CHM 2046C Final Exam Objectives Chapters 15-21 (150 points)

Chapter 15 Kinetics (10 points)

1. 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.

Chapter 16 Chemical Equilibrium (10 points)

1. Be able to write the equilibrium equation (mass law expression) for homogeneous and heterogeneous equilibria..
2. Be able to predict the direction of a reaction by comparing Q with K.
3. Be able to calculate equilibrium concentrations.

Chapter 17 Acids and Bases: A Second Look (5 points)

1. Be able to recognize acids and bases using the Arrhenius definition, the Brønsted-Lowry definition and the Lewis definition..
2. Know the identities of the common strong acids and the common strong bases.
3. Be able to write equations showing the ionization of both strong and weak acids (the reaction with water to produce hydronium ions.)
4. Be able to write equations showing the ionization of weak bases (the reaction with water to produce hydroxide ions.)

Chapter 18: Equilibria in solutions of weak acids and bases (15 points)

1. Be able to calculate and use pH values for weak acids and bases.
2. Be able to calculate equilibrium concentrations for weak acids and bases.
3. Be able to convert between Ka and Kb for conjugate acid base pairs.
4. Be able to predict shifts based on the Common-Ion Effect
5. Be able to calculate the concentrations of all ions present, pH and percent dissociation in solutions containing both weak acids and conjugate bases.
6. Be able to calculate the pH at different points in a titration.

Chapter 19 Solubility and Simultaneous Equilibria (10 points)

1. Be able to write equilibrium expressions for saturated solutions and calculate Ksp
2. Be able to calculate molar solubility
3. Be able to calculate molar solubilities taking into account the common ion effect and the formation of complex ions.
4. Be able to determine whether a precipitate will form when combining solutions.

Chapter 20 Thermochemistry (50 points)

1. Be able to write equations associated with ΔH_f and to use ΔH_f to calculate ΔH of reactions.
2. Be able to define entropy and predict the relative values for entropy changes.
3. Be able to use ΔG to determine if a reaction is spontaneous, nonspontaneous or at equilibrium. Predict whether the sign of ΔS is positive or negative for a chemical or physical change.

4. Be able to calculate and to use ΔG to determine if a reaction is spontaneous, non-spontaneous or at equilibrium.
5. Be able to correctly use and interpret the sign conventions used in thermodynamics
6. Be able to distinguish between internal energy and enthalpy and the heats of reaction at constant volume and at constant pressure.
7. Be able to convert between Δ*E* and Δ*H* for a chemical system.
8. Be able to state the 3 laws and thermodynamics and to correctly use them to work problems.
9. Be able to use and to calculate entropy.
10. Be able to the relationship that exists between the free energy change and the work that is available from a chemical reaction.
11. Be able to calculate equilibrium constants from thermodynamic data and vice versa.
12. Be able to use bond energies to estimate heats of reactions.

HW: Review Q and P: 5,12,20,30,31,32,36,41,43, 46,58,60,64-78(even; more if needed),80-85,86-110 (even; do more if needed),119,123,128

Chapter 21 Objectives (50 points)

1. Be able to sketch a galvanic cell, identifying the anode and cathode half-reactions, the sign of each electrode and the direction of electron and ion flow.
2. Write balanced chemical equations for reactions occurring in a galvanic cell.
3. Write and interpret shorthand for galvanic cells.
4. Calculate standard cell potentials using standard reduction potentials
5. Be able to balance a redox reaction (Chapter 6)
6. Be able to use standard reduction potentials to determine the spontaneous reaction.
7. Be able to use standard reduction potentials to determine relative oxidizing and reducing strength.
8. Use the Nernst equation to calculate cell potentials for reactions occurring under nonstandard conditions.
9. Inter-convert cell potential and free-energy change for a reaction.
10. Calculate equilibrium constants from standard cell potentials.
11. Be able to distinguish between a galvanic and an electrolytic cell.
12. Be able to calculate the mass of product expected in an electrolytic cell given current and time.

HW: 66-118 evens (more if needed)

Equations provided for Final:

$E°_{cell} = E°_{anode} + E°_{cathode}$

$\Delta G° = -nFE°$

$\Delta G = \Delta G° + RT\ln Q$

$E = E° - (.0592/n) \log Q$

Charge = current x time

Moles e^- = charge x (1mol e^-)/ 96500 C

$\Delta X_{rxn} = \Sigma(nX_{final}) - \Sigma(nX_{initial})$

$\Delta G = \Delta H - T\Delta S$

$\Delta G = \Delta G° + RT\ln Q$
$R = 8.314$ J/mol·K

$pH = pK_a + \log([A^-]/[HA])$