

Alkanes

1. Find the longest continuous carbon chain in the molecule. Name the alkane after the “normal” (straight chain) alkane with the same number of carbons.

The Normal Alkanes

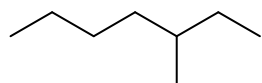
Number of carbons	Name	Formula	Number of carbons	Name	Formula
1	methane	CH ₄	11	undecane	CH ₃ (CH ₂) ₉ CH ₃
2	ethane	CH ₃ CH ₃	12	dodecane	CH ₃ (CH ₂) ₁₀ CH ₃
3	propane	CH ₃ CH ₂ CH ₃	13	tridecane	CH ₃ (CH ₂) ₁₁ CH ₃
4	butane	CH ₃ (CH ₂) ₂ CH ₃	14	tetradecane	CH ₃ (CH ₂) ₁₂ CH ₃
5	pentane	CH ₃ (CH ₂) ₃ CH ₃	15	pentadecane	CH ₃ (CH ₂) ₁₃ CH ₃
6	hexane	CH ₃ (CH ₂) ₄ CH ₃	20	eicosane	CH ₃ (CH ₂) ₁₈ CH ₃
7	heptane	CH ₃ (CH ₂) ₅ CH ₃	30	triacontane	CH ₃ (CH ₂) ₂₈ CH ₃
8	octane	CH ₃ (CH ₂) ₆ CH ₃	40	tetracontane	CH ₃ (CH ₂) ₃₈ CH ₃
9	nonane	CH ₃ (CH ₂) ₇ CH ₃	50	pentacontane	CH ₃ (CH ₂) ₄₈ CH ₃
10	decane	CH ₃ (CH ₂) ₈ CH ₃	100	hectane	CH ₃ (CH ₂) ₉₈ CH ₃

2. Substituent alkyl groups attached to the chain are named by replacing the *-ane* ending with the *-yl* ending. Both the IUPAC names and common names are given in the table below.

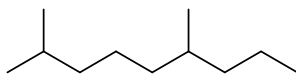
Common Alkyl Groups

Name	Structure	Name	Structure	Name	Structure
methyl	CH ₃ -	<i>n</i> -butyl	CH ₃ (CH ₂) ₂ CH ₂ -	<i>n</i> -pentyl	CH ₃ (CH ₂) ₃ CH ₂ -
ethyl	CH ₃ CH ₂ -	2-methylpropyl (isobutyl)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}-\text{CH}_2- \\ \\ \text{CH}_3 \end{array}$	3-methylbutyl (isopentyl)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}-\text{CH}_2-\text{CH}_2- \\ \\ \text{CH}_3 \end{array}$
propyl	CH ₃ CH ₂ CH ₂ -	1-methylpropyl (<i>sec</i> -butyl)	$\begin{array}{c} \text{CH}_3-\text{CH}_2-\text{CH}- \\ \\ \text{CH}_3 \end{array}$	2,2-dimethylpropyl (neopentyl)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{C}-\text{CH}_2- \\ \\ \text{CH}_3 \end{array}$
1-methylethyl (isopropyl)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}- \\ \\ \text{CH}_3 \end{array}$	1,1-dimethylethyl (<i>tert</i> -butyl)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{C}- \\ \\ \text{CH}_3 \end{array}$	1,1-dimethylpropyl (<i>tert</i> -pentyl)	$\begin{array}{c} \text{CH}_3 \\ \\ \text{CH}_3-\text{CH}_2-\text{C}- \\ \\ \text{CH}_3 \end{array}$

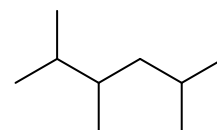
3. The position of the substituent(s) group(s) is given the lowest possible set of numbers, starting with the first branch point.



3-methylheptane
not
5-methylheptane



2,6-dimethylnonane
not
4,8-dimethylnonane



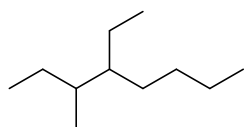
2,3,5-trimethylhexane
not
2,4,5-trimethylhexane

4. Multiple occurrences of the same substituent as attachments to a chain should use the following prefixes to designate the number of times the substituent is present.

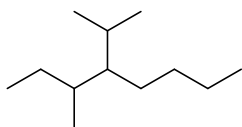
2 di- 3 tri- 4 tetra- 5 penta- 6 hexa- 7 hepta- 8 octa- 9 nona- 10 deca-

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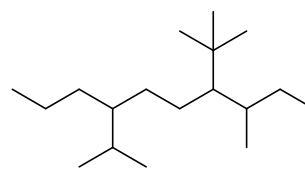
5. List the substituent groups in alphabetical order, skipping the prefixes *n*-, *sec*-, *tert*-, di-, tri-, tetra-, etc. (but not iso) in the alphabetization.



4-ethyl-3-methyloctane



4-isopropyl-3-methyloctane
-or-
3-methyl-4-(1-methylethyl)octane



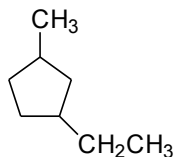
4-*tert*-butyl-7-isopropyl-3-methyldecane
-or-
3-methyl-4-(1,1-dimethylethyl)-7-(1-methylethyl)decane

Cycloalkanes

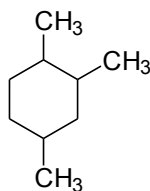
1. Cycloalkanes with one ring use the prefix “cyclo” with the corresponding name for the alkane with the same number of carbons.

cyclopropane	cyclobutane	cyclopentane	cyclohexane
cycloheptane	cyclooctane	cyclononane	cyclodecane

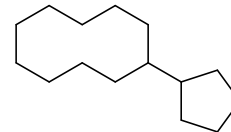
2. Substituents are given the lowest possible number.



1-ethyl-3-methylcyclopentane



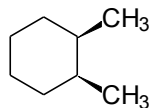
1,2,4-trimethylcyclohexane



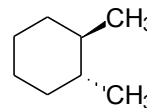
cyclopentylcyclodecane

3. Smaller cycloalkyl groups may be listed as a substituent on larger rings. Generally, alkyl groups are listed as substituents on cycloalkanes, cycloalkyl groups are not usually listed as substituents on alkanes.

4. Disubstituted alkanes may be described with the prefix *cis*- or *trans*- to indicate the relative position of the two groups. The *cis*- prefix is used to indicate the groups are on the same side, the *trans*- prefix is used to indicate the groups are on opposite sides.



cis-1,2-dimethylcyclohexane



trans-1,2-dimethylcyclohexane