Chem 164/261
Assignment 1 & Lecture Outline 1
Nature of Matter, Chemical Bonds, Functional Groups, Intermolecular & Intramolecular Forces, Infrared Spectroscopy

Read

Organic Chemistry, L Wade, UA Custom Edition, 2013, Volume 1 (Chem 164/261)

- Functional Group List - Inside Front Cover (also Handout)
- Periodic Table – Inside Back Cover - know 1st 10 elements (up through Neon)
- Relative Strength of Acids and Bases – Table 1.5
- Chapter 1 – Introduction & Review (Structure, Bonding, Resonance, Acids-Bases etc)
- Chapter 2 –Structure & Properties of Organic Molecules (Orbitals, Hybridization, Functional Groups, Intramolecular and Intermolecular Forces etc)
- Chapter 3 – Infrared Spectroscopy (Electromagnetic Spectrum, Molecular Vibrations etc)

Problems: (do all "*solved problems*" in chapters listed below)

Do **Not** turn in, answers available in "Student Solutions Manual for Organic Chemistry" for LG Wade.

- **Chapter 1:** 1.1a; 1.2 to 1.12; 1.15 to 1.19; 1.27; 1.31; 1.34; 1.36; 1.54
- **Chapter 2:** 2.1 to 2.11; 2.15; 2.16; 2.18; 2.20 to 2.22; 2.26; 2.28; 2.32; 2.35; 2.40; 2.42; 2.44
- **Chapter 3:** 3.12; 3.15

Lecture Outline 1

I. Introduction - Course Organization, Nature of Science and Chemistry

A. What is Science?
B. What is Matter?
C. Basic concepts and definitions - atoms, moles, etc.

II. **Physical Properties and Purity**

A. Purity
B. Comparison of Physical Properties
C. Methods of Purification
1. Crystallization
2. Distillation
3. Extraction
4. Chromatography
5. Molecular Filtration – Dialysis

III. **Analysis**

A. Qualitative - Organic or Inorganic
B. Quantitative - Calculation of molecular and empirical formula

IV. **Atomic Structure**

A. Theory - wave functions and orbitals

B. Periodic Table - Pauli principle, Hund rule, Aufbau

V. **Molecular Structure**

A. Ionic bonding

B. Covalent bonding

1. Molecular orbitals - Linear Combination of Atomic Orbitals (LCAO)
2. Hybridization and formation of sigma (σ) and pi (π) bonds
    a. sp^3
    b. sp^2
    c. sp

C. Size and Shape of Molecules

1. Bond Lengths and Hybridization

D. Representation of Molecules

1. Lewis Structures
2. Formal Charge
3. Resonance

VI. **Intermolecular Forces (Forces between different molecules)- van der Waals forces**

A. Electronegativity and Dipoles

B. Dipole-Dipole Interaction

C. London Forces

D. Hydrogen Bonding

VII. **Chemical Reactivity**

A. Bond Energy and Equilibrium

1. Enthalpy
2. Entropy
3. Equilibrium

B. Rate of Reaction and Activation Energy

C. Acid-Base Reactions

1. Lowry - Bronsted
2. Acidity Constant and pKa
3. Lewis acids and bases

VII. **Infrared Spectroscopy**

A. Electromagnetic Spectrum

B. Origin of Infrared Absorption

C. Utility and Selected Examples (most of this material will be covered in the Laboratory)