

Chem 261
Assignment & Lecture Outline 5:
Alcohols, Ethers and Introduction to Carbohydrates

Read

TWG Solomons and CB Fryhle Solomons, Fryle & Snyder 13th Edition (Electronic)

Functional Group List (see Handout) and (Periodic Table (Inside Back Cover) also p75 of Text

- Chapter 6 – Substitution Reactions (re-read alcohols from alkyl halides)
- Chapter 8 – Alkenes (re-read alcohols and ethers from alkenes)
- Chapter 11 – Alcohols and Ethers
- Chapter 22 – Carbohydrates (read sections 22.1 – 22.4 and sections 22.12 – 22.13)

Problems

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

- **Chapter 11:** 11.3; 11.11; 11.13; 11.15; 11.17 11.25; 11.26; 11.28; 11.32
- **Chapter 22:** 22.1; 22.2; 22.20 (a, b, c, h, i, j, k, l, p, q, r)

Lecture Outline #5

I. Structure and Nomenclature of Alcohols and Ethers

- A. Aliphatic Alcohols
 - 1. IUPAC system
 - 2. Common names – carbinol system, "alcohol" names
- B. Aromatic Alcohols (Phenols)
- C. Ethers
 - 1. Common names
 - 2. IUPAC system – "alkoxy"

II. Physical Properties

- A. Alcohols and Phenols – general properties
 - 1. MP, BP, solubility, density – hydrogen bonding
 - 2. Acidity of aliphatic alcohols (ROH) and ArOH
- B. Physical Properties of Ethers

III. Preparation of Alcohols (*Review – Previously Discussed in Class*)

- A. From Alkenes – Aliphatic Alcohols (ROH)
 - 1. Hydration (H_2O , H^+)
 - 2. Hydroboration – Oxidation [B_2H_6 then H_2O_2 , KOH]

- B. By Nucleophilic Substitution Reactions (S_N1 and S_N2)
 - 1. Definitions: S_N1 and S_N2
 - 2. Mechanisms
- C. S_N2 Reactions
 - 1. Stereochemistry – Walden Inversion (inversion of configuration)
 - 2. Substitution of primary and secondary alkyl halides
- D. S_N1 Reactions
 - 1. Stereochemical Aspects (loss of stereochemistry via carbocations)
 - 2. Substitution of tertiary alkyl halides and other tertiary carbons
 - 3. Synthesis of alcohols, ethers

IV. Reactions of Alcohols and Phenols

- A. Reactions Breaking O–H Bond
 - 1. Acid–base – alcohols as acids
 - 2. Ester formation **WILL NOT BE COVERED - WILL NOT BE ON EXAM**
 - 3. Ether formation
 - 4. Oxidation
- B. Reactions Breaking C–O Bond
 - 1. Dehydration to alkenes (reverse of water addition to alkenes)
 - 2. Formation of alkyl halide (substitution reactions)

V. Ethers (*Review – Previously Discussed in Class*)

- A. Preparation
 - 1. Epoxidation of alkenes
 - 2. From alcohols by removal of H_2O
 - 3. From alkyl halides or sulfonates
- B. Reaction of Ethers
 - 1. Cleavage of ethers to alcohols

VI. Carbohydrates

- A. Monosaccharides
 - 1. Classification – aldose, ketose, triose, tetrose, etc...
 - 2. Stereoisomerism
 - 3. Anomers and ring formation (hemiacetals, acetals)
 - 4. Properties and sweet taste
- B. Disaccharides and Polysaccharides
 - 1. Sucrose
 - 2. Cellulose, starch, glycogen