Organic Chemistry

An introduction or Review?

Organic chemistry is:

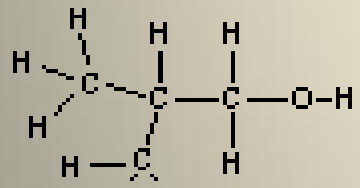
The study of compounds only containing carbon, hydrogen and oxygen.

Hydrocarbons: limited to carbon and

hydrogen atoms.

Diagrams

- Complete structural diagram – shows all atoms in a structure.
- Condensed structural diagram – simplifies the presentation of the structure.
- Line structure diagram – the ends and points represent a carbon (only used for hydrocarbon)

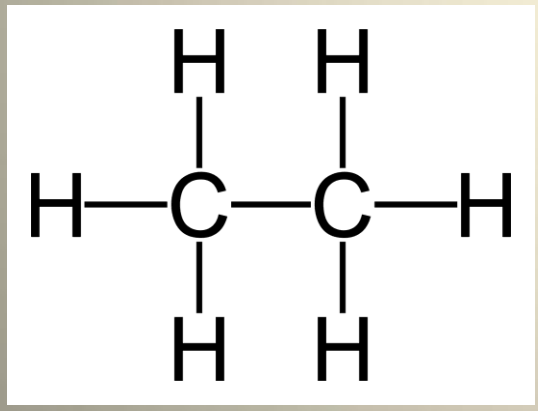


$(CH_3)_2CHCH_2OH$

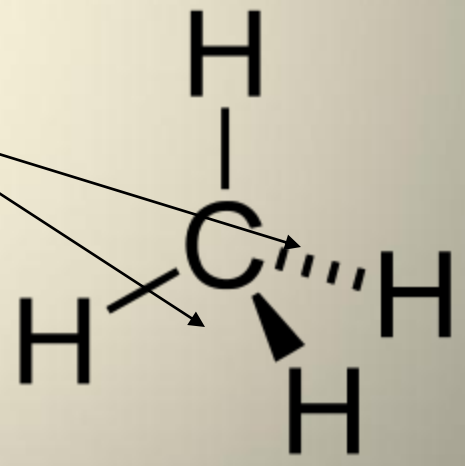
Alk**anes**

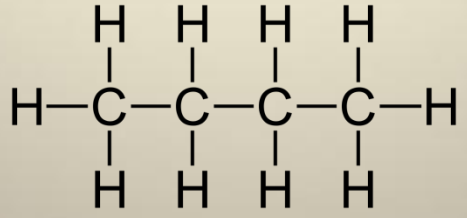
Distinguishing Feature: Single Bonds

- General Formula: (C_nH_{2n+2})
- Have only single bonds between carbon atoms



What do the lines represent?

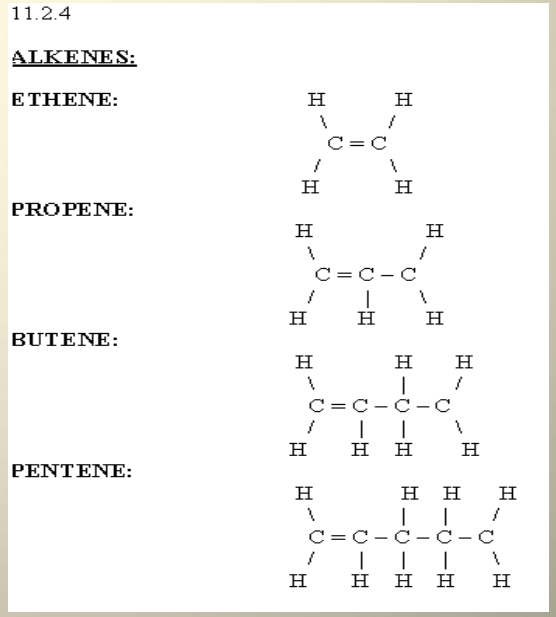




Alk**enes**

Distinguishing Feature: Double Bonds

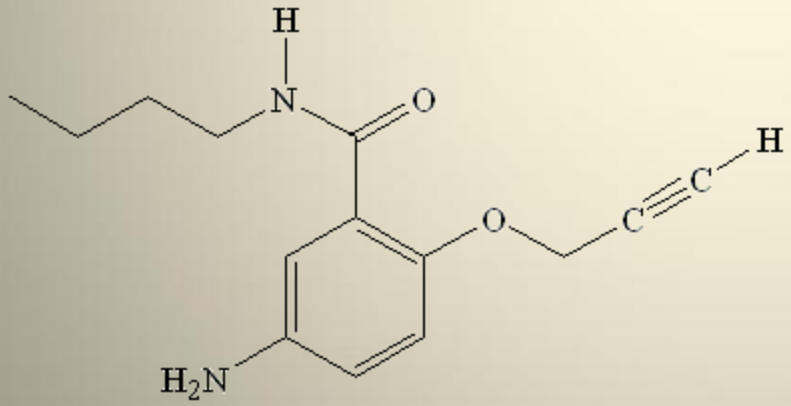
- General Formula: (C_nH_{2n})
- Have at least one double bond between carbon atoms

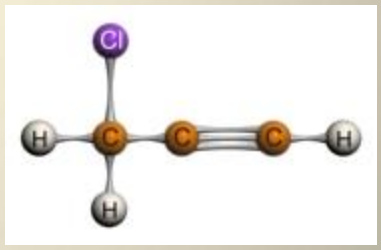


Alkynes

Distinguishing Feature: Triple Bonds

- General Formula: (C_nH_{2n-2}):
- Have at least one triple bond between carbon atoms.





Prefix Naming System

Monkeys eat peeled bananas: (first four)

1. meth-
2. eth-
3. prop-
4. but-
5. pent-
6. hex-
7. hept-
8. oct-
9. non-
10. dec-

Properties of C-C bonds

- C-C bonds are strong covalent bonds that are difficult to break
- Alkanes are not reactive
- Multiple bonds between carbon atoms are not as strong and therefore more readily broken
- Alkenes and alkynes are more reactive than alkanes

Functional Groups

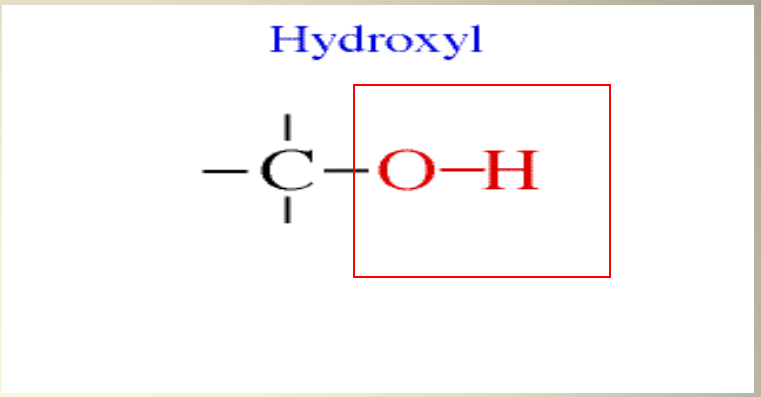
Groups of atoms that impact specific physical and chemical properties to an organic compound.

Useful in industries:

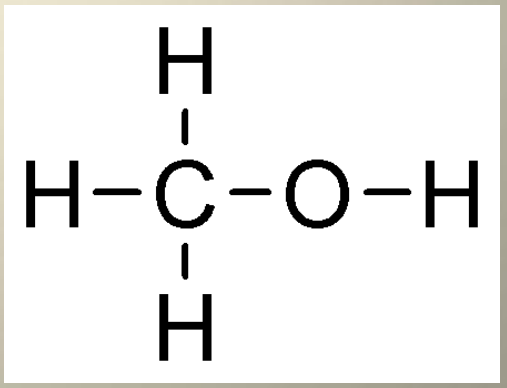
- Pharmaceuticals
- Perfume and cosmetics (alcohol-OH)
- Aerospace
- Ceramics, polymers, metals

Functional Groups

Alcohol (hydroxyl):

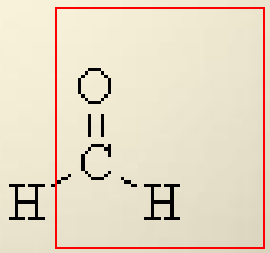


- ending in -ol
- Polar molecule
- Can be acidic depending on the surrounding atoms.
- Example:
- Methanol, ethanol

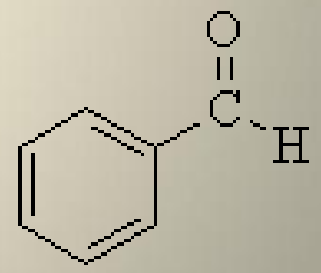


Aldehyde

- Ends in -al
- Double bond between carbon and oxygen atoms.
- Found at the end of the molecule.
- Example:



methanal

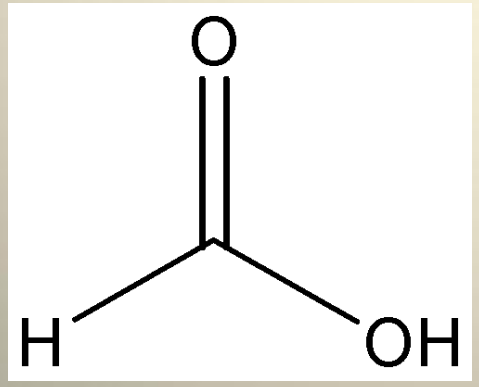


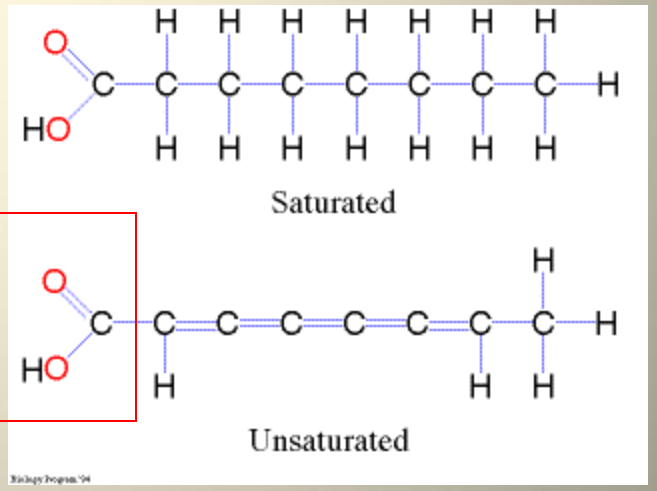
benzaldehyde

Carboxylic acid

- Ends in –oic
- Acid
- Double bond between carbon and oxygen atoms.
- Example:

Methanoic acid

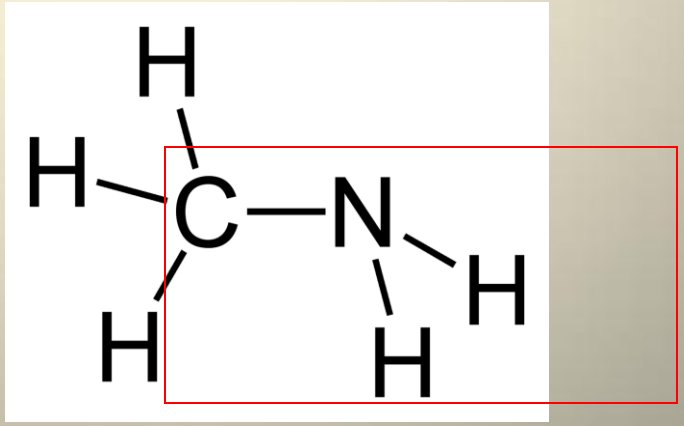




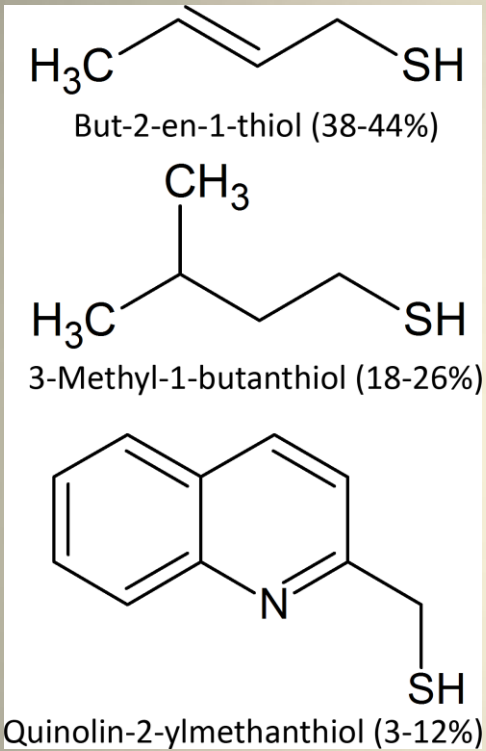
Amines (amino)

- End in –amine
- Amines
- Amines are a family of compounds containing nitrogen (**N**), all related to ammonia.
- Amines are different from ammonia in that at least one hydrogen (**H**) atom is **replaced** by a group of atoms containing carbon (**C**).

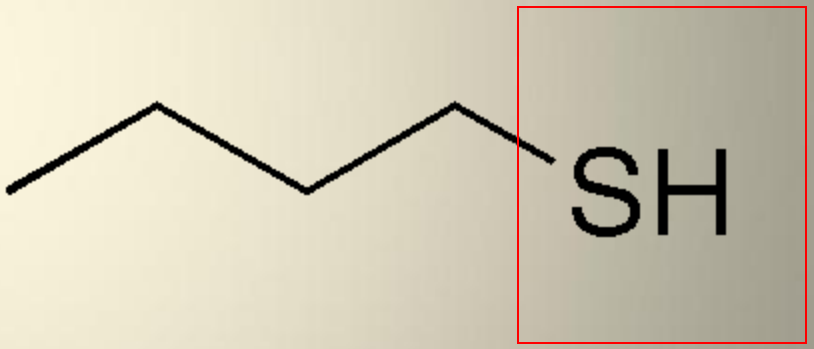
Example: methyl amine



Thiols

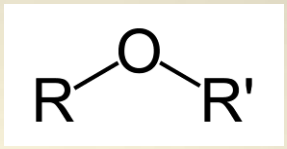


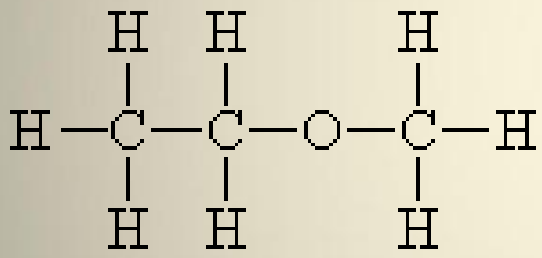
- Ends in –thiol
- Example: Butathiol

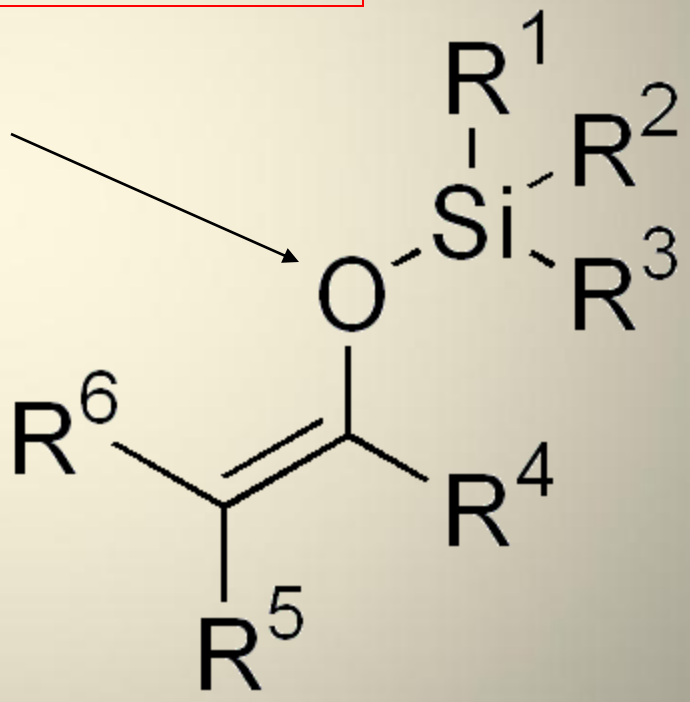


Ether

- Ends in ether
- Ethyl methyl ether

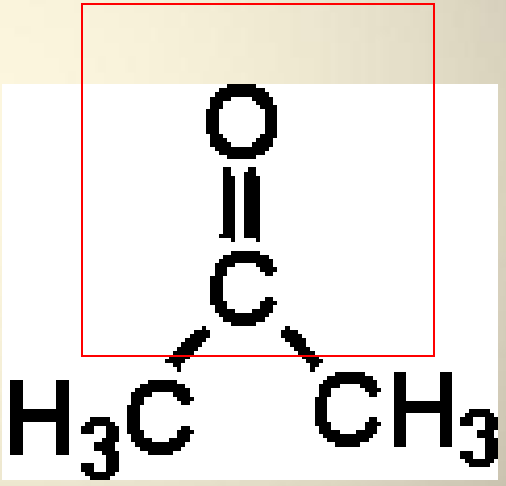






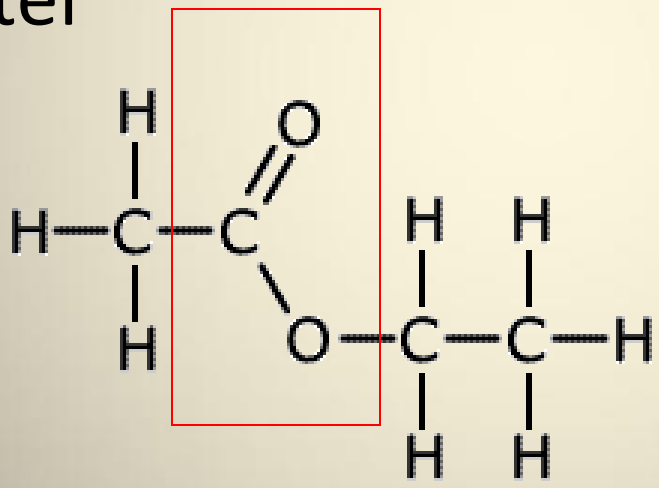
Ketone

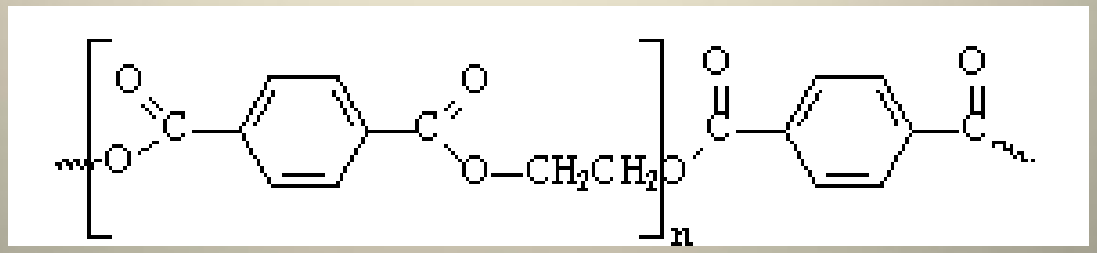
- End in –one
- Example Propanone
- Found in the middle



Ester

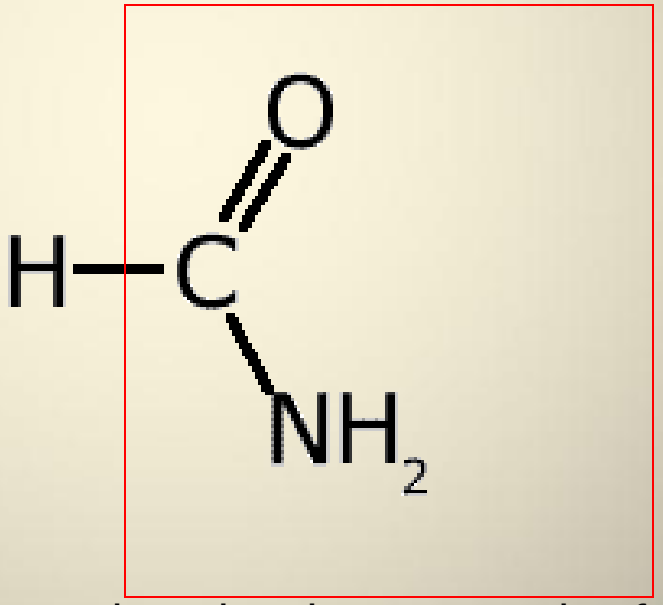
- Ends in oate
- Example: ethylethanoate
- polyester





*Amide – slightly basic

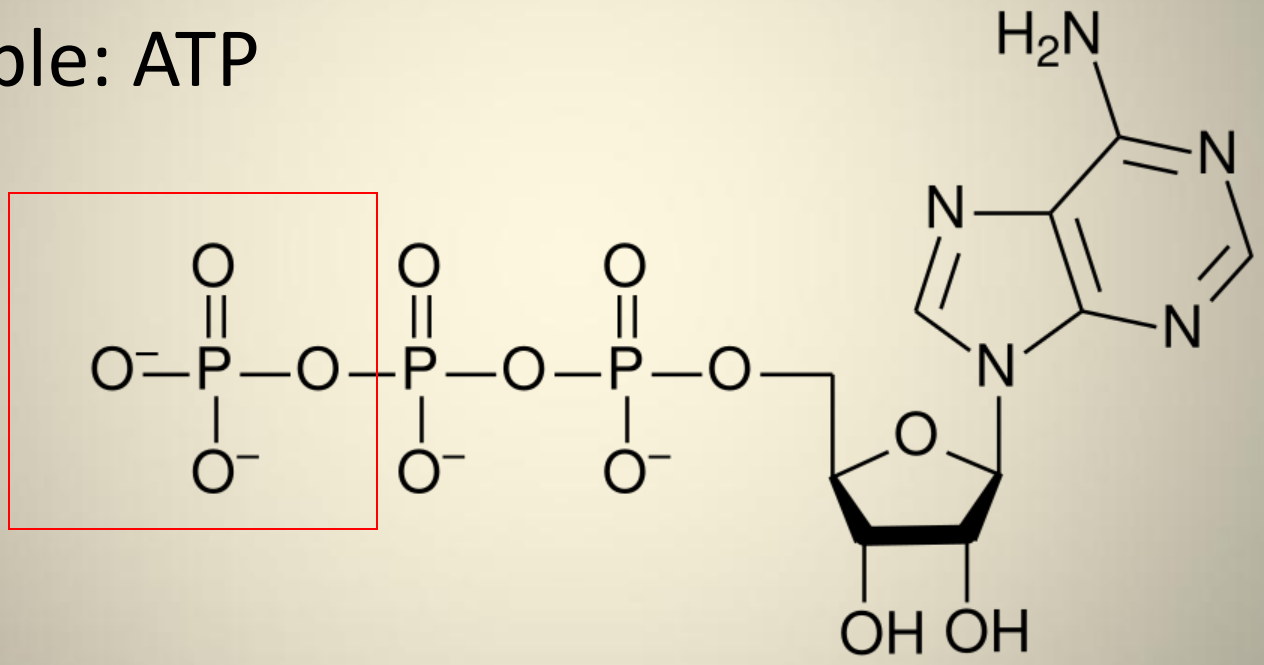
- Ends in –amide
- Example Methanamide



Can be found both midway through molecules or at ends of molecules

Phosphate- slightly acidic

- Ends in –phosphate
- Example: ATP



Can be found both midway through molecules or at ends of molecules