

Alkyl Halides

Table of Contents

<i>Summary</i>	62
Primary, secondary and tertiary carbons in alkyl halides	63
<i>Worked Examples</i>	64
3-bromohexane	64
2,2-dichlorobutane	66
4-fluoro-1,2-diiodopentane	68
2-chloro-4-ethyl-5,5-dimethylheptane.....	71

Summary

Alkyl halides, or halogenated organic compounds, can be named using the general rules. As they are a low priority, they are generally only incorporated in prefix form into the name of the compound.

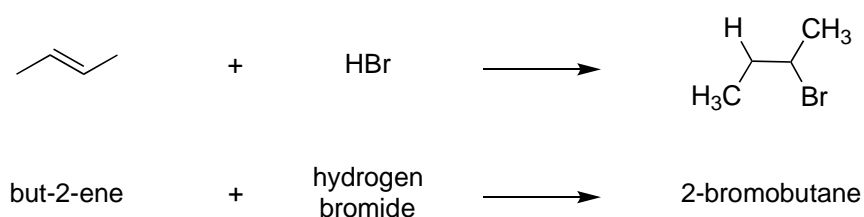
Halogen	Prefix
Fluorine	fluoro-
Chlorine	chloro-
Bromine	bromo-
Iodine	iodo-

When multiple halides of the same type are included in compound, the prefixes di- (2), tri- (3) and tetra- (4) are used.

When multiple halides of different types are included in the compound, the names of the halides are listed alphabetically (bromo-, chloro-, fluoro-, iodo-). In the case that there are multiple halides of the same and different types, the prefixes di-, tri- and tetra- are not considered in the alphabetical ordering.

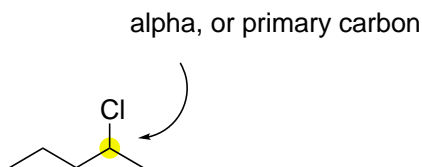
If there are side chains and halogens, the halogen component of the name takes priority.

Alkenes undergo addition reactions with hydrogen halides to form alkyl halides:

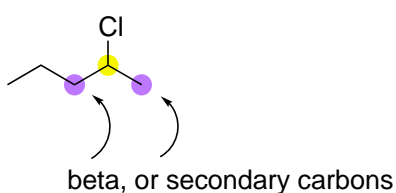


Primary, secondary and tertiary carbons in alkyl halides

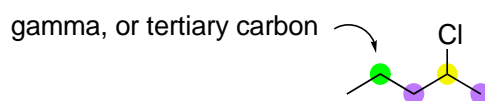
Similarly to alcohols, alkyl halides contain alpha carbons. These can also be referred to as primary carbons. This refers to the carbon to which the halide is directly attached.



The carbon to which the alpha carbon is attached is called the beta, or secondary carbon.



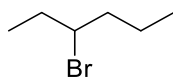
The carbon to which the beta carbon is attached, on the side *away* from the alpha carbon, is called the gamma, or tertiary carbon.



These concepts are relevant when discussing carbon environments in NMR.

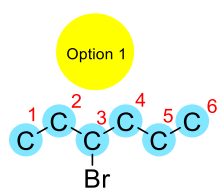
Worked Examples

3-bromohexane



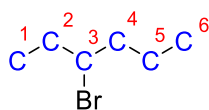
STEP 1: Identify the parent hydrocarbon chain

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



- Functional group ✓
- Longest chain ✓

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



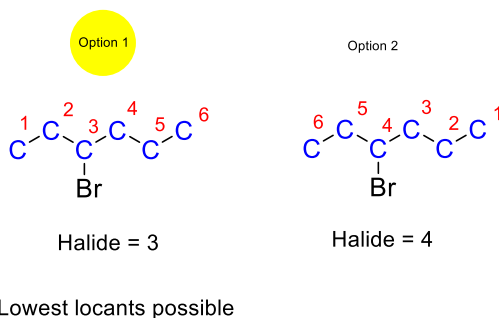
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

None

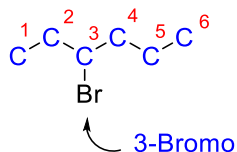
STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

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



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

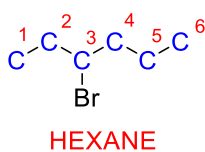


STEP 8: Write the complete name

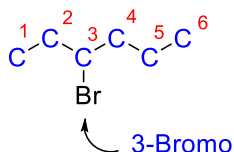
8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

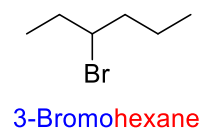
8.3 Successive words are combined into one word



Steps 1,2

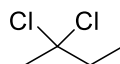


Steps 3,6,7



Step 8

2,2-dichlorobutane

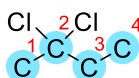


STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length

Option 1



- Functional group ✓
- Longest chain ✓

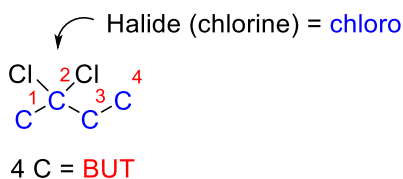
STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -ane suffix.



4 C = **BUT**

ALKANE = **-ANE**

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



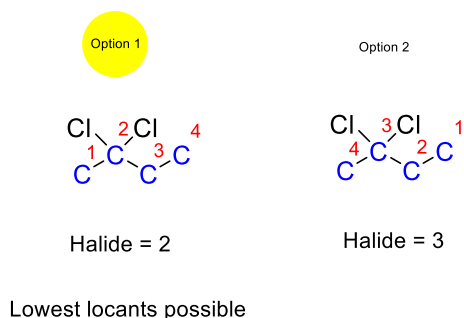
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

None

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

None

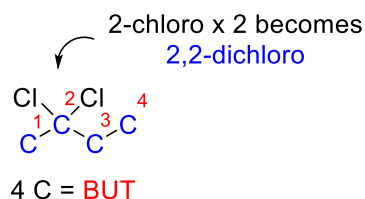
STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains



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

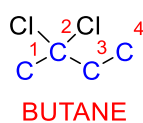


STEP 8: Write the complete name

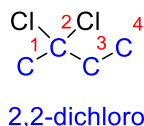
8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

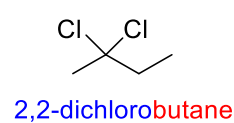
8.3 Successive words are combined into one word



Steps 1,2

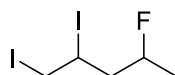


Steps 3,6,7



Step 8

4-fluoro-1,2-diiodopentane

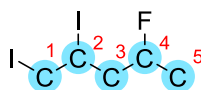


STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

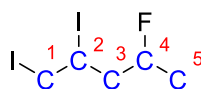
1.2 It should have the maximum length

Option 1



- Functional group ✓
- Longest chain ✓

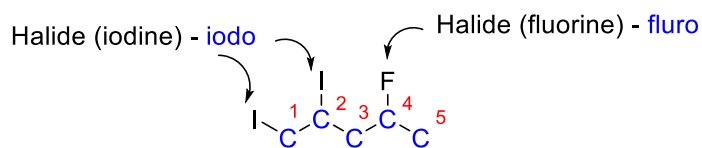
STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -ane suffix



5 C = PENT

ALKANE = -ANE

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



Both halides, hence equal priority

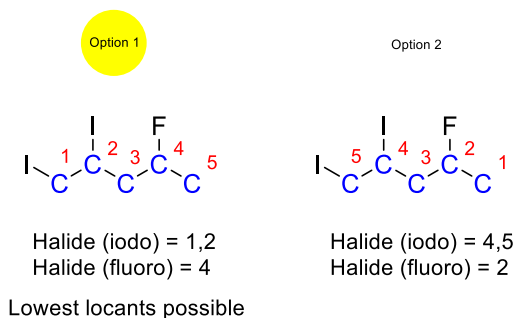
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

None

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

None

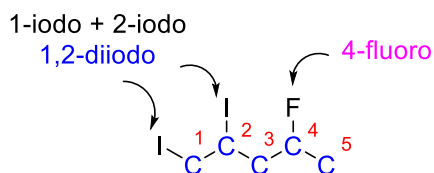
STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains



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

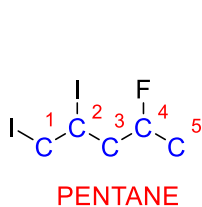


STEP 8: Write the complete name

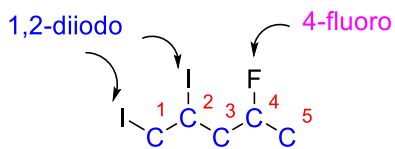
8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



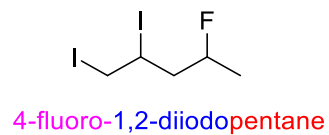
Steps 1,2



To combine, place in alphabetical order ignoring di, tri etc.

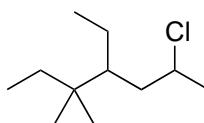
4-fluoro-1,2-diiodo

Steps 3,6,7



Step 8

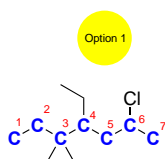
2-chloro-4-ethyl-5,5-dimethylheptane



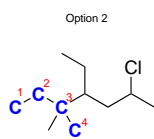
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

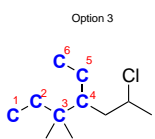
1.2 It should have the maximum length



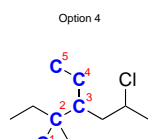
- Longest chain ✓



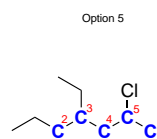
- Longest chain ✗



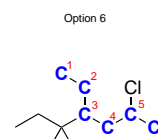
- Longest chain ✗



- Longest chain ✗

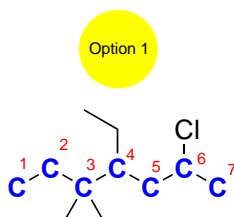


- Longest chain ✗



- Longest chain ✗

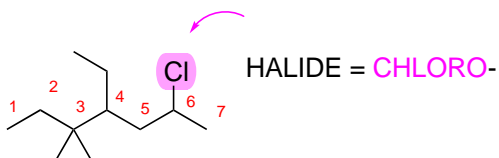
STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -ane suffix.



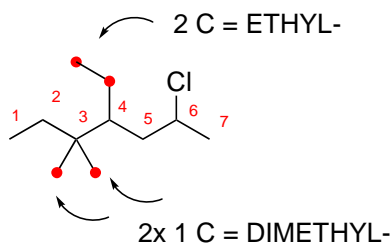
7 C = HEPT

ALKANE = -ANE

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

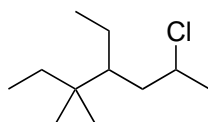


STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



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

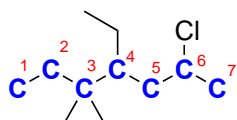
None



ALKANE = -AN-

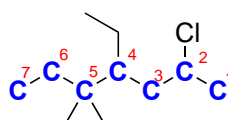
STEP 6: Number the parent hydrocarbon chain from the end that produces the lowest set of locants for, in order of precedence, functional groups, double and triple bonds and side chains

Option 1



Chloro = 6
Ethyl = 4
Methyl = 3,3

Option 2



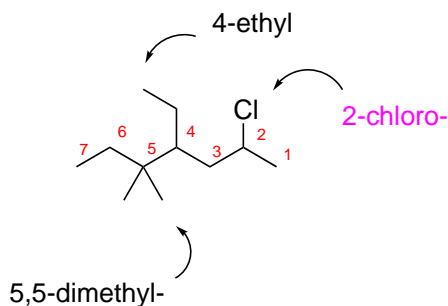
Chloro = 2
Ethyl = 4
Methyl = 5,5

Lowest locants possible ✓
following priorities

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

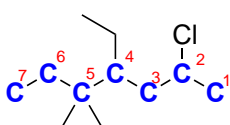


STEP 8: Write the complete name

8.1 Commas are written between numbers

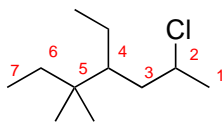
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



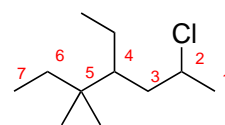
HEPTANE

Steps 1,2,5



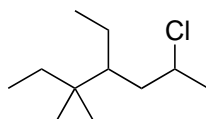
2-CHLORO-

Steps 3,6,7



4-ETHYL-5,5-DIMETHYL

Steps 4,6,7



2-chloro-4-ethyl-5,5-dimethylheptane

Step 8