

Alkenes

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Summary

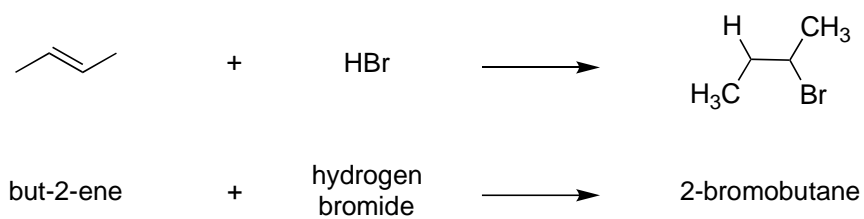
Functional group	General formula	Structure/example	Prefix (Used in side chains)	Suffix (Used in parent chain)
<i>Alkene</i>	-C=C-		-enyl	-ene

Alkenes in side chains

	ALKANE	ALKENE
1 C	 Methyl	 Methenyl
2 C	 Ethyl	 Ethenyl
3 C	 Propyl	 Propenyl
4 C	 Butyl	 Butenyl
5 C	 Pentyl	 Pentenyl
6 C	 Hexyl	 Hexenyl

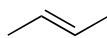
Selected Reactions

Alkenes undergo addition reactions:



Worked Examples

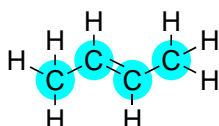
But-2-ene



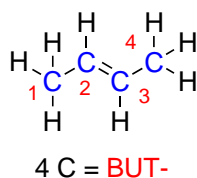
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority¹

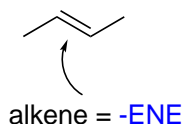
1.2 It should have the maximum length



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.



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

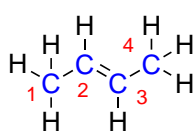
None

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

None

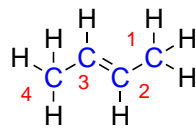
¹ The most recent IUPAC Blue Book release does not consider alkene substituents when determining the parent chain. However, in this example, the new rules will not alter the nomenclature.

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

-ENE = 2



Option 2

-ENE = 2

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

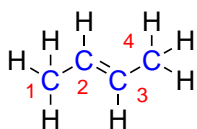
-2-ENE

STEP 8: Write the complete name

8.1 Commas are written between numbers

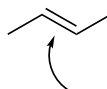
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



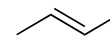
BUT-

Steps 1,2



-2-ENE

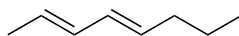
Steps 3,6,7



but-2-ene

Step 8

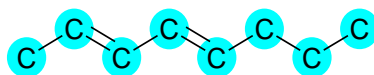
Oct-2,4-diene



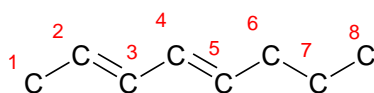
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority²

1.2 It should have the maximum length

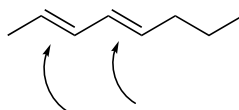


STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix.



8 C = **OCT-**

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



2x alkene = **-DIENE**

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

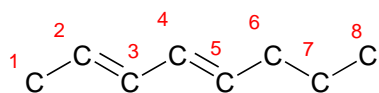
None

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

None

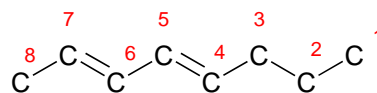
² The most recent IUPAC Blue Book release does not consider alkene substituents when determining the parent chain. However, in this example, the new rules will not alter the nomenclature.

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

-ENE = 2,4



Option 2

-ENE = 4,6

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

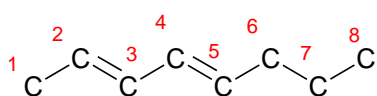
-2,4-DIENE

STEP 8: Write the complete name

8.1 Commas are written between numbers

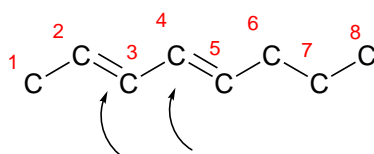
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



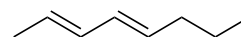
8 C = OCT-

Steps 1,2



-2,4-DIENE

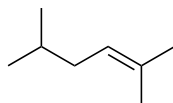
Steps 3,6,7



oct-2,4-diene

Step 8

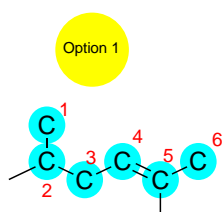
2,5-dimethylhex-4-ene



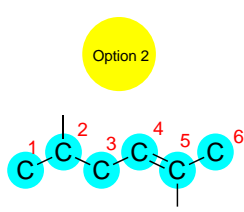
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority³

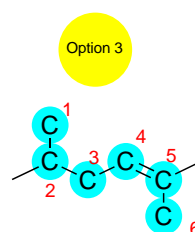
1.2 It should have the maximum length



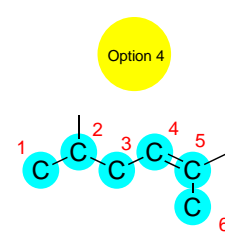
- Functional group ✓
- Longest chain ✓



- Functional group ✓
- Longest chain ✓

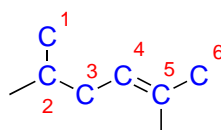


- Functional group ✓
- Longest chain ✓



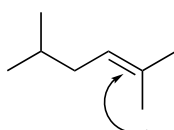
- Functional group ✓
- Longest chain ✓

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



6 C = **HEX-**

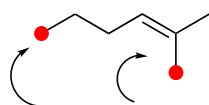
STEP 3: Identify the functional group with the highest priority and its suffix



alkene = **-ENE**

³ The most recent IUPAC Blue Book release does not consider alkene substituents when determining the parent chain. However, in this example, the new rules will not alter the nomenclature.

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

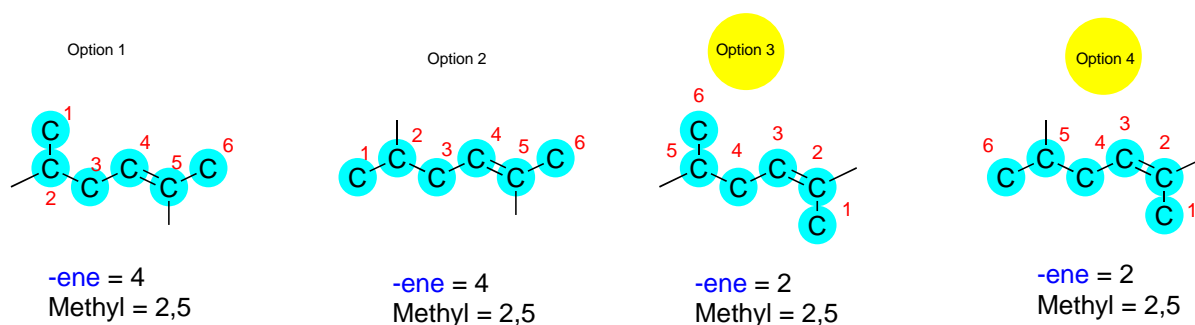


2x 1 C = DIMETHYL-

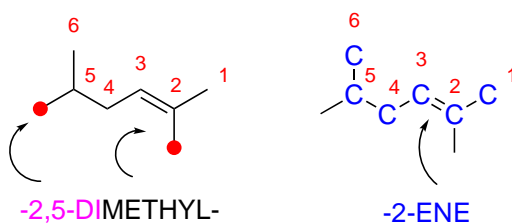
STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

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



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

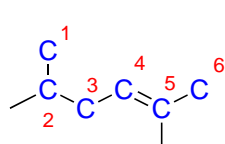


STEP 8: Write the complete name

8.1 Commas are written between numbers

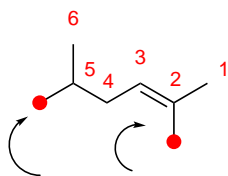
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



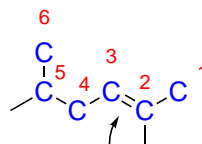
6 C = **HEX-**

Steps 1,2



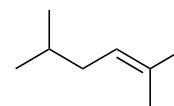
-2,5-DIMETHYL-

Steps 4,6,7



-2-ENE

Steps 3,6,7



2,5-dimethylhex-2-ene

Step 8

A note on the 2013 IUPAC Blue Book update when determining parent chains

STEP 1: Identify the parent hydrocarbon chain

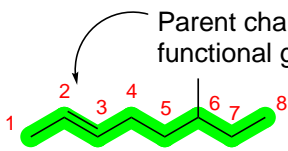
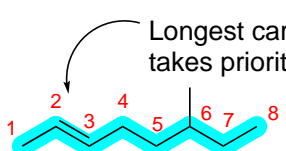
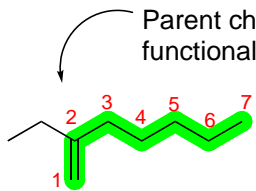
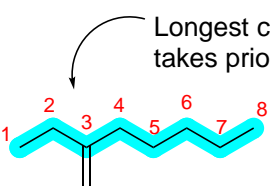
- 1.1 It should have the functional group with the highest priority
- 1.2 It should have the maximum length

The most recent release of the IUPAC Blue book has updated this rule such that chain length takes priority over alkene and alkyne substituents when determining parent chain.

However, many Australian chemists and chemistry teachers have not changed their naming practices to align with these new guidelines, possibly leading to some confusion. For clarity, we have included footnotes throughout this document when relevant, and further detail and examples with updated nomenclature on below.

Your state examiner's report will include guidance when the exam markers update their expectations to align with the new rules.

This change is only relevant where the longest carbon chain does not include the double or triple bond:

Alkene	Change	Pre-2013 nomenclature	Post-2013 nomenclature
in longest chain	no	 <p>Parent chain must include functional group (alkene)</p> <p>6-methyloct-2-ene</p>	 <p>Longest carbon chain takes priority</p> <p>6-methyloct-2-ene</p>
not in longest chain	name change	 <p>Parent chain must include functional group (alkene)</p> <p>2-ethyl-hept-1-ene</p>	 <p>Longest carbon chain takes priority</p> <p>3-methyloctane</p>

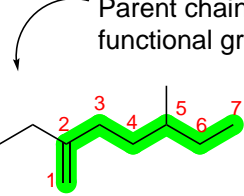
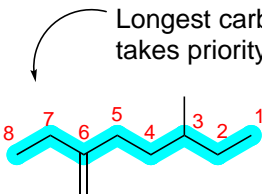
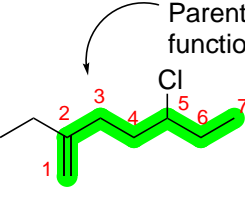
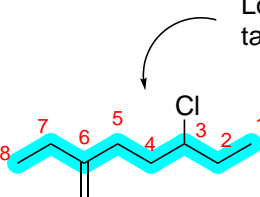
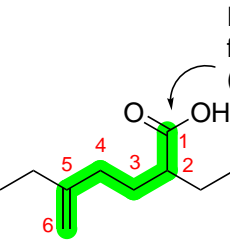
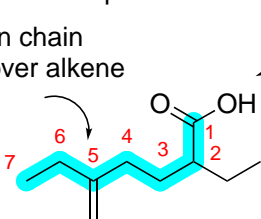
For further information, see:

Nomenclature of Organic Chemistry: IUPAC Recommendations and Preferred Names 2013, IUPAC Blue book, prepared for publication by Henri A Favre and Warren H Powell, by RSC Publishing, 2014 [ISBN 978-0-85404-182-4]; <https://doi.org/10.1039/9781849733069>.

The section on parent chain identification can be found here:

<https://iupac.qmul.ac.uk/BlueBook/P4.html#44>

Further Examples

Pre-2013 nomenclature	Post-2013 nomenclature
<p>Parent chain must include functional group (alkene)</p>  <p>2-ethyl-5-methylhept-1-ene</p>	<p>Longest carbon chain takes priority</p>  <p>3-methyl-6-methyloctane</p>
<p>Parent chain must include functional group (alkene)</p>  <p>5-chloro-2-ethylhept-1-ene</p>	<p>Longest carbon chain takes priority</p>  <p>3-chloro-6-methyloctane</p>
<p>Parent chain must include functional group (alkene + carboxylic acid)</p>  <p>2,5-diethylhex-5-enoic acid</p>	<p>carboxylic acid functional group still included in parent chain</p> <p>Longest carbon chain takes priority over alkene</p>  <p>2-ethyl-5-methyloctanoic acid</p>