

Chem 161
Assignment & Lecture Outline 1:
Nature of Chemical Bonds, Intermolecular & Intramolecular Forces

Read

From TWG Solomons and CB Fryhle "Organic Chemistry" 8th Edition (2004):

- Functional Group List on pp 70-71 and (Periodic Table) one page back from Inside Back Cover
- Relative Strength of Acids and Bases on Inside Front Cover - same table on page 105 (most important now: HCl, H₂O, CH₃CH₂OH, HCCH, CH₂=CH₂, CH₃CH₃)
- Chapter 1 - Carbon Compounds and Chemical Bonds
- Chapter 2 - Representative Carbon Compounds, Functional Groups, Intermolecular Forces, Infrared (IR) Spectroscopy
- Chapter 3 - Acids and Bases - Mechanism and its representation

Problems

Do **Not** turn in, answers available in "Study Guide and Solutions Manual for Organic Chemistry" for Solomons. This is available in the Bookstore or can be borrowed from Cameron Library's Reserve Reading Room

- **Chapter 1:** 1.1 to 1.9; 1.11; 1.13 to 1.17; 1.21 to 1.23; 1.27; 1.31; 1.32
- **Chapter 2:** 2.1; 2.2; 2.3; 2.9; 2.17; 2.20; 2.21; 2.28; 2.32; 2.33; 2.35; 2.37; 2.39; 2.42
- **Chapter 3:** 3.1 to 3.3; 3.5; 3.7; 3.10; 3.11; 3.13; 3.15; 3.17; 3.20 to 3.22; 3.24; 3.27; 3.31; 3.36

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