Chap 13
Alcohols, Phenols, Ethers.

a. a. Alcohols
R-OH  alcohol, high boiling point, less than five carbons are very water soluble.
More –OH more soluble and higher bp.
A) Methanol, wood grain alcohol, heat wood in the absence of air.

B) Ethanol formed from fermentation-
\[ C_6H_{12}O_6 + O_2 \rightarrow 2CH3CH2OH + 2CO_2 \]
Scotch (grain), bourbon (corn), burgundy (grapes and grape skins) chablis (grapes without red skins)
Classification methyl, primary, secondary, tertiary

Characteristics of phenol- slightly acidic.

\[
\text{Phenol}
\]

\[
\text{Phenol} + \text{H}_2\text{O} \rightleftharpoons \text{Phenolate} + \text{H}_3\text{O}^+
\]

Can cause- corrosive, burns and ingestion is fatal. (used to be used as antiseptics but have been replaced)

b. Nomenclature. – Change –e to –ol.

\[
\text{Propanol}
\]
number giving –OH priority.

Ex 12-1

4-bromo-3-methyl-2-propanol

2-isopropylcyclopropanol

6-chloro-3,4-dimethyl-2-hexanol

4-chloro-3-methylphenol

4. Rxn of alcohols.
   a. Dehydration- lose H₂O.

Ex.

b. Formation by reduction. Reduction = loss of oxygen or gain of hydrogen.
Ex.

\[
\begin{align*}
\text{Ketone} + H_2 & \xrightarrow{\text{Ni}} \text{Alcohol} \\
\text{[O]} = \text{KMnO}_4/\text{OH}^{-} & \text{ or } H_2\text{CrO}_4 \text{ careful.}
\end{align*}
\]

c. Oxidation rxns- gain of oxygen or loss of hydrogen

2. Thiols- \( R-SH \)

characteristics- smell bad.

\( CH_3-SH \) (methanethiol) Contained in oysters, cheddar cheese, bad breath.


\[
\begin{align*}
\text{2-methyl-3hexanethiol} & \quad \text{3-bromo-cyclohexanethiol} \\
\text{trans-2-butene-1-thiol}
\end{align*}
\]
Cystines contain thiol cross links—used in hair perms.

3. Ethers—R-O-R
   a. Physical properties.
      solubility—Not very polar so they are in between alcohols and alkanes. No H-bonds. Flammable and can form peroxides. Diethyl ether was an anesthetic introduced in 1800’s.
   b. Formation. Can react two alcohols with an acid catalyst.

\[ R\text{-}OH + R'\text{-}OH \xrightarrow{H^+} R\text{-}O\text{-}R' + H_2O \]

Ex

\[ \text{OH} + \text{OH} \xrightarrow{H^+} \text{O} \quad + \text{H}_2\text{O} \]

c. Nomenclature-
   1. Common—groups are alphabetized and then add ether.
      
      ethyl propylether
   2. IUPAC—
      steps—
      1: Select longer chain
      2: Name the shorter chain and oxygen as an alkoxy group.
      Number nearest O on parent chain.
      3: Write the location of the alkoxy group on the parent chain.
1-ethoxy cyclopentane

1-ethoxy propane

2-methoxypentane

Ethoxy benzene