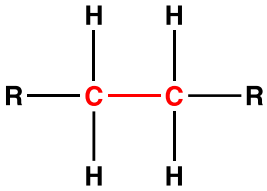
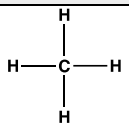
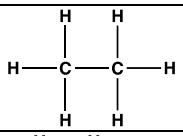
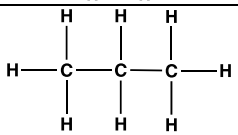
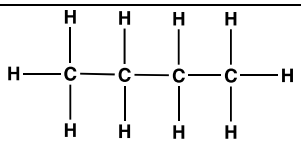
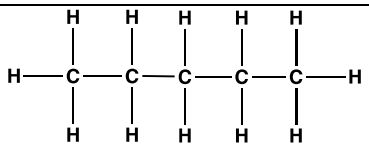
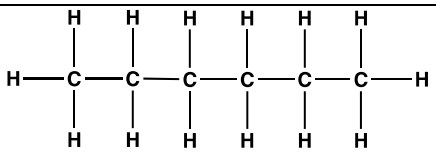
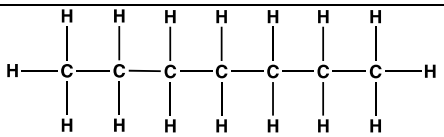
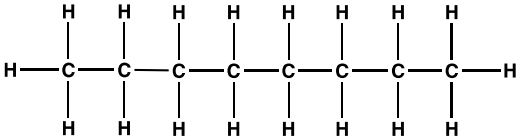
Alkanes

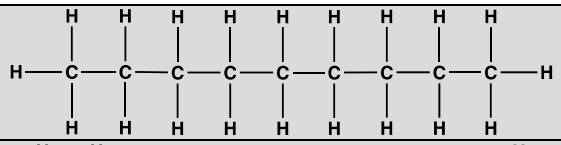
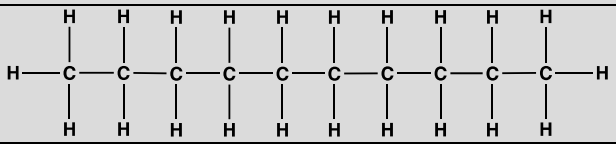
Table of Contents

Linear chains (unsubstituted)

Summary

Functional group	General formula	Structure/example	Prefix (Used in side chain)	Suffix (Used in parent chain)
Alkane	-C-C-		-yl	-ane

No. of C	Prefix	Suffix	Structural formula	Molecular formula
n		-ane		C_nH_{2n+2}
1	Meth-	-ane		CH_4
2	Eth-	-ane		C_2H_6
3	Prop-	-ane		C_3H_8
4	But-	-ane		C_4H_{10}
5	Pent-	-ane		C_5H_{12}
6	Hex-	-ane		C_6H_{14}
7	Hept-	-ane		C_7H_{16}
8	Oct-	-ane		C_8H_{18}

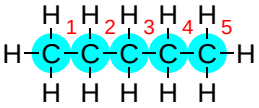
9	Non-	-ane		C_9H_{20}
10	Dec-	-ane		$C_{10}H_{22}$

Note: The VCE and QCE courses expect students to name alkanes up to C10. All other states require students to name alkanes up to C8.

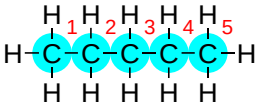
Worked Examples

Pentane

STEP 1: Identify the parent hydrocarbon chain



STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix.



5 C = *PENT-*

alkane = -ANE

STEP 3: Identify the functional group with the highest priority and its suffix

alkane = -ANE

STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

None

STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes.

None

STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains

Not required

STEP 7: Numbers indicating the locant of the functional group are placed directly before the functional group portion of the name.

7.1 Names are listed alphabetically

7.2 If there is more than one of the same functional group, the prefix di- (2), tri- (3), tetra- (4) are used. These are not considered for alphabetical listing

7.3 If the functional group is in a position where no alternative position is possible, no number is required (e.g. ethan-1-ol should be written as ethanol)

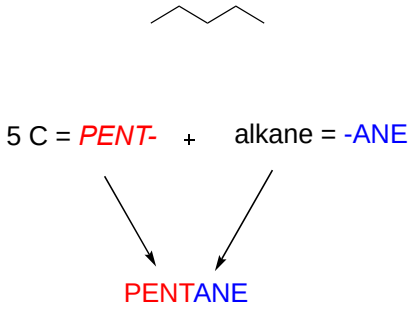
Not required

STEP 8: Write the complete name

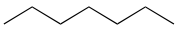
8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

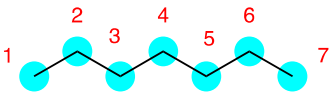
8.3 Successive words are combined into one word

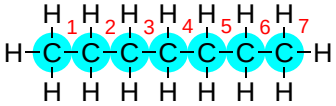


Heptane

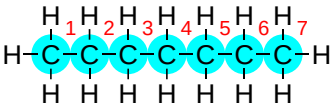


STEP 1: Identify the parent hydrocarbon chain





STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix.



7 C = HEPT

alkane = -ANE

STEP 3: Identify the functional group with the highest priority and its suffix

alkane = -ANE

STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

None

STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

None

STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains

Not required

STEP 7: Numbers indicating the locant of the functional group are placed directly before the functional group portion of the name.

7.1 Names are listed alphabetically

7.2 If there is more than one of the same functional group, the prefix di- (2), tri- (3), tetra- (4) are used. These are not considered for alphabetical listing

7.3 If the functional group is in a position where no alternative position is possible, no number is required (e.g. ethan-1-ol should be written as ethanol)

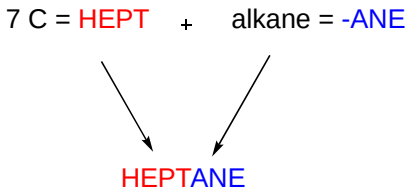
Not required

STEP 8: Write the complete name

8.1 Commas are written between numbers

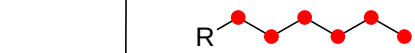
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



Branched Alkanes

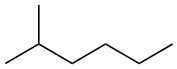
Summary

	ALKANE
1 C	 Methyl
2 C	 Ethyl
3 C	 Propyl
4 C	 Butyl
5 C	 Pentyl
6 C	 Hexyl

Please check your curriculum guidance regarding the length of side chains required in your State or Territory. Most courses only require students to know methyl and ethyl branched chains. However, if updated (2013 IUPAC Blue Book) guidelines are being used by markers, students may need to be familiar with longer branched chains.

Worked Examples

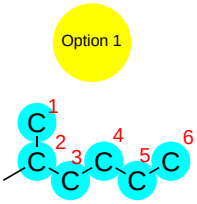
2-methylhexane



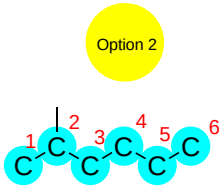
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length

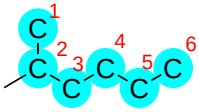


- Functional group ✓
- Longest chain ✓



- Functional group ✓
- Longest chain ✓

STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix



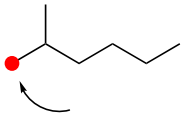
6 C = HEX-

alkane = -ANE

STEP 3: Identify the functional group with the highest priority and its suffix

None

STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

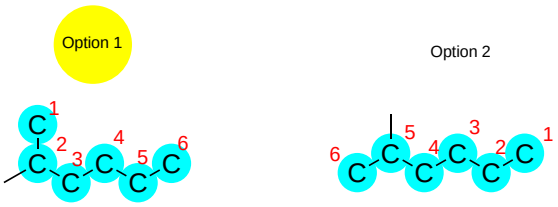


1 C = METHYL-

STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

None

STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains

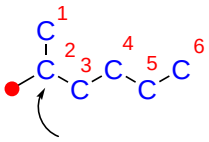


Methyl = 2

Methyl = 5

Lowest locants possible ✔

STEP 7: Numbers indicating the locant of the functional group are placed directly before the functional group portion of the name.



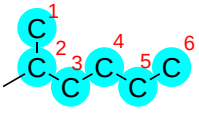
2-METHYL-

STEP 8: Write the complete name

8.1 Commas are written between numbers

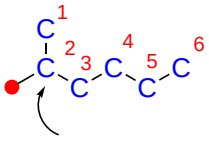
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word

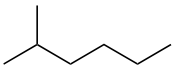


6 C = HEX-

alkane = -ANE



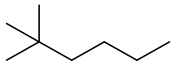
2-METHYL-



2-methylhexane

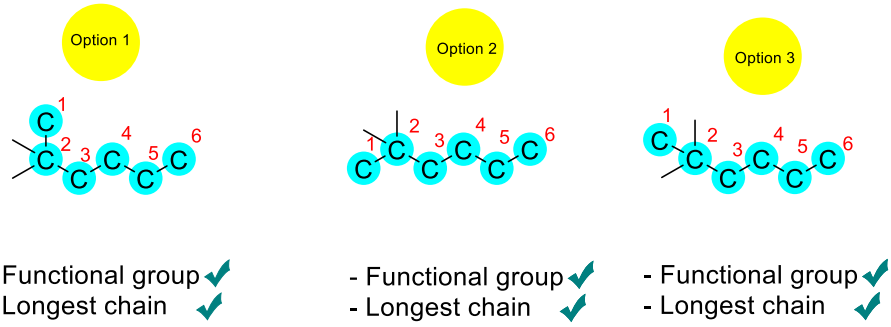
Steps 1,2 **Steps 4,6,7** **Step 8**

2,2-dimethylhexane

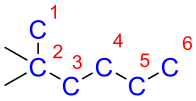


STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority
1.2 It should have the maximum length



STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix.



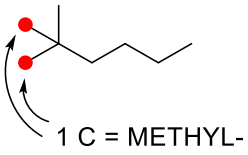
6 C = HEX-

alkane = -ANE

STEP 3: Identify the functional group with the highest priority and its suffix

None

STEP 4: Identify side chains



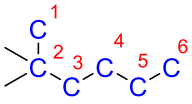
x2 = -DIMETHYL-

STEP 5: Identify any remaining functional groups (including double and triple bonds)

N/A

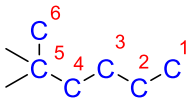
STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains

Option 1



Methyl = 2

Option 2



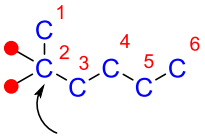
Methyl = 5

Lowest locants possible

STEP 7: Numbers indicating the locant of the functional group are placed directly before the functional group portion of the name.

7.1 Names are listed alphabetically

7.2 If there is more than one of the same functional group, the prefix di- (2), tri- (3), tetra- (4) are used. These are not considered for alphabetical listing

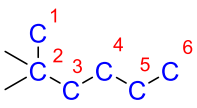


2-METHYL- (2x)

becomes

2,2-DIMETHYL

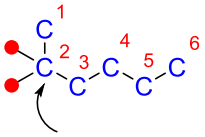
STEP 8: Write the complete name



HEX-

-ANE

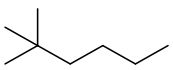
Steps 1,2



2-METHYL- (2x)

2,2-DIMETHYL

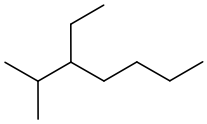
Steps 4,6,7



2,2-dimethylhexane

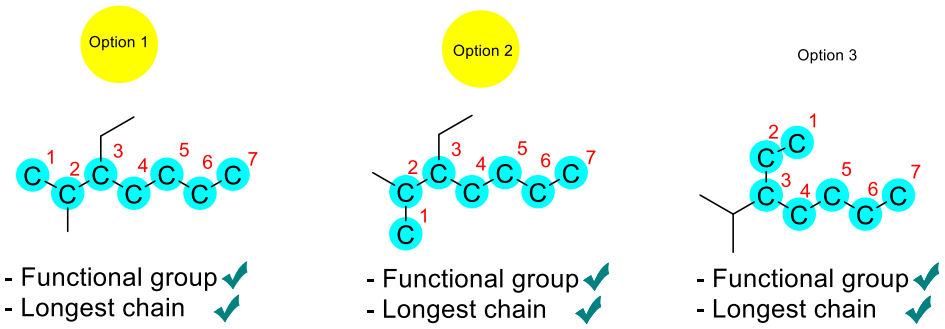
Step 8

3-ethyl-2-methylheptane



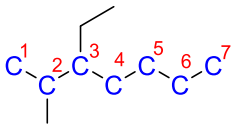
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority
1.2 It should have the maximum length



NB: *Option three results in the branch on the alkyl chain also being branched itself (-CH(CH$_3$)$_2$)! To avoid this, we use option 1 or 2 where the individual branches are linear (-CH$_3$ and -CH$_2$CH$_3$).*

STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix.



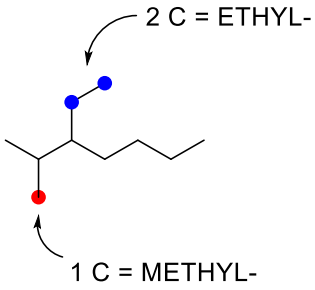
7 C = HEPT-

alkane = -ANE

STEP 3: Identify the functional group with the highest priority, its locant and its suffix

None

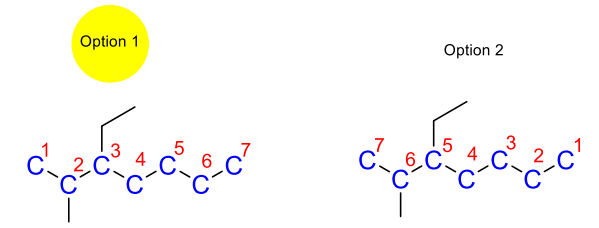
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

N/A

STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains



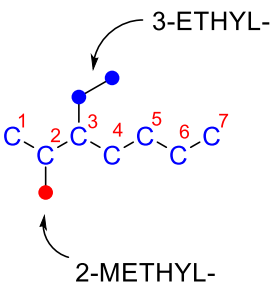
Methyl = 2, Ethyl = 3

Methyl = 6, Ethyl = 5

Lowest locants possible

STEP 7: Numbers indicating the locant of the functional group are placed directly before the functional group portion of the name.

7.1 Names are listed alphabetically
7.2 If there is more than one of the same functional group, the prefix di- (2), tri- (3), tetra- (4) are used. These are not considered for alphabetical listing

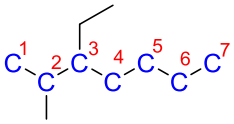


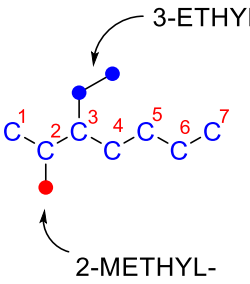
NB: Ethyl before methyl as alphabetical order takes higher priority

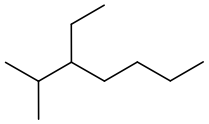
3-Ethyl-2-methyl-

STEP 8: Write the complete name

8.1 Commas are written between numbers
8.2 Hyphens are written between numbers and letters
8.3 Successive words are combined into one word







HEPT-

-ANE

Steps 1,2

3-ETHYL-2-METHYL –

Steps 4,6,7

3-ethyl-2-methylheptane

Step 8