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

Read

Organic Chemistry, L Wade, UA Custom Edition, 2013, Volume 1 (Chem 164/261)

- Functional Group List - Inside Front Cover (also Handout)
- Chapter 7 – **Review** Substitution Reactions of Alkyl Halides to Give Alcohols and Ethers
- Chapter 9 – **Review** Reactions of Alkenes to form Alcohols and Ethers
- Chapter 11 – Structure and Synthesis of Alcohols
- Course Handout on Carbohydrates: Nomenclature & Properties

Problems: (do all "*solved problems*" in chapters listed below)

Do **Not** turn in, answers available in "Student Solutions Manual for Organic Chemistry" for LG Wade

- **Chapter 11:** 11-1 to 11.5; 11.7 to 11.16; 11.31 to 11.33; 11.39

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 – Parts A & B 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. From Alkyl Halides: Nucleophilic Substitution Reactions (S_N1 and S_N2)

C. Grignard Reagents & Grignard Reactions – Addition to Carbonyl

D. Hydride Addition to Carbonyls (Ketones & Aldehydes)

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
   3. Ethers

C. 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

D. Reaction of Ethers
   1. Cleavage of ethers to alcohols

V. 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