CHEMISTRY 263 - Section B6
Lecture Outline 2 & Assignment 2

TR 12:30-13:50
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Read:

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 page 105
- Chapter 14 – Aromatic Compounds read for overview
    - study sections 14.1 to 14.10
- Chapter 15 – Reactions of Aromatic Compounds
- Chapter 20 – Sections 20.1; 20.6; 20.7; 20.8; 20.11
- Chapter 21 – Phenols and Aryl Halides

Problems:

Do Not turn in, answers available in "Study Guide and Solutions Manual for Organic Chemistry" by Solomons and Fryhle.

Chapter 14:
14.2;14.10; 14.12; 14.16

Chapter 15:
15.1; 15.3; 15.4; 15.7; 15.9; 15.10; 15.13; 15.19; 15.20; 15.26

Chapter 20:
20.11; 20.12; 20.15; 20.16

Chapter 21:
21.1; 21.2; 21.3; 21.13

Lecture Outline 2: Aromaticity and Reactions of Benzene Derivatives (Electrophilic Aromatic Substitution)

1. **Review of Aromaticity, Benzene, and Nomenclature**

    A. Structure and Properties of Benzene
        1. Resonance Stabilization
        2. Substitution vs. Addition Reactions

    B. Annulenes and Huckel's Rule
        1. Coplanar Systems of (4n+2) pi Electrons
        2. Aromatic Ions - Acidity of Parent Compounds

    C. Other Aromatic Systems - Naphthalene, Anthracene, and Heteroaromatic Systems
        1. Five membered rings - Furan, Pyrrole, Thiophene, Imidazole
        2. Six membered rings - Pyridine, Pyrimidine

    D. Nomenclature of Monosubstituted Benzenes
        1. As Derivatives of Benzene
        2. Common names (Phenol, Aniline, Anisole, etc.)

    E. Nomenclature of Multiply-Substituted Benzenes
        1. Using Numbers and Common Names
        2. Ortho, Meta, Para Nomenclature

2. **Electrophilic Substitution Reactions**

    A. Benzene - General Mechanism
        1. Halogenation - X2
        2. Nitration - HNO3
        3. Sulfonation - SO3 .H2SO4
        4. Friedel-Crafts Alkylations - Lewis Acid + RX
        5. Friedel-Crafts Acylations - Acylium Ions from Acid Halides / Anhydrides

6. Use of Clemmensen Reduction (Zn/Hg and HCl) with Friedel-Crafts Acylation

B. Effects of Substituents
    1. Activation vs. Deactivation - Electron Donating vs Electron Withdrawing Groups
    2. Orientation - (Ortho-Para vs. Meta)
    3. Inductive vs. Resonance Effects
    4. Disubstituted Benzene Reactions

3. **Reactions of Side Chains and Substituents of Aromatic Systems**

A. Nitro to Amino to Diazonium Salts
    1. Reduction of Nitrobenzenes to Anilines and Diazotization ($NaNO_3$ and HCl)
    2. Replacement of Diazo Group
    3. Azo Coupling and Dyes

B. Oxidation of Alkyl Side Chains of Aromatic Compounds to Carboxylic Acids