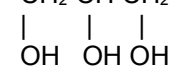
DERIVATIVES(FUNCTIONAL GROUPS) AND CLASSES OF ORGANIC COMPOUNDS

- The bonds within functional groups are often the site of chemical reactivity.

1. **ALCOHOLS** - 1 or more hydroxyl group R -OH

Naming them:
Name the parent compound - longest chain of C atoms that contains the -OH.
Suffix: - ol
1 hydroxyl group use the root carbon group name + -ol (hexanol)

2 or more hydroxyl group - use the full name of alkane and add suffix, -diol (2), -triol (3), etc.
ex. Glycerol (3 hydroxyl groups - allows the structure to bond easily with water -ex. Moisturizer)



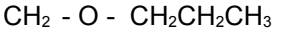
other uses: gums, shelac, resins, ethanol (grain alcohol - can be made by fermentation of starch, cellulose, and sugars), motor fuel, dyes, perfumes

2. **ETHERS** - 2 hydrocarbon groups are bonded to the same O. R - O - R'

Ending: - ether or -oxy-

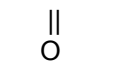
Naming it:

A. Name the parent compound. The word *ether* will come at the end.
B. Add the names of the alkyl groups. Arrange in alphabetical order, if possible in front of the word ether or put oxy in the middle. Ex. Methylpropyl ether or methyloxypropane



Use: not very reactive; solvents, gasoline octane enhancer

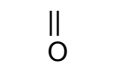
1. **ALDEHYDES** - A carbonyl groups is attached to a carbon atoms at the end of a C atom chain.



Naming them: Locate the longest chain that contains the carbonyl group and add the suffix *-al* to the root word.
Ex. Propanal

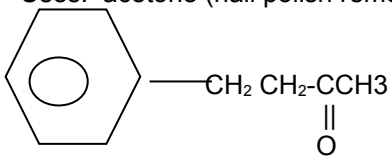
Uses: Methanal = formaldehyde, plastics

2. **KETONES** - A carbonyl group is attached to C atoms within the chain.

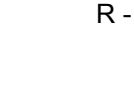


Naming them:
A. Locate the longest chain that contains the carbonyl group & suffix *-one.*
B. # the C atoms in the chain so that the C atom in the carbonyl group has the lowest possible #.
C. Place the carbonyl position # in front of the name and separate position # from the name with a hyphen, as usual.

Uses: acetone (nail polish remover), odors and flavors (raspberry ketone)



3. **CARBOXYLIC ACIDS** - They contain the carboxyl functional group



Naming them:

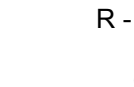
- Locate the longest chain that contains the carboxyl group and if there is only 1, add the suffix *-oic* acid. If there is more than 1, use the full name of the corresponding alkane and add the suffix to match. Like (2) -dioic acid

Ex. Butanoic acid $CH_3CH_2CH_2COOH$

Ethanedioic acid COOHCOOH

Uses: Weaker than inorganic acids using in food and drink (citric acid, lactic acid); preservative like benzoic acid - can kill microorganisms, PVA (polyvinyl acetate - adhesive, latex paint)

4. **ESTERS** - carboxylic groups in which hydrogen of the hydroxyl group has been replaced by an alkyl group.

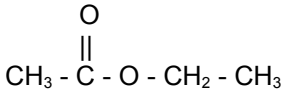


ESTERS (con.)

Naming them:

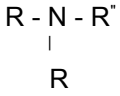
A. Name the carboxylic acid from which the ester was formed and change the -oic acid to - *oate*.
B. Add the name of the alkyl group that has replaced the hydrogen of the hydroxyl group and add the name of the alkyl group to the front of the name.

Ex. Ethyl ethanoate



Uses: Sweetners, flavors, odors; ex. Isoamyl acetate (banana)

5. **AMINE** - Can be considered derivatives of ammonia (NH_3)

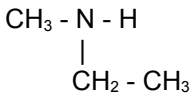


Naming them:

The end of the name will be - amine. Arrange the names of the alkyl groups attached to the nitrogen atom in alphabetical order and add the prefixes di- or
tri- in front.

AMINES (con.)

Ex. Ethylmethylamine



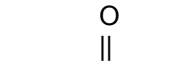
Uses: amines are weak bases and are common in nature; formed in the breakdown of proteins and reflect foul odors (dead fish, feces…);

Note - *ALKALOIDS* - consist of amines and are found in caffeine, nicotine, morphine, etc.

6. **AMIDE** - Similar to amine & has a carboxyl group

The ending of the name will be - *amide*

Ex. Propanamide



9. BENZENE RING with DERIVATIVE

3 - bromo- 5- methylphenol or
3 - bromo- 5- methylbenzenol or
m - bromomethylphenol or m-bromomethylbenzenol

4 TYPES OF ORGANIC REACTIONS:

1. SUBSTITUTION - 1 or more atoms replace another atom or group of atoms in a molecule.

Methane + chlorine ----→ choromethane + HCl

2. ADDITION - 1 atom/molecule is added to an unsaturated molecule and increases the saturation of the molecule.
   Ex. Hydrogenation - used for making margarine, Criso)

Liquid fat, like fatty acid (many double bonds) + H_2 ----------→ Fat (solid)

3. CONDENSATION - 2 molecules or parts of the same molecule combine. (forming proteins!)

Ex. Amino acid + amino acid ---→ dipeptide + H_2O

4. ELIMINATION - A simple molecule, such as water or ammonia, is removed from adjacent C atoms of a larger molecule.

Ex. Sucrose dehydrates when it with sulfuric acid to produce a compound of just C.

Polymers- build up of monomers (simple molecules)

Cellulose proteins ---------→ natural
Starch rubber

Nylon Polyethylene --------→ synthetic
Starch *Dacron

Rubber- from latex (sap of a rubber tree) M.W.- 136,000 g
~ C_5H_8 (union of isoprene units)

It has a property- stickiness, so vulcanization, heating rubber w/ sulfur, takes place and a 3D polymer is formed.

- Filters are used to ↑ wearing qualities
  zinc oxide - white
  Antimony (V) sulfide - orange
  Carbon black - black

- Synthetic Fibers
  Condensation Polymer (nylon and Dacron)
  Polyethylene - flexible, tough polymer, water-resistant, excellent insulating properties
  Polyvinyl Chloride - polymer of vinyl chloride
  Teflon - Polymer of tetraflouroethylene
- Thermoplastic and thermosetting polymers