

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

Read

Organic Chemistry, Solomons, Fryle & Snyder 11e Edition

- Functional Group List – Learn to recognize – Please see Green Handout – also p 76 of text
- Periodic Table – Inside Front Cover - know 1st 10 elements (up through Neon)
- Relative Strength of Acids and Bases – Inside Front cover (reference only)
- Chapter 1 –Introduction & Review: Structure, Formulas & Bonding (Resonance, Formal Charge, Orbitals, Hybridization)
- Chapter 2 –Functional Groups & Infrared Spectroscopy (Electromagnetic Spectrum, Molecular Vibrations, Intramolecular and Intermolecular Forces etc)
- Chapter 3 - Acids & Bases, Energy Changes

Problems:

Do **Not** turn in, answers available in "Study Guide Student Solutions Manual " Solomons, Fryle, Snyder

- **Chapter 1:** 1.1 to 1.8; 1.10 to 1.14; 1.18; 1.19; 1.23 to 1.25; 1.35; 1.36
- **Chapter 2:** 2.3; 2.4; 2.25; 2.29; 2.30; 2.46
- **Chapter 3:** 3.1; 3.6; 3.18; 3.20; 3.23; 3.35

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 pK_a

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)