Chem 301, F11
Exam 1 Review Sheet

Listed below are the major topics of chapters 1-3. Keep in mind that this is only a review sheet. We've covered more material and more details than can be confined to a single page.

Chapter 1: valence electrons; octet rule; ionic and covalent bonds; index of hydrogen deficiency, writing good Lewis structures; formal charges; what are constitutional isomers?; writing good resonance structures: use curved arrows, evaluate which resonance contributors are most important; atomic orbitals and their relative energies; assignment of the electron configuration of atoms in periods 1 and 2 (Aufbau principal, Pauli exclusion principle, Hund's Rule); bonding and antibonding orbitals; construction of hybridized orbitals and identifying hybridization; σ and π bonds; trends in bond strength and length; use of VSEPR to determine electronic geometry and molecular geometry (shape); using wedges and dashes when conveying geometries of molecules; be comfortable interpreting condensed formulas, line structures

Chapter 2: recognizing functional groups (alkane, alkene, alkyne, alkyl halide, alcohol, carbonyl group); nonpolar vs polar covalent bonds; identify the direction of a dipole moment, identify whether a compound is relatively polar or nonpolar compared to another compound; three types of nonbonding interactions (dipole-dipole, hydrogen bonding, London dispersion forces) and requirements for a molecule to participate in each type of interaction; use nonbonding interactions to explain phase changes, solubility; *IR:* use an IR spectrum to determine whether certain functional groups are present in a molecule; assign/identify important peaks in an IR spectrum; use an IR spectrum to propose a reasonable molecular structure from a formula

You are not responsible for knowing classification of primary, secondary, tertiary alkyl halides or alcohols. I didn't remove those questions from the set of suggested problems because some of those problems had other parts that are still good practice for constitutional isomers, etc. Also, familiarity with a variety of functional groups (in addition to the ones you need to be able to name) is helpful for Lewis structures and IR.

Chapter 3: Brønsted-Lowry and Lewis definition of acidity/basicity, conjugate acid/base pairs; curved arrow notation to depict acid-base reactions; what ratio defines the equilibrium constant?; what is the ΔG^o or K telling you about the stability of the products versus the reactants?; relationship of K_a, pK_a; predict the outcome of acid-base reactions; use effects on B-L acidity (element, hybridization, inductive, resonance) to make predictions about relative strengths of acids

We skipped the following sections:
1.2A, 1.13B, 2.4B, 3.1, 3.9, 3.12, 3.14, 3.16

A WORD ON MEMORIZATION.

You should know how to calculate the index of hydrogen deficiency. You do not need to try to memorize dozens of pK_a's. An abbreviated pK_a table will be provided for you (see practice exam for an example). However, you do need to be comfortable with typical pK_a's in order for the table to be of any use to you. You should not try to memorize all of the typical stretching frequencies for various functional groups in an IR spectrum. You should know the general trends and the general process for analyzing a spectrum. You should be familiar with using the IR table, so you are comfortable using it.