficient
      4. The relationship between activity coefficient and ionic strength (Extended Debye-Hückle equation will be provided).
      5. Use of the above solutions to calculate pH and solubility of a relatively insoluble salt in the presence of a strong inert salt.

Chapter 8.
      1. Charge and mass balance equations
      2. Setting up enough equations using charge and mass balance equations and equilibrium constants for a solution containing several species.

Chapter 9.
      1. Systematic treatments of weak acid and base equilibria.
      2. Calculating the pH values of weak acid and base in relatively high and low acid/base concentrations.
      3. Buffer solutions and components of a buffer solution
      4. Henderson-Hasselbalch equation and the calculations involved (dilution, addition of an acid, preparation of a buffer solution and some special cases).

Chapter 11.
      1. Strong acid-base titration curve. Calculating the pH values in the three regions: (a) before, (b) at, and (c) after equivalence point
      2. Strong acid-monoprotic weak base (or vice versa) titration curve. Calculating the pH values in the four regions: (a) before titrant is added, (b) before, (c) at, and (d) after the equivalence point.
      3. How indicator works and the choice of an indicator for a particular titration.

Chapter 12.. EDTA titration

        1. The chelate effect and multidentate ligands.
        2.   Conditional formation constant of a metal-EDTA complex. The use of it to calculate free metal concentration in a metal-EDTA solution of known concentration.
        3. Calculate pM^{n+} at different stage of an EDTA titration: before, at and after the equivalence point.