

IUPAC Rules For Naming Organic Compounds with Functional Groups

Reference: 24.4 (pg. 1026-8,1030-1)

(Ignore “Carbohydrates”, “Ester groups in polymers” and “Esters in living systems”)

Reference: 24.5 (pg. 1032-5)

(Main sections of “Amines” and “Amides” only)

The naming of hydrocarbons follows a few basic rules. However, when organic molecules contain functional groups, the situation is more complex. Often, the rules for naming molecules with functional groups are cumbersome. For example, what about an alkene with an OH group attached to it? Where should the numbering of carbons start? Does the carbon attached to the alcohol get the lowest number, or is it the carbon involved in the double bond? There are IUPAC rules for naming complex molecules like this. However, our focus will be limited to naming simple molecules with only one functional group.

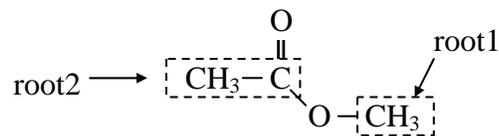
Functional group	Rules for Naming	Name of 3C molecule(s)
Alcohol	[position][root]ol	1-propanol, 2-propanol
Ethers	[yl root]_[yl root]_ether ^{1,2}	ethyl methyl ether
Carboxylic acids	[root]oic_acid	propanoic acid
Esters	[yl root1]_[root2]oate ³	methyl ethanoate, ethyl methanoate
Aldehydes	[root]al	propanal
Ketones	[position][root]one	2-propanone ⁵
Amines	[yl root][yl root][yl root]amine ^{2,4}	propylamine, isopropylamine, ethylmethylamine, trimethylamine
Amides (one R group only)	[root]amide	propanamide

In this chart, “_” indicates a blank space. [position] indicates the number of the carbon atom where the functional group is located. [root] refers to main carbon chain of the molecule. [yl root] indicates that the alkyl name is used. For example, if the longest carbon chain is 2 carbons long then [root] is “ethan” and [yl root] is “ethyl”. When root is listed more than once it indicates that all are of equal importance in naming. When root1 is listed with root2 it indicates that they are treated differently when naming compounds (see 3 below).

¹ List groups in alphabetical order; ethyl methyl ether is correct, methyl ethyl ether is not.

² Di or tri is used to condense the name; dimethyl ether is correct, methyl methyl ether is not.

³ In this case, “root1” refers to the carbon chain that is single bonded to O; “root2” refers to the carbon chain bonded to both oxygens (the diagram shows methyl ethanoate):



⁴ There may be 1, 2, or 3 alkyl root names

⁵ The 2 in 2-propanone is redundant since it can have only one configuration. However, in naming ketones the number on the carbon chain is given even if only one possibility exists.

You may encounter common names for alcohols, carboxylic acids, esters, etc. Unfortunately there are no obvious rules governing common names. There aren't many common names that you will have to know for this course. The important ones will be pointed out to you.

Assignment:

- 1) Draw structures for the 3C molecules that are named in the chart (write names next to structures).
- 2) Draw structures and give names for all possible 2-carbon molecules.
- 3) Draw structures and give names for all possible 4-carbon molecules. Note: you may use “iso” to indicate a branched chain, such as for an isopropyl group (or an isobutyl group in some cases). This is not an IUPAC method, but is used for this exercise to simplify naming.