

Organic compounds can be organized into families of compounds based on groupings of atoms called functional groups

1. Hydrocarbons - contain only C + H

a. alkanes - all single bonds

b. alkenes - contain at least one $C=C$

c. alkynes - contain at least one $C\equiv C$

alkanes - saturated compounds (cannot add any more H's)

alkenes / alkynes - unsaturated (can add in more H's)

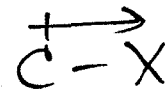
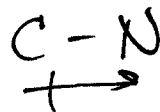
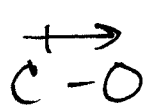
d. aromatic - contain a benzene ring



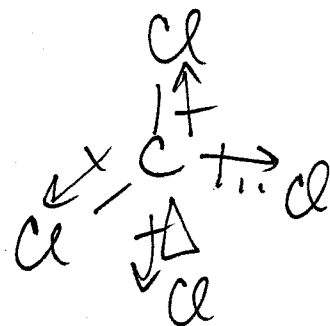
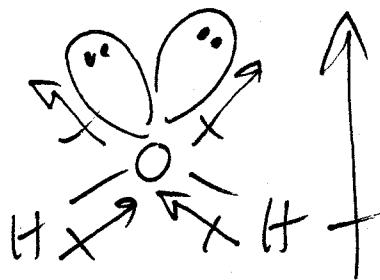
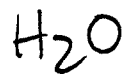
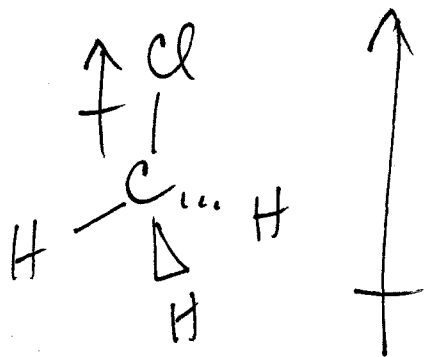
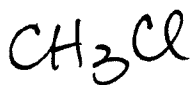
Aside: Bond polarity

nonpolar covalent - little or no difference in e'neg. between 2 atoms
 $C-C$, $C-H$ etc.

polar covalent - one of the atoms is considerably more e'neg than the other



sum of the individual bond dipoles is the dipole moment of the molecule.



nonpolar

What is an alkyl group?

- * an alkane that has had one H removed
- * generally symbolized "R"

1. Hydrocarbons

- | | |
|------------|-----------------|
| a. alkanes | $R-H$ |
| b. alkenes | $R_2C=CR_2$ |
| c. alkynes | $R-C\equiv C-R$ |

d. aromatic

Ph-

C_6H_5-

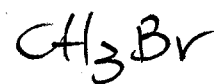
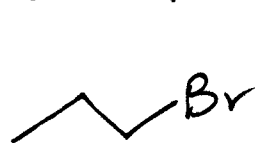
Ar-

$\phi-$

2. Alkyl halides

$R-X$

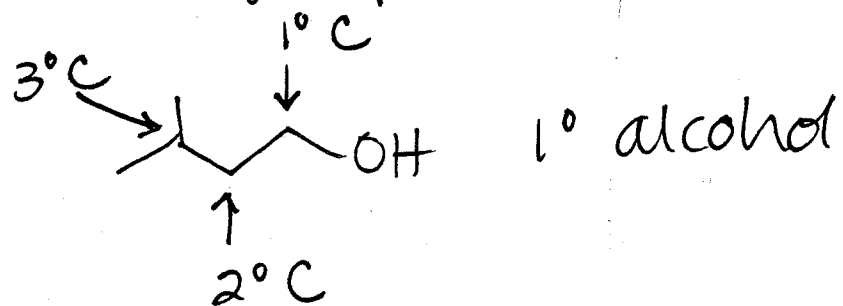
subgroups: $1^\circ, 2^\circ, 3^\circ$ (primary, secondary, tertiary)



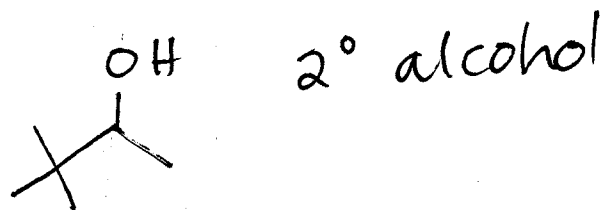
classified by how many C's are attached to the carbon bearing the halogen.

3. Alcohols $R-OH$

subgroups: $1^\circ, 2^\circ, 3^\circ$



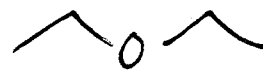
(same as RX)



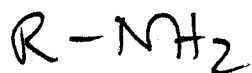
4. Ethers $R-O-R'$

symmetrical $R = R'$

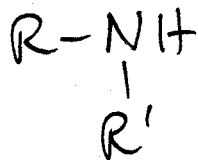
asymmetrical $R \neq R'$



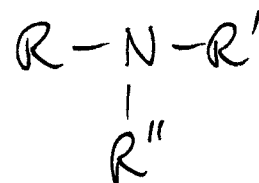
5. Amines - based on ammonia - NH_3



1° amine



2° amine



3° amine

6. Carbonyls $C=O$ $RCHO$

a. aldehydes $R-\overset{\overset{O}{\parallel}}{C}-H$ $C=O$ has a H directly attached.

b. ketone $R-\overset{\overset{O}{\parallel}}{C}-R'$ $C=O$ has two R' groups

c. carboxylic acids $R-\overset{\overset{O}{\parallel}}{C}-OH$ $C=O$ has an OH directly attached
* NOT $R-\overset{\overset{O}{\parallel}}{C}-OH$ $\left(\begin{matrix} RCO_2H \\ RCOOH \end{matrix} \right)$

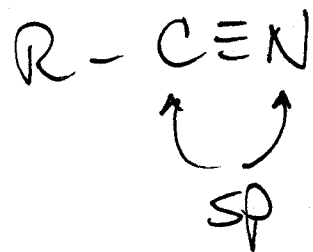
d. esters $R-\overset{\overset{O}{\parallel}}{C}-OR'$ (RCO_2R')

e. amides $R-\overset{\overset{O}{\parallel}}{C}-NH_2$ 1° amide

$R-\overset{\overset{O}{\parallel}}{C}-NH$ 2° amide

$R-\overset{\overset{O}{\parallel}}{C}-N(R')R''$ 3° amide

7. nitriles



Be able to look at a molecule + identify the functional groups.

ex. Norethindrone

