Chapter 17 – Organic Chemistry

NOT complete notes but highlighting some of the key features we discussed.

1) Functional Groups – A special arrangement of atoms in an organic compound tha is capable of characteristic chemical reactions. The existence of functional groups gives the organic compound properties that are unique to compounds which have that same functional group.

2) Halocarbons – A class of organic compounds containing covalently bonded fluorine, chlorine, bromine, or iodine. The halogen groups are simply added as substituents in place of hydrogen. Their presence is indicated by prefixes (*fluoro, chloro, bromo, or iodo*) in front of the hydrocarbon name. The number of the carbon to which they are attached is also included in the name.

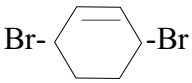
   Examples – Name the following:

   1) $CH_2(Cl)\text{-}C(CH_3)_2\text{-}CH_2CH_2CH_3$

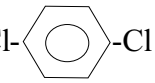
      1-chloro-2,2-dimethylpentane

   2) $CH_2{=}C(F)\text{-}CH(F)\text{-}CH_3$

      2,3-difluoro-1-butene

   3) 

      3,6-dibromocyclohexene

   4) 

      1,4-dichlorobenzene

3) Alcohols are organic compounds with an –OH group. To name continuous chain and substituted alcohols by the I.U.P.A.C. system, drop the –e ending of the parent alkane name and add the ending *–ol*. The parent alkane is the longest continuous chain of carbons that includes the carbon attached to the -OH group. In numbering the longest continuous chain, the position of the -OH group is given the lowest possible number.

   Examples – Names and uses for some common alcohols

   1) $CH_3\text{-}OH$
      * methanol
      * methyl alcohol
      * wood alcohol (poisonous)

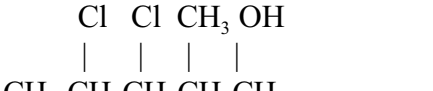
   2) $CH_3\text{-}CH_2\text{-}OH$
      * ethanol
      * ethyl alcohol
      * grain alcohol (booze)

   3) $CH_3\text{-}CH(OH)\text{-}CH_3$
      * 2-propanol
      * isopropyl alcohol
      * rubbing alcohol

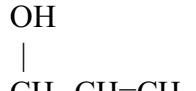
   Misc.: denatured alcohol: ethyl alcohol to which a small amount of a substance that is poisonous and repugnant to the taste is added. 100 proof = 50% alcohol

   beer = 5%, wine = 12.5%, whiskey = <10 - 50%, everclear = 95%

Examples – Name the following alcohols:

1) 

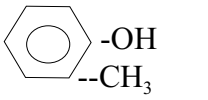
3,4-dichloro-2-methyl-1-pentanol

2) 

2-propene-1-ol

3) 

1,2-ethanediol (ethylene glycol)

4) 

2-methylphenol

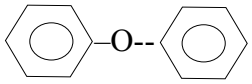
4) Ethers are compounds in which oxygen is bonded to two carbon groups. Ethers are named by naming each of the alkyl groups attached to the oxygen atom and adding the word *ether*.

Examples – Give names for the following:

1) CH_3-O-CH_3
methyl ether
(dimethyl ether)

2) CH_3-CH_2-O-CH_2-CH_3
ethyl ether
(diethyl ether)

3) CH_3-O-CH_2-CH_3
methylethyl ether

4) 

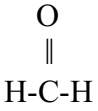
phenyl ether
(diphenyl ether)

5) Aldehydes and Ketones

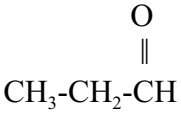
a) A carbonyl group consists of a carbon atom and an oxygen atom joined by a double bond.

b) Aldehydes are organic compounds in which the carbon of the carbonyl group is the first carbon in the chain. One of the other bonds for the carbon is to a hydrogen. The -e ending of the hydrocarbon is replaced by *-al* to designate an aldehyde. In aldehydes, the number one carbon is always the carbonyl carbon.

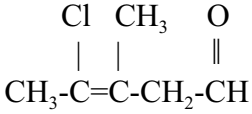
Examples – Name the following:

1) 

methanal

2) 

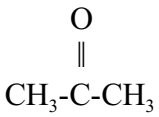
propanal

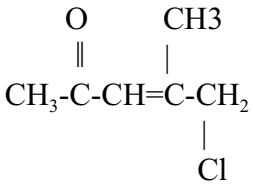
3) 

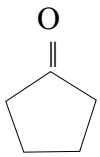
3-methyl-4-chloro-3-pentenal

c) Ketones are organic compounds in which the carbon of the carbonyl group is joined to two other carbons. Ketones are named by changing the ending of the longest continuous carbon chain that contains the carbonyl group from -e to *-one*. If the carbonyl group could occur at several places on the chain, then its position is designated by the lowest possible number.

Examples – Name the following:

1) 

2) 

3) 

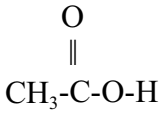
2-propanone (acetone)

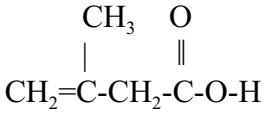
5-chloro-4-methyl-3-pentene-2-one

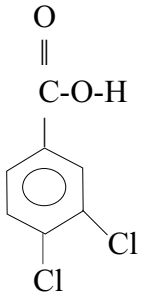
cyclopentanone

6) Carboxylic Acids – are compounds that contain a carboxyl group 
Carboxylic acids are named by changing the -e ending of the parent alkane to *-oic acid*. The carboxyl group is always the number one carbon.

Examples – Name the following:

1) 

2) 

3) 

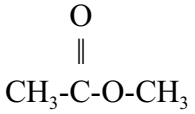
ethanoic acid (acetic acid)

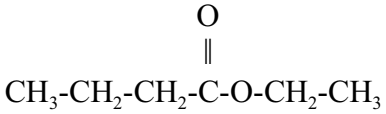
3-methyl-3-butenoic acid

3,4-dichlorobenzoic acid

7) Esters – are compounds made from carboxylic acids where the acidic H is replaced by an alkyl group. Usually the reactions are between a carboxylic acid and an alcohol. The alkyl group is named first and then the acid with the ending changed to *-ate*.

Examples – Name the following:

1) 

2) 

methyl ethanoate (methyl acetate)

ethyl butyrate

8) Amines – Amines are formed with an $-NH_2$ group added to the end of a carbon chain, these are based on substituted ammonia (NH_3). Sometimes more that on hydrogen can be replaced.

Examples – Name the following:

1) $CH_3\text{-}CH_2\text{-}NH_2$

ethyl amine

2) $(CH_3\text{-}CH_2)_3N$

triethyl amine

9) Amides – Amides contain a carbonyl group (C) with an NH_2 attached.

Examples: – Name the following:

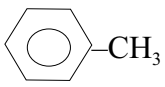
1) $CH_3\text{-}\overset{\overset{O}{\|}}{C}\text{-}NH_2$

ethanamide
(acetamide)

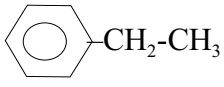
10) Aromatics – the simplest contain a benzene ring which has six carbons in a ring. It has just the six carbons and six hydrogens. The carbons are joined by double bonds. A common representation of this is given as:

They can be named as either the benzene being the parent or with some other group being the parent (and the ring gets the name "phenyl")

Examples: – Name the following:

1) 

methyl benzene
(toluene)
phenyl methane

2) 

ethyl benzene

phenyl ethane