CHE 171
Fall, 2005
Specific Objectives for Exam 1

1. Understand why atoms form bonds and what types of bonds they form based on relative electronegativity (or electropositivity).

2. Be able to draw good Lewis dot structures (or Lewis structures) given a molecular formula; also be able to calculate formal charge and incorporate this into your Lewis structures where applicable.

3. Be aware that there may be two (or more) ways to connect the atoms of a given molecular formula (constitutional isomers) and be able to draw Lewis structures for them.

4. Understand the concept of resonance and be able to show contributing resonance structures for a compound whose electrons may be delocalized.

5. Be able to predict bond angles and geometry for designated atoms within a molecule.

6. Understand the concept of hybridization and be able to predict the hybridization of indicated atoms within a given molecule.

7. Be able to draw organic compounds as condensed structures and skeletal structures (bond line form).

8. Understand trends associated with bond length and strength and know the relative lengths and strengths of common types of C-C bonds and C-H bonds

9. Know what electronegativity is and how to predict the relative electronegativity values of atoms.

10. Be able to recognize polar bonds.

11. Be able to predict whether or not a molecule is polar based on the bonds present and the overall geometry.

12. Understand what constitutes Bronsted acids and bases.

13. Be able to show electron flow (curved arrow notation) for an acid-base reaction.

14. Understand what pK_a is and how pK_a values correspond to relative acid strength.

15. Be able to predict the outcome of a given acid-base reaction (in which direction does the equilibrium lie?).

16. Understand how the following factors affect acid strength: elemental/periodic trends, induction, resonance, hybridization.

17. Be able to rank a given set of compounds in terms of increasing or decreasing acidity (or basicity).

18. Be able to recognize acidic and basic components (or sites) of a given molecule (see, for example, morphine on the top of page 56 in Smith).

19. Understand what constitutes a Lewis acid (electrophile) and Lewis base (nucleophile).

20. Be able to show how (curved arrow notation) a given electrophile reacts with a given nucleophile; be able to show the product(s) of such a reaction.

21. Know what a heteroatom is.

22. Know what a "functional group" is in organic chemistry.

23. Understand the following classes of organic compounds: hydrocarbons (all types), "C-Z" compounds, "C=O" compounds.

24. Be able to recognize the following types of organic compounds: alkyl halides, alcohols, ethers, amines, aldehydes, kektones, carboxylic acids, esters, amides, and acid chlorides; be able to recognize the corresponding functional groups within larger molecules.

25. Be able to recognize and classify the three types of intermolecular forces; understand what gives rise to these forces and what effects they have on physical properties like BP, MP, and solubility.

26. Be able to recognize electron-rich and electron deficient sites in a molecule and predict whether or not two compounds will react based only on their relative electron densities.

This exam will be comprehensive in the sense that all of the material we have discussed thus far is related and contributes to a "big picture." This will be the case throughout most of the year; organic chemistry is by its nature a comprehensive subject, and learning it is a sort of building process. Even if you have performed well on the previous two quizzes (and many of you have) I would encourage you to take this exam seriously because it will really test your ability to "put it all together," so to speak, and leave you in a good position to apply what you know to the new material we'll begin to cover next week.