

Functional Groups

Halocarbons

- Aka Organic Halides
- contains 1 or more halogen atom
- general formula: R-X
- (where R is a carbon chain and X is a halogen)

- as the number of halogens increase, the number of hydrogens decrease:
increased number of electrons
= increase in polarity
= increase in boiling point

IUPAC Naming

- Numbered like an ordinary branch from a parent chain
- Arranged in alphabetical order

- Aryl halides: contain at least 1 aromatic hydrocarbon chain
- Alkyl halides: no aromatic

Example

- 2,3-dichloro 1-phenyl cyclobutane

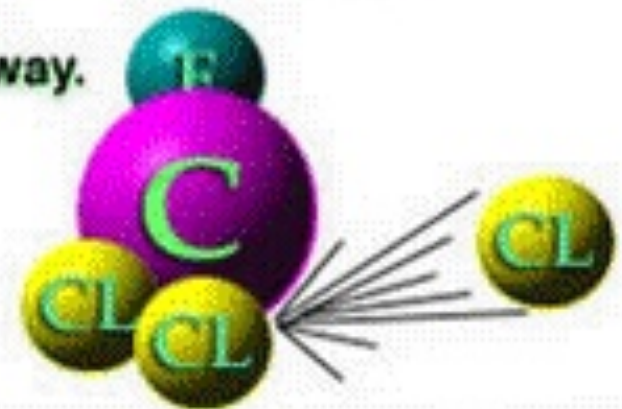
Example 2



Ultraviolet radiation strikes a CFC molecule. . .



. . .and causes a chlorine atom to break away.



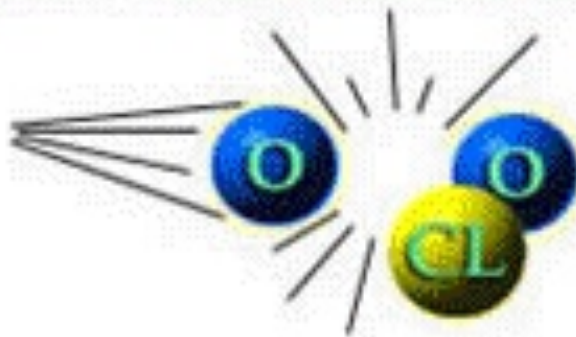
The chlorine atom collides with an ozone molecule. . .



. . .and steals an oxygen atom to form chlorine monoxide and leave a molecule of ordinary oxygen.



When a free atom of oxygen collides with the chlorine monoxide. . .



. . .the two oxygen atoms form a molecule of oxygen. The chlorine atom is released and free to destroy more ozone.



Alcohols

- Hydrocarbon covalently bonded to a hydroxyl group (OH-)
- General formula: R-OH
- (where R is a carbon chain and OH is a hydroxyl)

- Alcohols are polar (therefore they dissolve in water)
- Alcohols have a higher boiling point than alkanes because of their hydrogen bonds (OH)

WARNING

THE CONSUMPTION OF ALCOHOLIC BEVERAGES
MAY LEAD YOU TO BELIEVE
YOU ARE INVINCIBLE



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you are whispering
when you are not.

WARNING

DRINKING
ALCOHOLIC BEVERAGES
BEFORE PREGNANCY
CAN CAUSE
PREGNANCY

Spooof of New York City Department of Health

IUPAC Naming

1. Find the parent (longest chain containing the OH)
2. Change the ending of the name to “ol”
3. OH gets the lowest possible number

4. Name and number the remaining branches
5. Number the position of the OH
6. If there is more than one OH, put a prefix in front of the “ol” (i.e. diol)
7. A benzene with an OH is known as a phenol

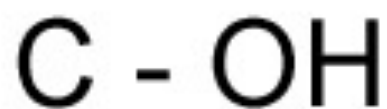
Types of Alcohols

- Grouped according to the number of R groups attached to the hydroxyl group
- The number of branches attached to the C of the C-OH bond dictates the classification

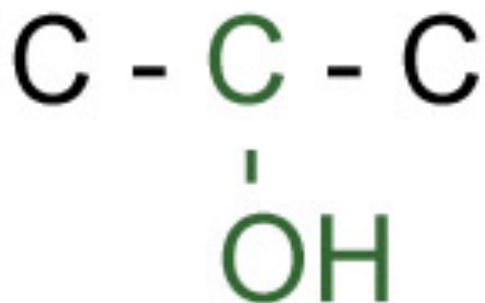
Types of Alcohols

- Primary

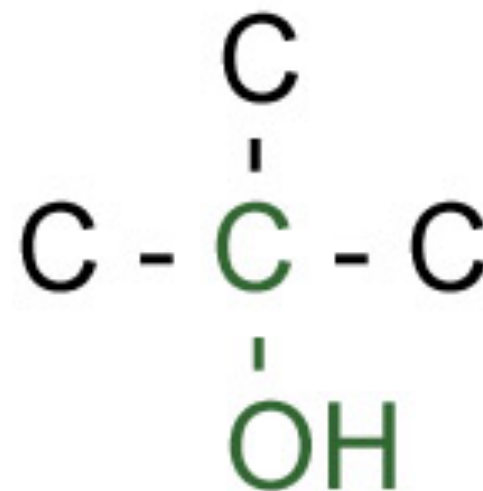
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Primary



Secondary

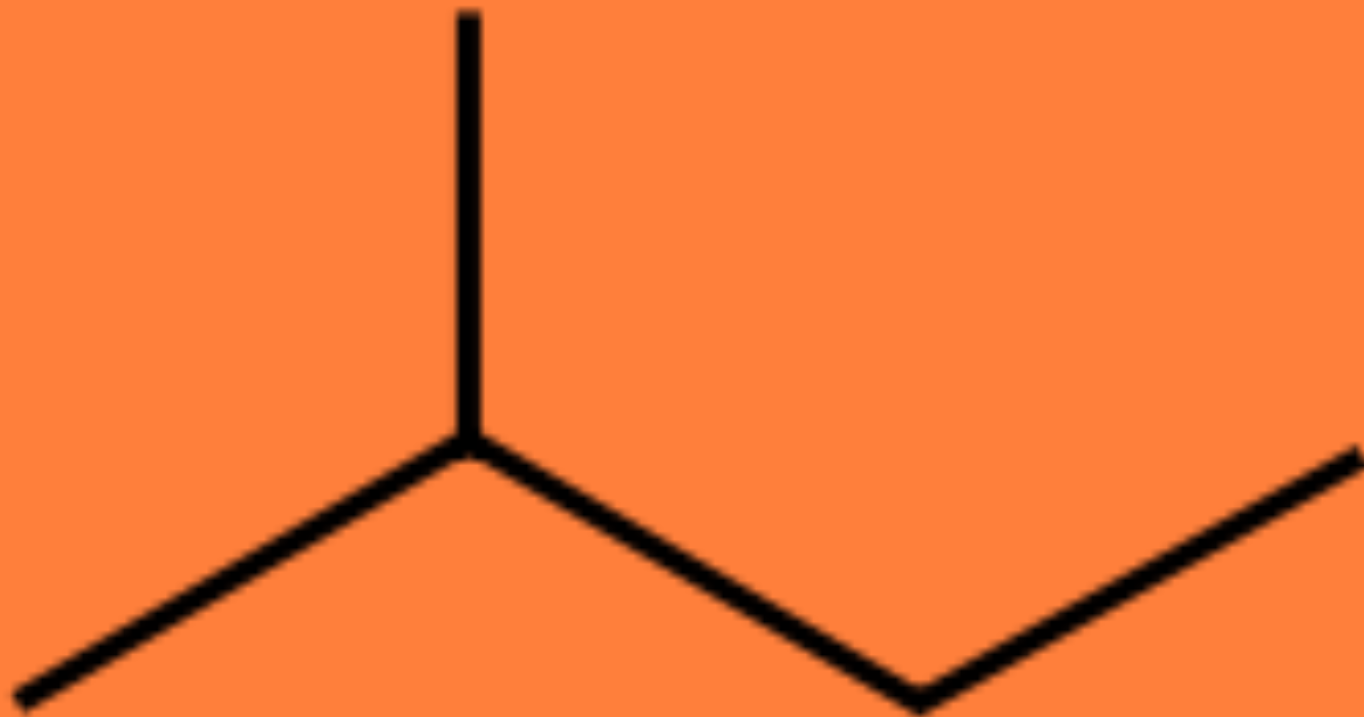


Tertiary

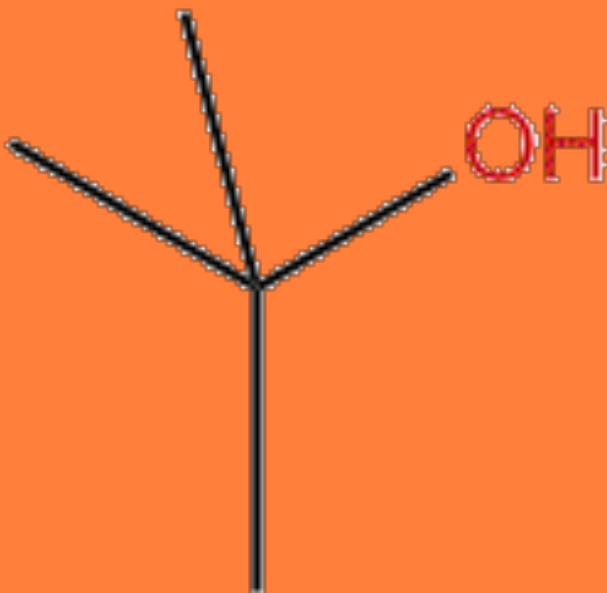
to the C-OH group

Example

OH



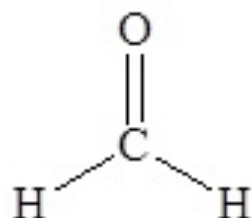
Example



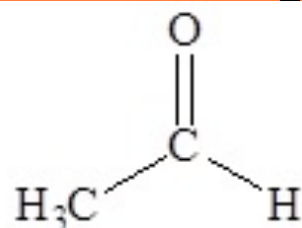
Examples

- 4-ethyl decan-1-ol
- 3-butyl 2,4-dimethyl heptan-1,7-diol

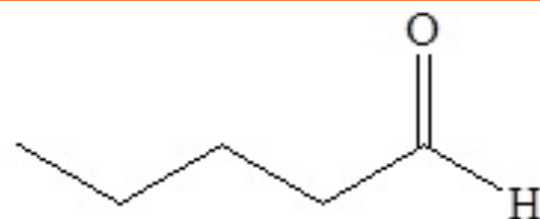
Aldehydes



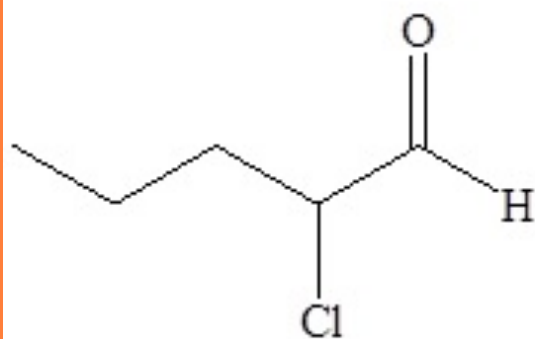
Methanal
(Formaldehyde)



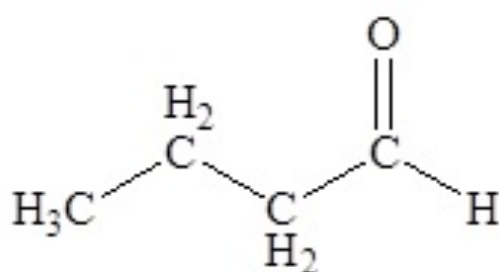
Ethanal
(Acetaldehyde)



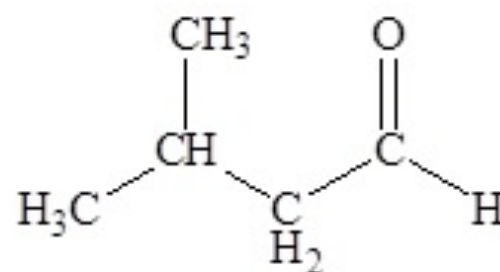
Pentanal
(Valeraldehyde)



2-Chloropentanal
(α -Chlorovaleraldehyde)



Butanal
(Butyraldehyde)



3-Methylbutanal
(isovaleraldehyde)

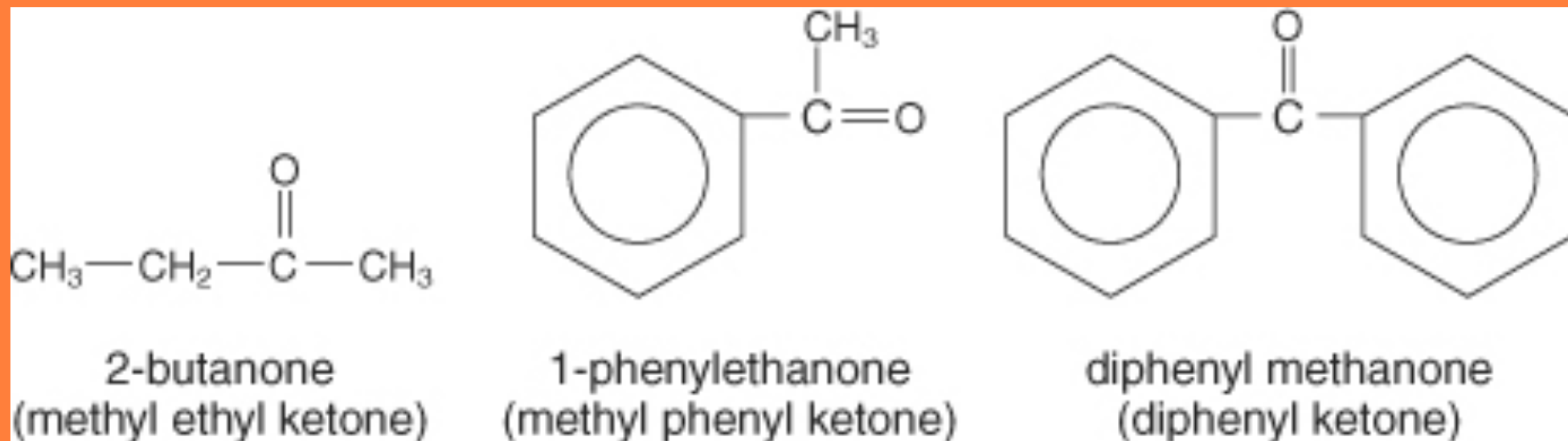
Uses of Aldehydes

- Formaldehyde (Methanal) is used in tanning, preserving and embalming, as well as in germicide, fungicide and insecticide
- Aldehydes are often used in perfumes and flavorings



Ketones

- Carbonyl groups in the middle of a chain (R-CO-R')
- End in “one”



Uses of Ketones

- Acetone is infinitely soluble in water AND dissolves organic compounds.
- For this reason it is used as an industrial solvent for things like paints, varnishes, resins, coatings and nail polish remover.
- They are also found in hormones!

Carboxylic Acids and Esters

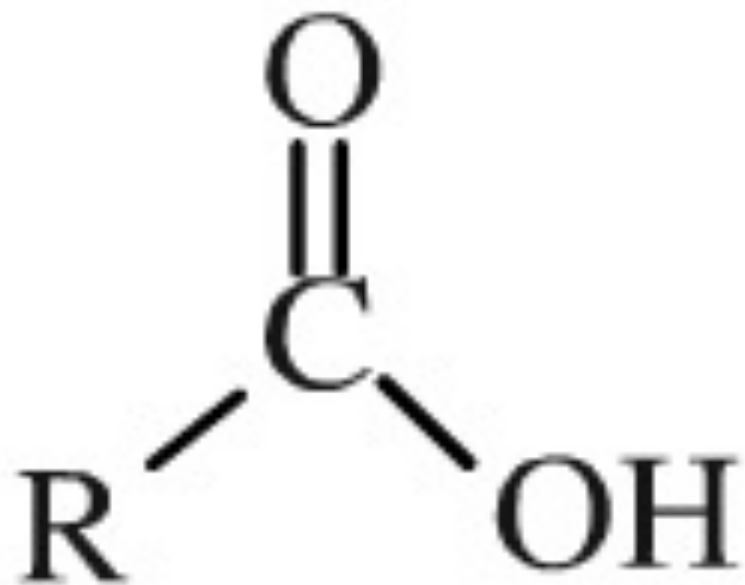
Carbonyl Group:

- Carbon-oxygen double bonds

Carboxyl Group:

- A carbon that is bonded to a hydroxyl group and double bonded to an oxygen atom
- (R-COOH)

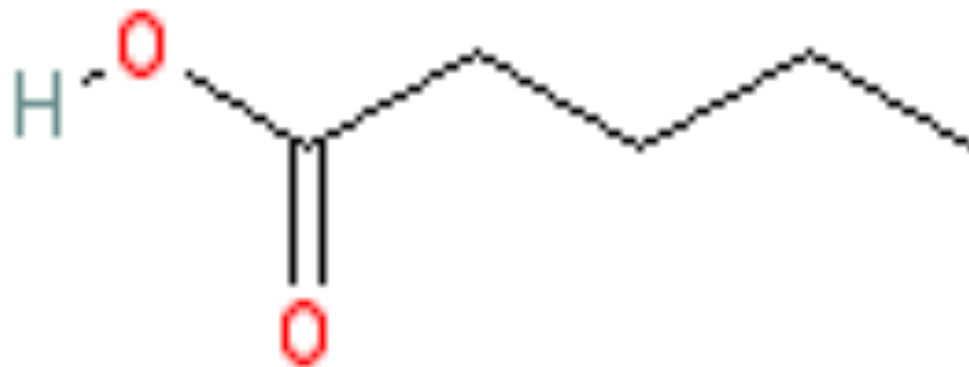
Carboxylic Acid



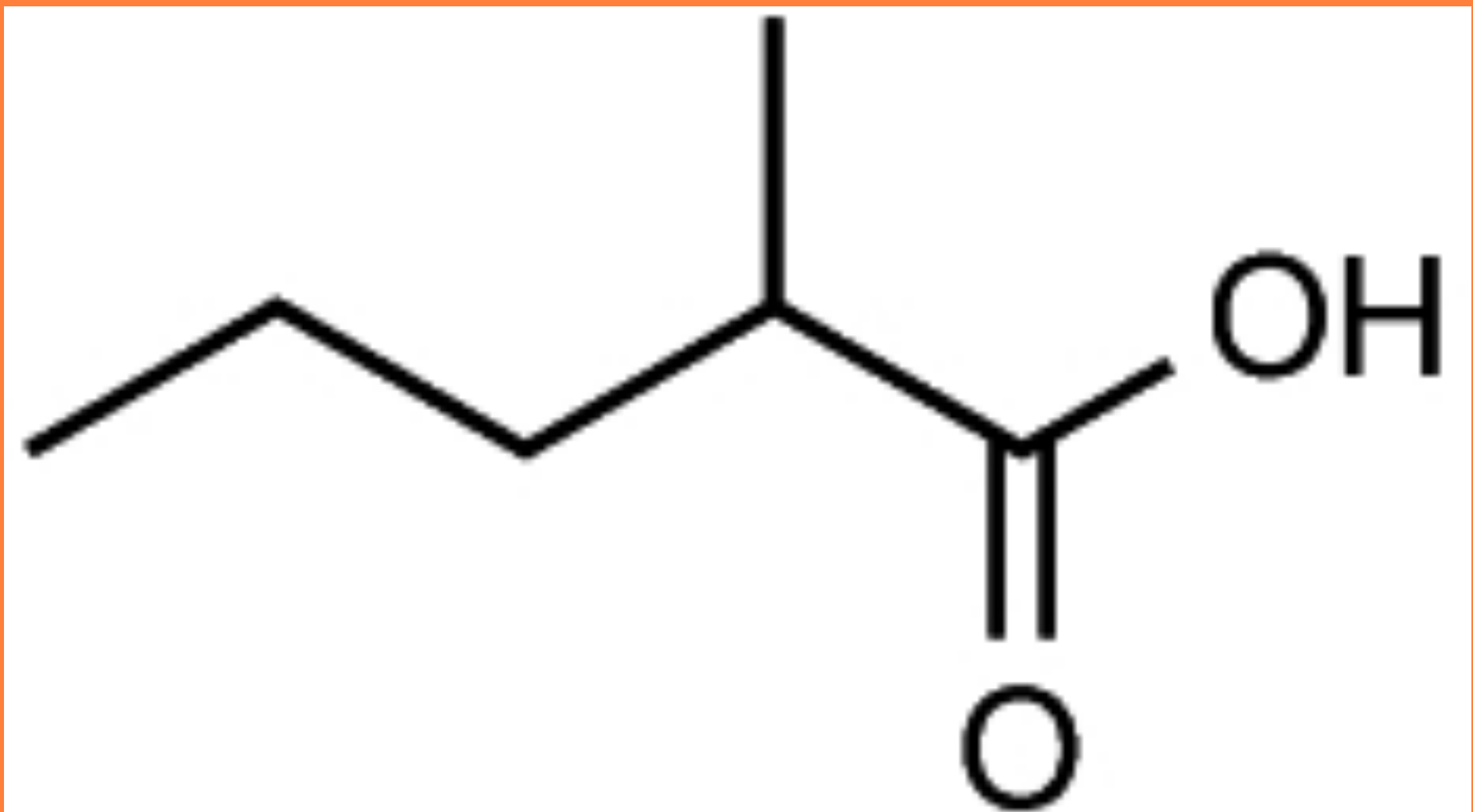
IUPAC Naming

- Count the number of carbons present in the compound, use the alkane name
- add the ending “oic acid”
- see the chart p. 159 workbook

Example



Example



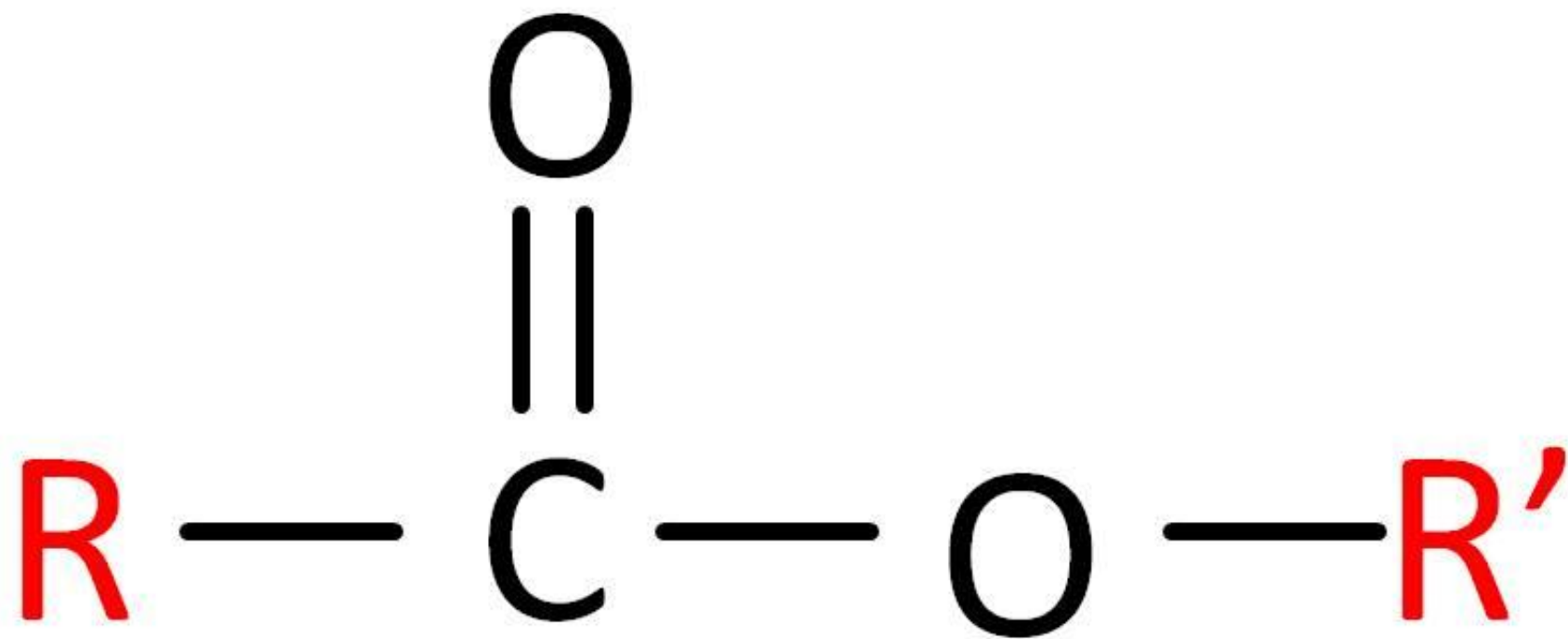
Examples

- Benzenoic acid
- 3-chloro hexanoic acid

Esters

- Carboxylic acid reacts with an alcohol to form an ester
- Water is precipitated out (known as a condensation reaction)

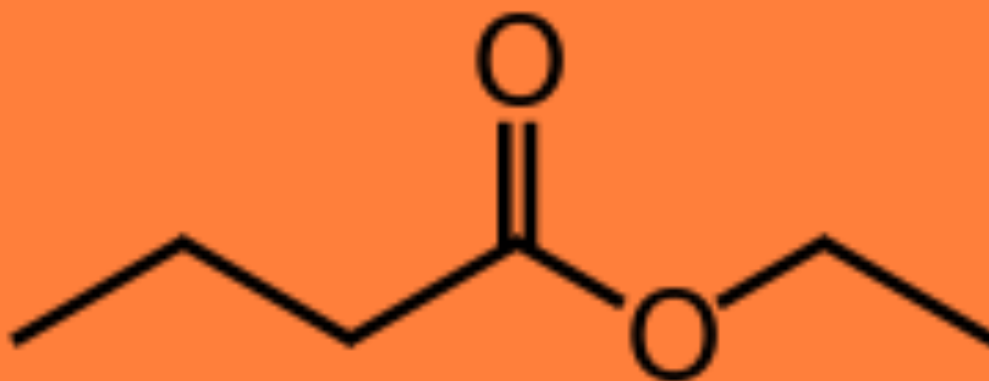
- formation of an ester is called **ESTERIFICATION**
- esters have very characteristic odors and flavors (fruits, perfumes and phermones)
- higher melting and boiling points than carboxylic acids



- Begin with the alcohol ending with “yl”
- Then name the acid component ending with “oate”

Example

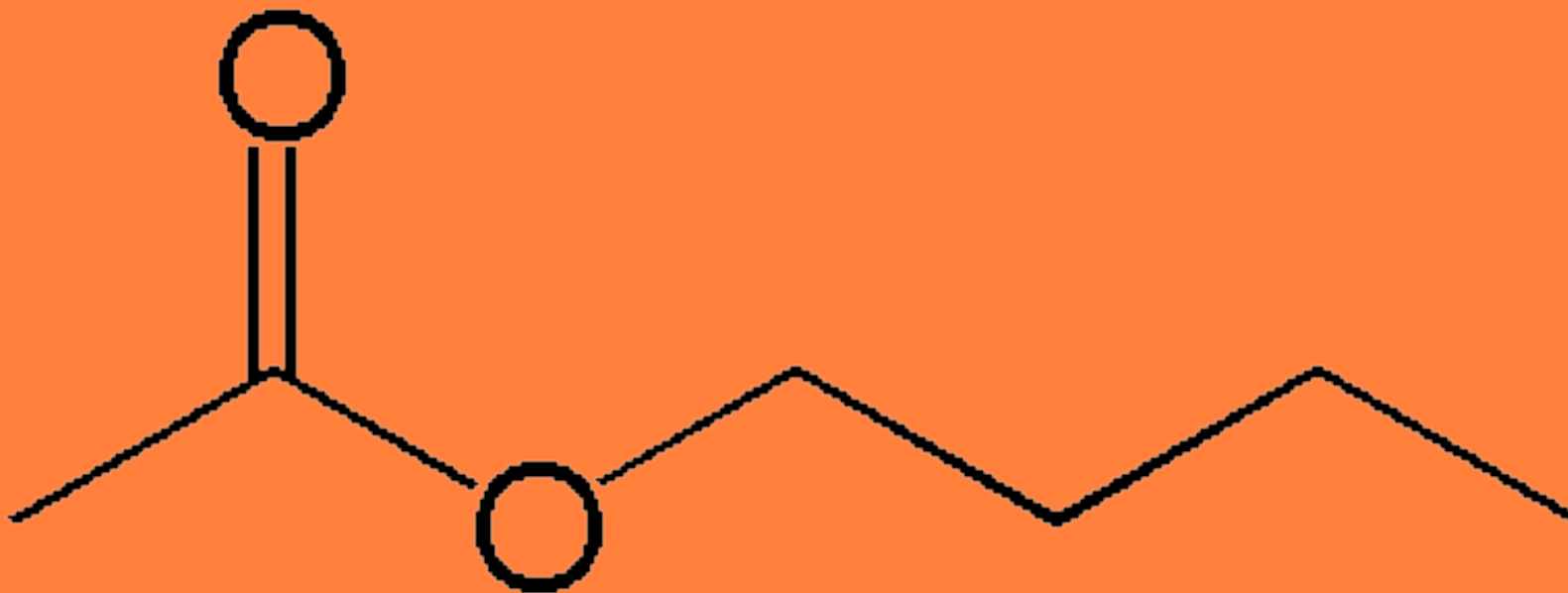
- Reaction of ethanol with butanoic acid forms:



Example

- Phenyl heptanoate

Example



Example

