Chem 164/261
Assignment & Lecture Outline 5:
Alcohols, Ethers and Introduction to Carbohydrates

Read

TWG Solomons and CB Fryhle "Organic Chemistry" 10e Edition (2011) (8th or 9th Edition also OK)

- Functional Group List on pp 73-74 (pp 68-69 -9th Edition; pp 70-71 - 8th Edition) and (Periodic Table) one page back from Inside Back Cover
- Chapter 6 – Substitution Reactions (re-read alcohols from alkyl halides)
- Chapter 8 – Alkenes (re-read alcohols from alkenes)
- Chapter 11 – Alcohols and Ethers
- Chapter 21 – Phenols (read for overview sections 21.1 – 21.5 only)
- 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. This is available in the Bookstore

- **Chapter 11:** 11.2 to11.4; 11.9; 11.13 to 11.16; 11.25 to 11.27; 11.34
- **Chapter 21:** 21.3
- **Chapter 22:** 22.1; 22.2; 22.6; 22.11; 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 and Phenols *(Review – Previously Discussed in Class)*

A. From Alkenes – Aliphatic Alcohols (ROH)
   1. Hydration (H_20, H+)
   2. Oxymercuration – Demercuration [$Hg(OAc)_2$ then $NaBH_4$]
   3. 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
   3. Ether formation
   4. Oxidation

B. Reactions Breaking C–O Bond
   1. Dehydration to alkenes
   2. Formation of alkyl halide

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

A. Preparation
   1. Mercuration – Demercuration of alkenes in alcohols
   2. Epoxidation of alkenes
   3. From alcohols by removal of H_2O
   4. 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