

Nomenclature of Substituted Alkanes

The nomenclature of alkanes is the simplest, but is the foundation for all other organic compound nomenclature. The same principles can be used for almost any other functional group—cycloalkanes, cycloalkenes, alkenes, benzene derivatives, alcohols, ketones, aldehydes and esters. Some of these will just use a different suffix. Some will need a prefix. Others will need to be done in parts, similar to how substituted alkanes will be done.

An alkane will be named based on its number of carbons, with the generic “-ane” ending. A substituted alkane is similar, but with the specific substituent and its placement used as a prefix.

1. Determine the longest carbon chain—this is the parent chain and serves as the base of the name.

Carbons	Alkane Name with root bolded
1	Methane
2	Ethane
3	Propane
4	Butane
5	Pentane
6	Hexane
7	Heptane
8	Octane
9	Nonane
10	Decane

2. Number the carbons on the parent chain, such that you reach a substituent soonest. If you reach a substituent at the same distance from either side, but the chain is not symmetrical, it will depend upon which side gets you to the next substituent sooner. Example:

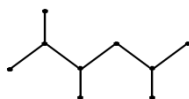


Figure 1. Substituted carbon chain

Numbering from the left gives you substituents at the 2nd, 3rd, and 5th carbons. Numbering from the right gives you substituents at the 2nd, 4th and 5th carbons. So, numbering from the left would be preferred.

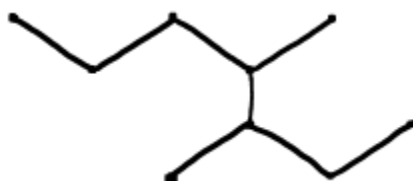
3. The number of the carbon a substituent is bonded to must be included in the name. The carbon number goes before the substituent within the name. Substituents of the same type can be grouped together with prefixes denoting how many, such as di-, tri-, tetra-, etc. All placements must be listed.

Some Rules!

Substituents go in alphabetical order before the parent chain.

Numbers are separated from other numbers by commas. Numbers are separated from letters by dashes. There is no space between words, like substituents and chains.

Nomenclature Example



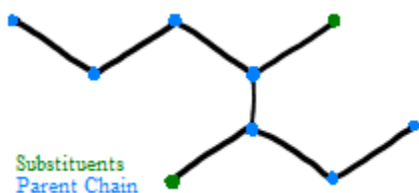
Note!

Alkane substituents, like CH₃, will use the alkane root with a -yl suffix.

Halogen substituents are named as follows: fluoro, chloro, iodo, and bromo.

Substituted alkanes will be named in two parts:

- Label your substituents and parent chain. How many carbons are there for each?



Substituents	Parent Chain
1 carbon → methyl	7 carbons → heptane
1 carbon → methyl	

- Where are the substituents?

One of the methyls is on the 3rd carbon, one is on the 4th. I have counted them starting from the right. Counting from the left would give you substituents on the 4th and 5th carbon atoms.

- What order should the substituents be in?

The substituents are the same! This means you can group them together. There are two, so the prefix for the substituents will be “di-”.

- Let's list the substituents together with their placement:

3,4-dimethyl

- Now just add the parent chain:

3,4-dimethylheptane

This is your IUPAC name! Congratulations.