The Alkanes

	Prefix	*No. of Carbons*
a.	meth-	1
b.	eth-	2
c.	prop-	3
d.	but-	4
e.	pent-	5
f.	hex-	6
g.	hept-	7
h.	oct-	8
i.	non-	9
j.	dec-	10

Here is a summary of the rules used to name alkanes:

RULE 1: Locate the longest continuous chain of carbon atoms. This will give you the name of the "parent" compound.

RULE 2: The name of the parent compound is modified by noting what alkyl groups are attached to the chain. Number the longest chain so that the alkyl group(s) will be on the lowest numbered carbons.

RULE 3: When the same alkyl group occurs more than once in a molecule, the numbers of the carbons to which they are attached are all included in the name. The number of the carbon is repeated as many times as the group appears. The number of repeating alkyl groups is indicated in the name by the use of Greek prefixes for 2, 3, 4, 5, etc. (di, tri, tetra, penta, etc.).

RULE 4: If there are two or more different kinds of alkyl groups attached to the parent chain, name them in alphabetical order.

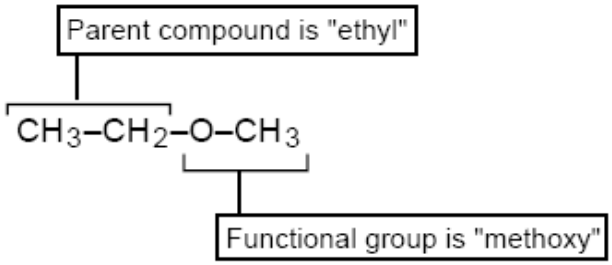
RULE 5: To put the finishing touches on the name of an alkane, keep the following points in mind:
(a) hyphens are used to separate numbers from names of substituents;
(b) numbers are separated from each other by commas;
(c) the last alkyl group to be named is prefixed to the name of the parent alkane, forming one word; and
(d) the suffix "-ane" indicates that the molecule is an alkane.

The Alcohols

Additional Rules for the Nomenclature of Alcohols:
RULE 1: Locate the longest continuous chain of carbon atoms which contains the "hydroxy" (-OH) group. This chain will serve to identify the parent compound.
RULE 2: Number the chain so as to give the carbon atom which is bonded to the –OH group the lowest possible number.
RULE 3: A number is included before the name of the parent compound to indicate the position of the –OH group.
RULE 4: The suffix "ol" is added to the name to indicate that the molecule is an alcohol.

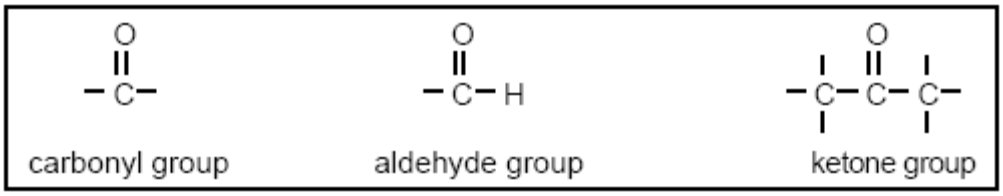
The Ethers

Ethers are compounds which contain an oxygen atom bonded to two carbon atoms within the carbon chain. The functional group is the C–O–C arrangement found within the chain.



The Aldehydes and Ketones

The next two organic functional groups we will study are those of the *aldehydes* and *ketones*. Aldehydes and ketones contain a *carbonyl group*, which consists of an oxygen atom which is double–bonded to a carbon atom. There are two kinds of carbonyl groups involved here. In aldehydes, at least one hydrogen is attached to the carbonyl carbon, while in ketones, two carbon atoms are always attached to the carbonyl carbon.

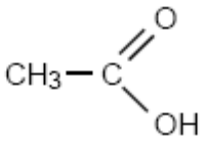


Additional Rules for the Nomenclature of **Aldehydes**:
RULE 1: The longest continuous chain containing the aldehyde group is considered to be the parent compound.
RULE 2: The carbonyl carbon is part of the parent chain and is always considered to be in the #1 position.
RULE 3: The suffix "al" is added to the name of the parent compound to indicate that the compound is an aldehyde.

Additional Rules for the Nomenclature of **Ketones**:
RULE 1: The longest continuous chain containing the ketone group is considered to be the parent compound.
RULE 2: A number is included before the name of the parent compound to indicate the position of the ketone group. The chain is always numbered so that the carbonyl carbon has the lowest possible number.
RULE 3: The suffix "one" is added to the name of the parent compound to indicate that the compound is a ketone.

The Organic Acids

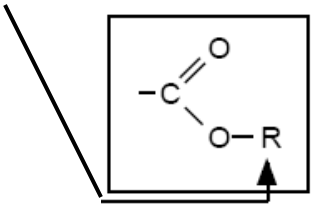
Additional Rules for the Nomenclature of **Carboxylic Acids**:
RULE 1: The longest continuous chain containing the carboxyl group is considered to be the parent compound.
RULE 2: The carboxyl carbon is part of the parent chain and is always considered to be in the #1 position.
RULE 3: The suffix "oic" is added to the name of the parent compound, and the word "acid" is added to the name.



The Esters

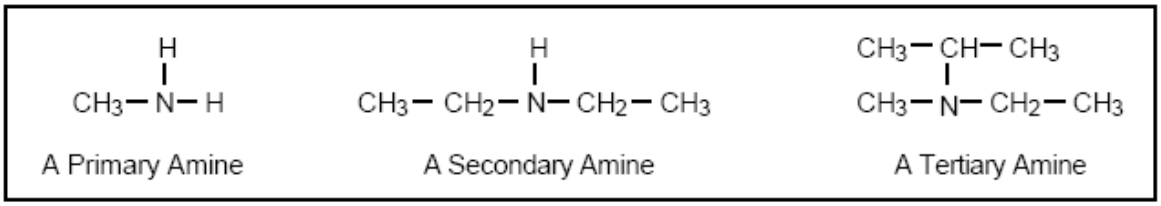
Additional Rules for the Nomenclature of Esters:
RULE 1: Determine the name of the "R" group.
RULE 2: Place the name of the "R" group in front of the name of the parent acid, forming two words.
RULE 3: Determine the name of the parent acid, and change its suffix from "–ic" to "–ate." Drop the word "acid."

The letter "R" in the structure at right represents some organic group (methyl, ethyl, etc.).



The Amines

1. In *primary* amines one hydrogen atom in ammonia has been replaced by an alkyl group.
2. In *secondary* amines two hydrogen atoms in ammonia have been replaced by two alkyl groups.
3. In *tertiary* amines all three hydrogen atoms in ammonia have been replaced by three alkyl groups.

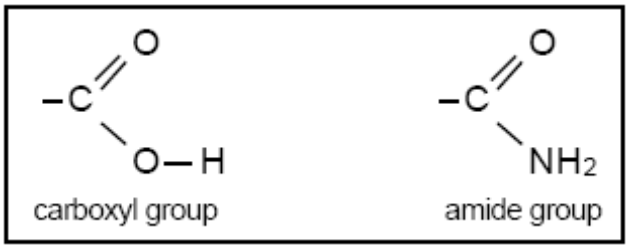


Additional Rules for the Nomenclature of Amines:
RULE 1: In primary amines only, the IUPAC system treats the NH_2 (amino) group as a substituent group on the parent chain.
RULE 2: When using the common naming system, the names of the alkyl groups which are attached to the nitrogen atom are listed in alphabetical order and are attached to the suffix "amine" to form one word. Greek prefixes are used if specific alkyl groups occur more than once in a molecule.

The Amides

You are already familiar with the carboxyl group which is the functional group of a carboxylic acid. If you replace the hydroxy group (–OH) in the carboxyl group with an amino group (–NH_2), you get the functional group of a class of organic compounds known as primary *amides*.

Additional Rules for the Nomenclature of Amides:
RULE 1: Identify the carboxylic acid from which the amide was derived and change the suffix of the acid name from "–oic" to "–amide," and drop the word acid.
RULE 2: Add the names of any alkyl groups to the name of the parent compound, forming one word.

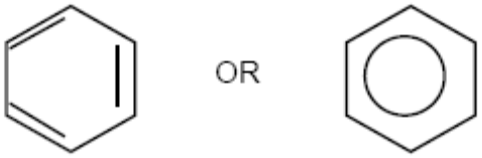


The Halogenated Hydrocarbons

In these compounds, the functional group is a single atom of a halogen such as fluorine, chlorine, bromine, or iodine.

Additional Rules for the Nomenclature of Halogenated Hydrocarbons:
RULE 1: Drop the "–ine" suffix from the name of the halogen atom(s) and add a suffix consisting of the letter "o".
RULE 2: Add the altered name(s) of the halogen atom(s) to that of the parent compound.

Aromatic Compounds



Benzene Benzene

bromo	–Br	nitro	$–NO_2$
chloro	–Cl	amino	$–NH_2$
fluoro	–F	hydroxy	–OH
iodo	–I	methyl	$–CH_3$
		ethyl	$–C_2H_5$

When the ring contains more than one substituent, the names become more complex. When the ring has two substituents, the prefixes *ortho*, *meta*, and *para* are used to describe the positions of the substituents. Ortho refers to adjacent positions, while meta describes two positions separated by one carbon atom. Para positions are located across from each other on the ring. The prefixes can be abbreviated as o-, m-, and p- as in the examples below.