Honors Chemistry - Second Semester Review Topics

1. *Intermolecular Forces of Attraction*
   (a) Lewis Dot structure for elements, ions and compounds.
   (b) VSEPR: electron-pair repulsion theory and molecular shapes
   (c) electronegativity; polar and nonpolar molecules
   (d) metallic bonding and the properties of metals
   (d) solids – types / bonding / properties
   (e) intermolecular forces of attraction and physical properties (ΔH_{vap}, ΔH_{fusion} …)

2. *Thermochemistry and Thermodynamics*
   (a) Endothermic and exothermic reactions; signs of ΔH
   (b) Thermochemical equations and energy diagrams
   (c) Calculate the amount of heat absorbed or given off for a given amount to reactant reacted.
   (d) Calorimetry – determining the ΔH of reaction from experimental data.
   (e) Hess' Law
   (f) Translate word descriptions into balanced thermochemical equations.
   (h) Entropy and predicting the sign of ΔS for a given reaction
   (i) driving forces behind a chemical reaction (entropy and enthalpy)
   (j) free energy and the Gibb's equation ($\Delta G^o = \Delta H^o - T\Delta S^o$)
   (k) predicting the spontaneity of a reaction

3. *Kinetics*
   (a) Factors affecting reaction rate
   (b) reaction rates and Stoichiometry
   (c) experimental determination of an rate equation - order of reaction
   (d) collision theory as it relates to rates of reaction
   (e) reaction mechanisms
   (f) activation energy, energy diagrams, catalysis
   (g) radio active decay - half life

4. *Equilibrium*
   (a) define equilibrium - give examples of systems at equilibrium
   (b) equilibrium expressions - K = products/reactants
   (c) what does the equilibrium constant tell us?
   (d) predicting the direction of a reaction - Q test
   (e) calculating equilibrium concentrations - when to use the approximation method
   (f) factors the affect chemical equilibrium - LeChatelier's Principle
   (g) Concentration-time diagrams showing how concentrations change when a stress is placed on an equilibrium system.
   (h) Only temperature changes affect the equilibrium constant (K)
   (i) solubility product - Ksp
   (j) calculate the molar solubility (s) given the K_{sp} value of a salt
   (k) calculate the K_{sp} of a salt given its molar solubility.

5. *Acid-Base Equilibrium*
   (a) define an acid and base
   (b) Bronsted Acids and Bases - conjugate acids/conjugate bases
   (c) writing ionization reactions for an acid or base reacting with water
   (d) autoionization of water
   (e) $K_w = [H+][OH-]$ or $10^{-14} = [H+][OH-]$
   (f) hydronium ion $H_3O+ = H+$
   (g) "big five" pH , pOH, $[H+] = 10^{-pH}$, $pOH = 10^{-pOH}$
   (h) strengths of acids and bases – acid and conjugate bases
   (i) calculating the pH (or pOH) of a weak acid or weak base solution
   (j) $K_w = K_aK_b$ - calculate the K_b of base given its K_a value
   (k) acid-base neutralization reactions
   (l) titration curves
   (m) hydrolysis
   (n) selecting the appropriate indicator
   (o) buffers - how make them, which component reacts with what, calculate their pH

6. *Electrochemistry*
   (a) define oxidation and reduction
   (b) assign oxidation numbers to each atom of a compound
   (c) identify the oxidizing agent; identify the reducing agent
   (d) electrochemical cells
   (e) separating a redox reaction into its two half reactions
   (f) CROAK
   (g) calculate the voltage of a cell, E, given the overall redox reaction
   (h) interpret information from a standard reduction potential table
   (i) factors the that effect the cell voltage - the chemical nature of the reactants, concentration of reactants, and temperature
   (j) electrolysis - electrolytic cells
   (k) quantitative problems involving electrolysis

7. *Experiments* - Review all second semester labs.