Learning Objectives Exam 2

Chapter 17 Acids and Bases: A Second Look

1. Be able to recognize acids and bases using the Arrhenius definition, the Brønsted-Lowry definition and the Lewis definition.
2. Be able to identify conjugate acid-base pairs in a chemical reaction.
3. Know the identities of the common strong acids and the common strong bases.
4. Be able to write equations showing the ionization of both strong and weak acids (the reaction with water to produce hydronium ions.)
5. Be able to write equations showing the ionization of weak bases (the reaction with water to produce hydroxide ions.)
6. Be able to write equations illustrating amphoterism (see practice exercise 5)
7. Be able to predict the direction of a reaction if you know relative strengths of the acids and bases.
8. Be able to predict relative acid strength using electronegativities, bond energies and
9. oxidation numbers.
10. Be able to explain how metal ions can behave as acids.
11. Be able to predict whether an oxide is likely to be acidic or basic, and to write equations illustrating it.
12. Be able to write the equation for the dissociation (auto-ionization) of water and to use it to determine concentrations of hydronium ions and hydroxide ions in water.
13. Be able to use $[H_3O^+]$ and $[OH^-]$ to determine if a solution is acidic, basic or neutral.
14. Be able to calculate and interpret pH (and pOH) values.
15. Be able to explain how pH is measured.
16. Be able to work a neutralization problem that includes pH as part of the information (HW 76 and 77)

Homework (Review Q&P): 7-9,12-16, 23,27,29,32-36,40-50 (evens; do more if more work is needed);54,55,58,60,62,66,68,70,72,74,76,77, 81,83

Chapter 18: Equilibria in solutions of weak acids and bases

1. Be able to interpret Ka and Kb values in terms of relative acid-base strength.
2. Be able to calculate and use pH values for weak acids and bases.
3. Be able to calculate equilibrium concentrations for weak acids and bases.
4. Be able to determine the % dissociation of weak acids and bases.
5. Be able to determine the equilibrium concentrations of all species present in polyprotic acids.
6. Be able to convert between Ka and Kb for conjugate acid base pairs.
7. Be able to predict whether salts are acidic, basic or neutral.
8. Be able to write net ionic equations for neutralization reactions and calculate the Kn.
9. Be able to predict shifts based on the Common-Ion Effect
10. Be able to calculate the concentrations of all ions present, pH and percent dissociation in solutions containing both weak acids and conjugate bases.
11. Be able to calculate pH of buffer solutions and to recommend how to make a solution that buffers at a given pH.
12. Be able to label equivalence points on titration curves of strong and weak acids and bases.

13. Be able to calculate the pH at different points in a titration.
14. Be able to explain how acid base indicators work and how to select the right indicator for a titration.

Homework: Thinking it through: 10, 11 Review Q&P: 2,3,5,6,10,13,15,16,17,19,22,23,25,26,27,28,29,33,37,38,39,41,42-120 (evens; do as many as possible from each section; more practice = increased skill!)

Equations Provided on test
$pH = pKa + \log([A^-]/[H^+])$

From last exam:

Chapter 15 Chemical Kinetics - Review

1. From the coefficients of a balanced chemical equation, express the relative rates of consumption of reactants and formation of products. Practice with HW 66-68
2. From a table of initial concentrations of reactants and initial rates, determine the order of reaction with respect to each reactant, the overall order of reaction the rate law, the rate constant, and the initial rate for any other set of initial concentrations. Practice with HW 27-30 and 76-81.

Chapter 16 Chemical Equilibrium - Review

1. Be able to define equilibrium in terms of concentration changes as well as reaction rates.
2. Be able to write the equilibrium equation (mass law expression) for homogeneous and heterogeneous equilibria.
3. Be able to use K to evaluate the efficiency of the reaction.
4. Be able to predict the direction of a reaction by comparing Q with K.
5. Be able to calculate equilibrium concentrations.
6. Be able to clearly state le Châtelier's Principle.
7. Be able to predict shifts using on le Châtelier's Principle.