

Amines

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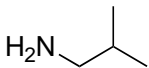
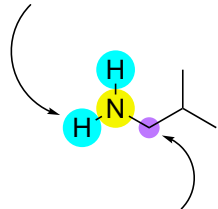
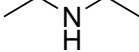
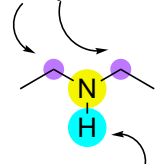
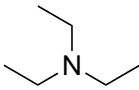
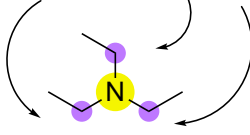
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Summary

Functional group	General formula	Structure/example	Prefix	Suffix
<i>Amine</i>	-NH ₂	R—NH₂	amino-	-amine

Primary, Secondary and Tertiary Amines

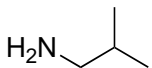
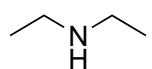
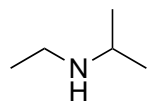
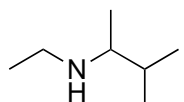
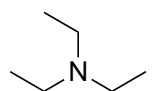
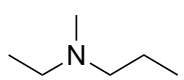
Amines can be classified as primary, secondary or tertiary amines. This classification relies on the **nitrogen atom** and the number of carbon (or hydrogen atoms) bonded directly to the nitrogen.

Configuration	Description	Example (Skeletal)	Example (Amine configuration)
Primary amine	<p>The nitrogen has:</p> <p>one carbon atom bonded directly to it</p> <p>two or more hydrogen atoms bonded directly to it.</p>		<p>2x Hydrogen atoms attached directly to Nitrogen</p>  <p>1x Carbon atom attached directly to Nitrogen</p>
Secondary amine	<p>The nitrogen has:</p> <p>two carbon atoms bonded directly to it</p> <p>one hydrogen atom bonded directly to it.</p>		<p>2x Carbon atoms attached directly to Nitrogen</p>  <p>1x Hydrogen atom attached directly to Nitrogen</p>
Tertiary amine	<p>The nitrogen has:</p> <p>three carbon atoms bonded directly to it</p> <p>no hydrogen atoms bonded directly to it.</p>		<p>3x Carbon atoms attached directly to Nitrogen</p>  <p>No Hydrogen atoms attached directly to Nitrogen</p>

There are special naming conventions that need to be used for primary, secondary and tertiary amines.

Primary amines follow similar naming conventions to other functional groups.

Secondary and tertiary amines use an italicised '*N*-' to locate the side chains in relation to the amine group. Secondary amines contain a single *N*- in their name, whereas tertiary amines contain two *N*- parts. The *N*- takes the place of a numbered locant for groups attached directly to the Nitrogen.

Configuration	Example (Skeletal)	Common name (Acceptable)	IUPAC convention (Preferred)
Primary amine	—NH_2		methanamine
			2-methylpropan-1-amine
Secondary amine		diethylamine	<i>N</i> -ethylethan-1-amine
			<i>N</i> -ethylpropan-2-amine
			<i>N</i> -ethyl-3-methylbutan-2-amine
Tertiary amine		triethylamine	<i>N,N</i> -diethylethan-1-amine
			<i>N</i> -ethyl- <i>N</i> -methylpropan-1-amine

Worked Examples – Primary amines

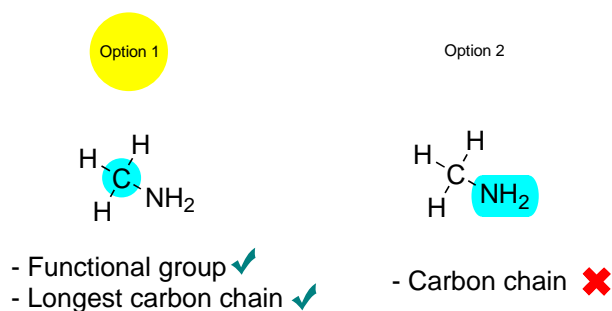
Methanamine



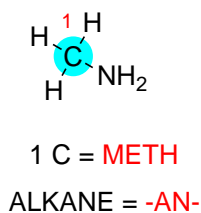
STEP 1: Identify the parent hydrocarbon chain

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



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

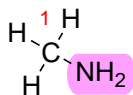
None

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

Option 1



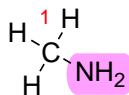
Amine = 1

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)



-AMINE

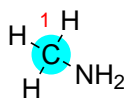
Locant can be dropped
as 1 is the only option

STEP 8: Write the complete name

8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

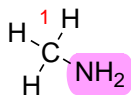
8.3 Successive words are combined into one word



1 C = METH

ALKANE = -AN-

Steps 1,2



-AMINE

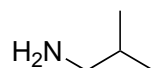
Steps 3,6,7



methanamine

Step 8

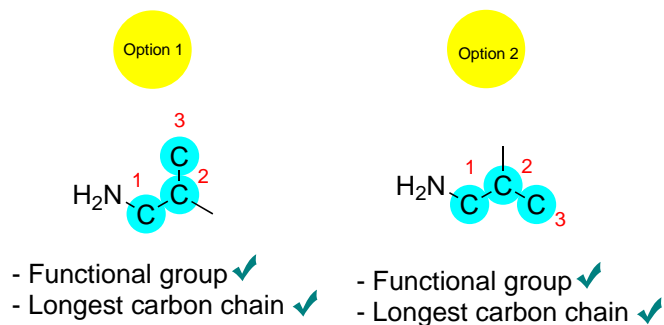
2-methylpropan-1-amine



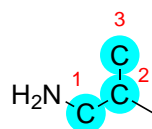
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length

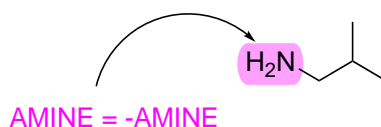


STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix

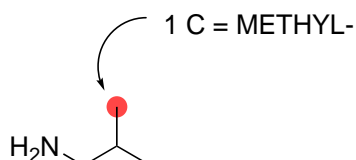


3 C = **PROP**
ALKANE = **-AN**

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



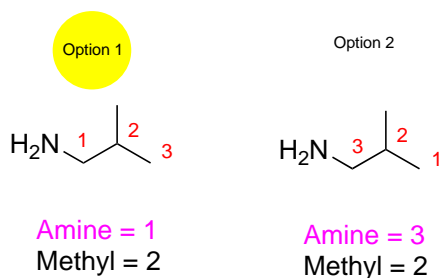
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



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

None

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



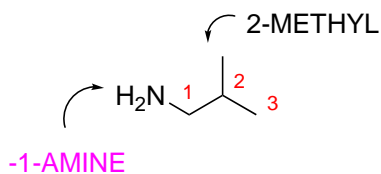
Lowest locants possible
following priorities ✓

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

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)

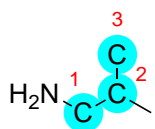


STEP 8: Write the complete name

8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

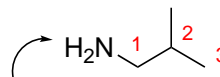
8.3 Successive words are combined into one word



3 C = **PROP**

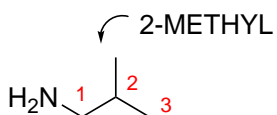
ALKANE = **-AN**

Steps 1,2

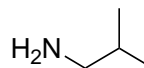


-1-AMINE

Steps 3,6,7



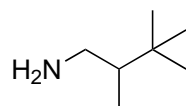
Steps 4,6,7



2-methyl**propan-1-amine**

Step 8

2,3,3-trimethylbutan-1-amine

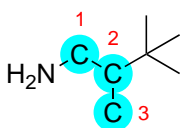


STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

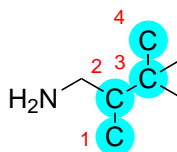
1.2 It should have the maximum length

Option 1



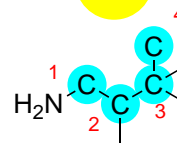
- Functional group ✓
- Longest carbon chain ✗

Option 2



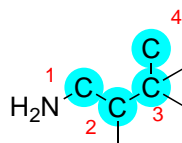
- Functional group ✗
- Longest carbon chain ✓

Option 3



- Functional group ✓
- Longest carbon chain ✓

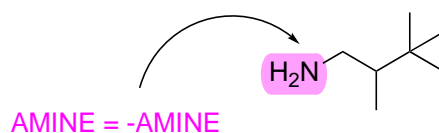
STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix



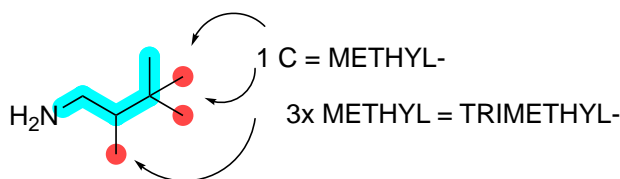
4 C = **BUT-**

ALKANE = **-AN**

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



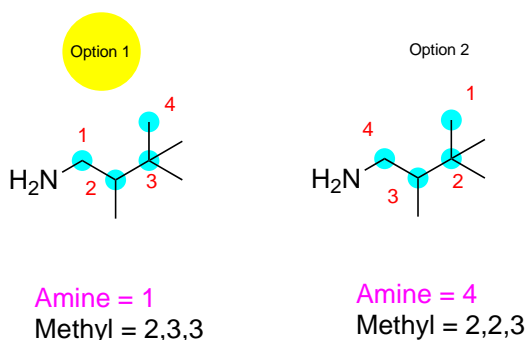
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



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

None

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



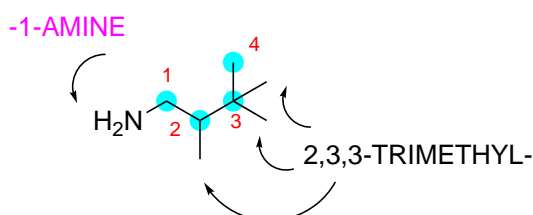
Lowest locants possible following priorities ✓

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

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)

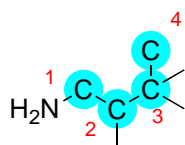


STEP 8: Write the complete name

8.1 Commas are written between numbers

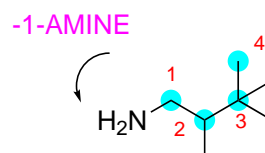
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word

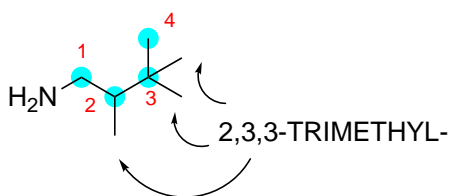


4 C = **BUT-**
ALKANE = **-AN**

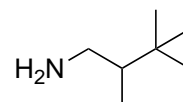
Steps 1,2



Steps 3,6,7



Steps 4,6,7

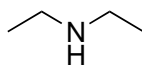


2,3,3-trimethyl**butan-1-amine**

Step 8

Worked Examples – Secondary amines

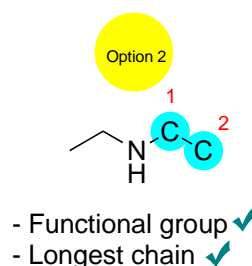
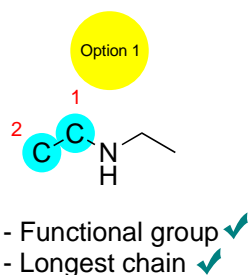
Diethylamine | *N*-ethylethan-1-amine



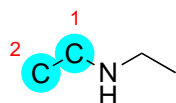
STEP 1: Identify the parent hydrocarbon chain

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



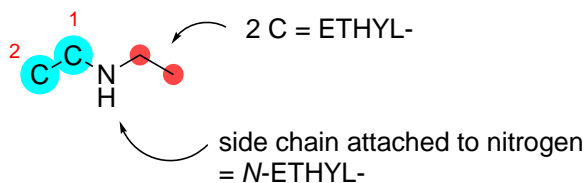
2 C = ETH-

ALKANE = -AN-

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



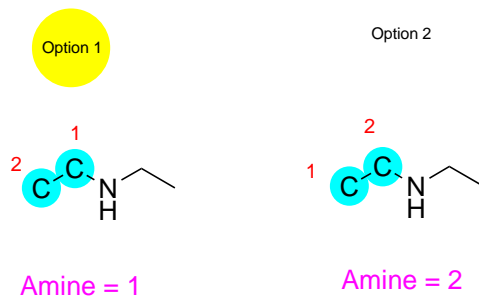
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



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

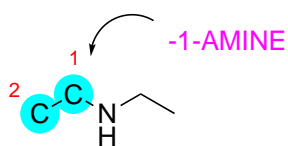
None

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



Lowest locants possible ✓

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

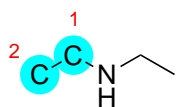


STEP 8: Write the complete name

8.1 Commas are written between numbers

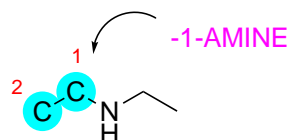
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word

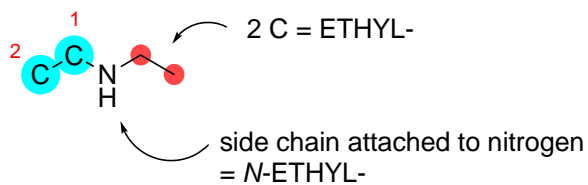


2 C = **ETH-**
ALKANE = **-AN-**

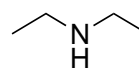
Steps 1,2



Steps 3,6,7



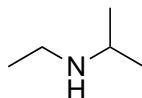
Step 4



N-ethyl**ethan-1-amine**

Step 8

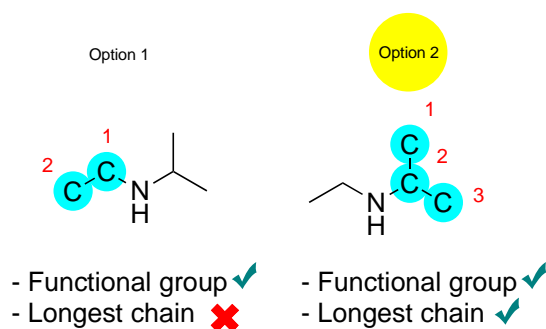
N-ethylpropan-2-amine



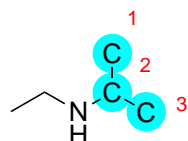
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length

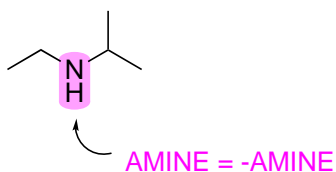


STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix

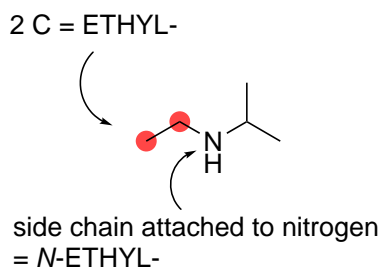


3 C = PROP-
ALKANE = -AN

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



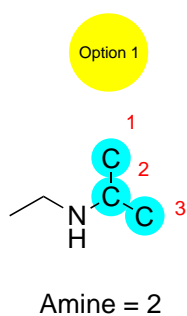
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



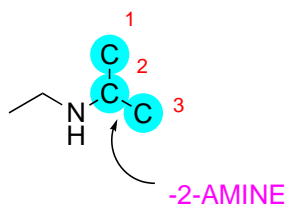
STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

None

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.

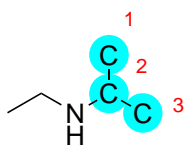


STEP 8: Write the complete name

8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

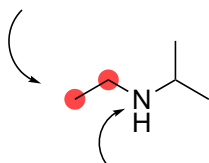
8.3 Successive words are combined into one word



3 C = PROP-
ALKANE = -AN

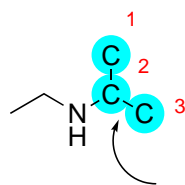
Steps 1,2

2 C = ETHYL-



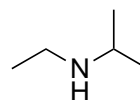
side chain attached to nitrogen
= N-ETHYL-

Step 4



-2-AMINE

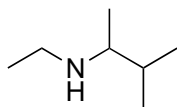
Steps 3,6,7



N-ethylpropan-2-amine

Step 8

N-ethyl-3-methylbutan-2-amine

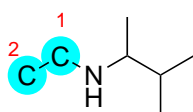


STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

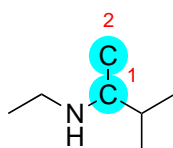
1.2 It should have the maximum length

Option 1



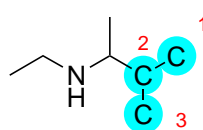
- Functional group ✓
- Longest chain ✗

Option 2



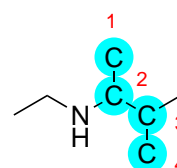
- Functional group ✓
- Longest chain ✗

Option 3



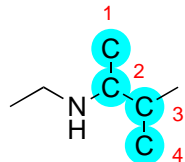
- Functional group ✗
- Longest chain ✗

Option 4



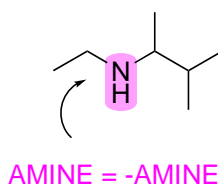
- Functional group ✓
- Longest chain ✓

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

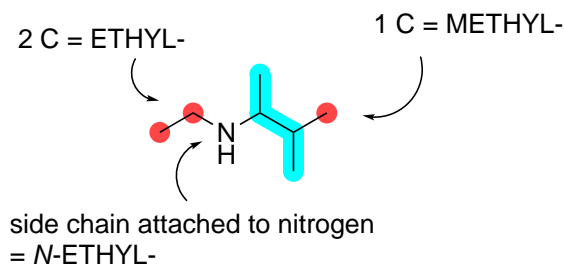


4 C = **BUT-**
ALKANE = **-AN**

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



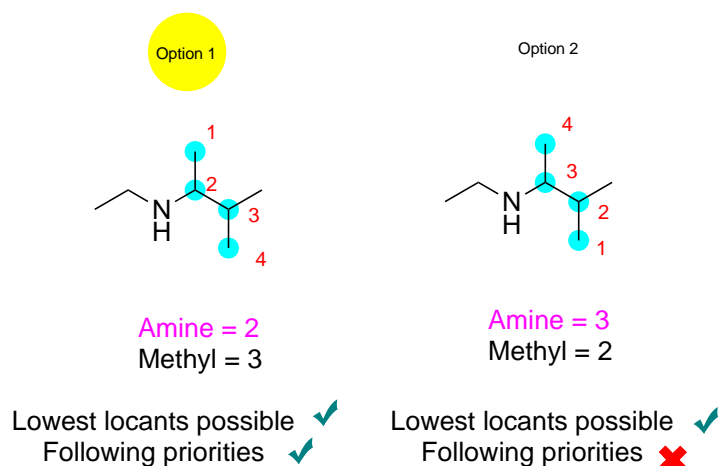
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



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

None

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

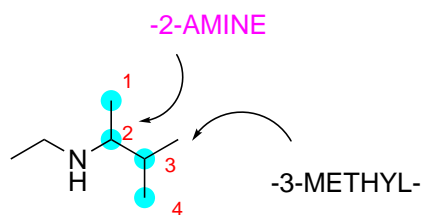


STEP 7: Numbers indicating the locant of the functional group are placed directly before the functional group portion of the name.

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

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)

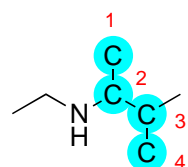


STEP 8: Write the complete name

8.1 Commas are written between numbers

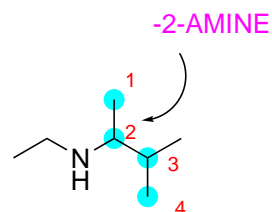
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



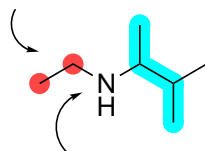
4 C = **BUT-**
ALKANE = **-AN**

Steps 1,2



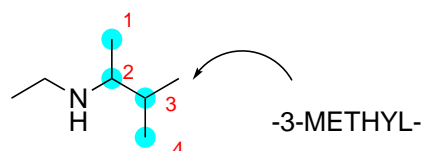
Steps 3,6,7

2 C = **ETHYL-**

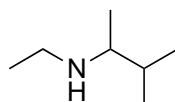


side chain attached to nitrogen
= **N-ETHYL-**

Step 4



Steps 4,6,7

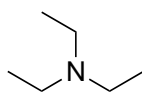


N-ethyl-3-methyl**butan-2-amine**

Step 8

Worked Examples – Tertiary amines

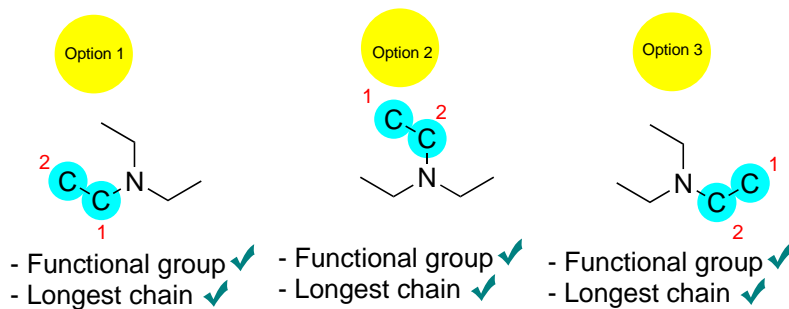
Triethylamine | N,N-diethylethan-1-amine



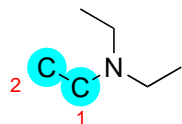
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the highest number of multiple bonds

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

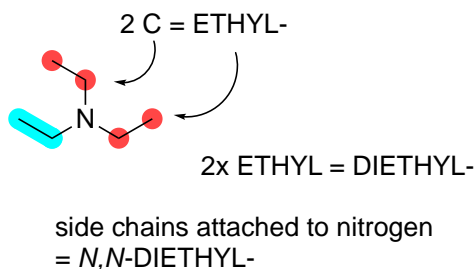


2 C = **ETH-**
ALKANE = **-AN-**

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



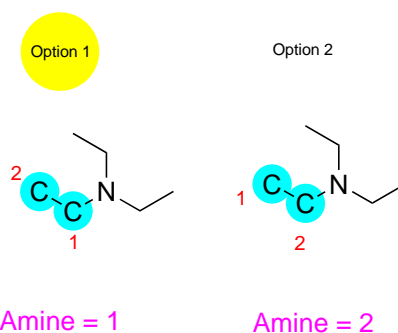
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



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

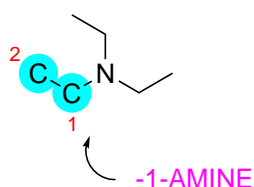
None

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



Lowest locants possible ✓

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

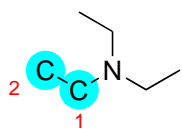


STEP 8: Write the complete name

8.1 Commas are written between numbers

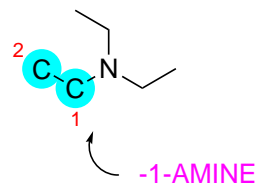
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word

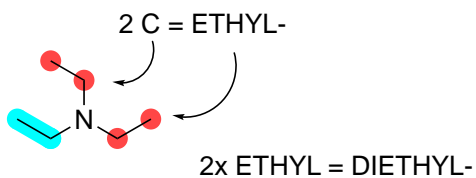


2 C = ETH-
ALKANE = -AN-

Steps 1,2

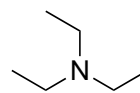


Step 3,6,7



side chains attached to nitrogen
= *N,N*-DIETHYL-

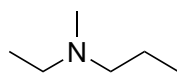
Step 4



N,N-diethylethan-1-amine

Step 8

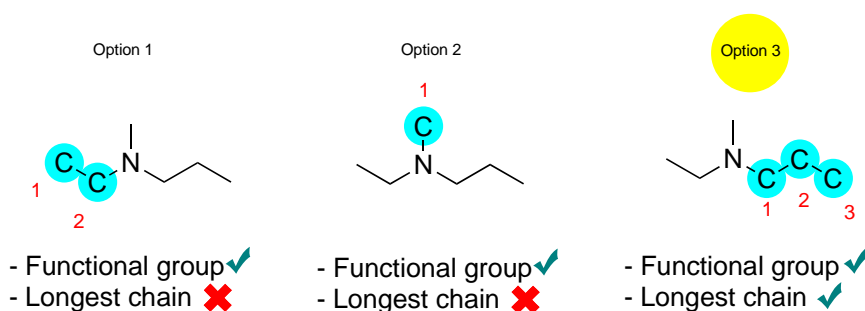
N-ethyl-*N*-methylpropan-1-amine



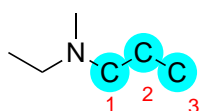
STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length

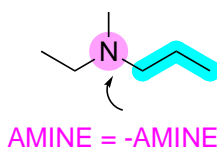


STEP 2: Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix

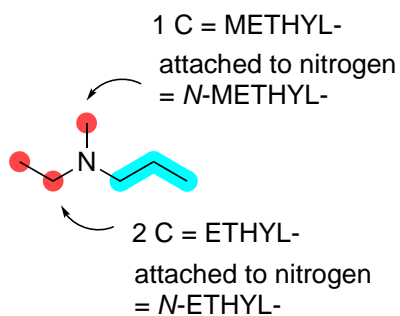


3 C = PROP-
ALKANE = -AN-

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



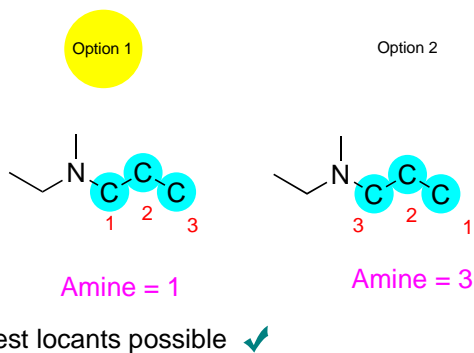
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix



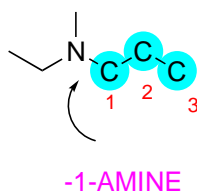
STEP 5: Identify any remaining functional groups (including double and triple bonds) and their suffixes

None

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.

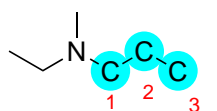


STEP 8: Write the complete name

8.1 Commas are written between numbers

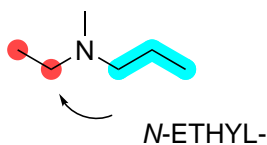
8.2 Hyphens are written between numbers and letters

8.3 Successive words are combined into one word



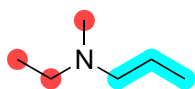
3 C = **PROP-**
ALKANE = **-AN-**

Steps 1,2

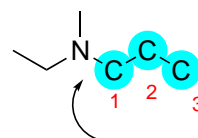


Step 4

N-ETHYL-N-METHYL
alphabetical order

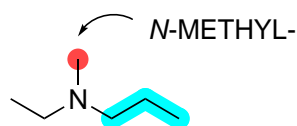


Step 4

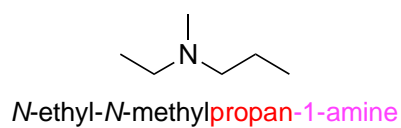


-1-AMINE

Steps 3,6,7



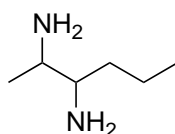
Step 4



Step 8

Worked Examples – Multiple amines

Hexan-2,3-diamine

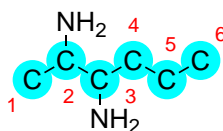


STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

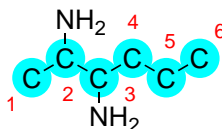
1.2 It should have the maximum length

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 -an suffix



6 C = **HEX**

ALKANE = **-AN-**

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



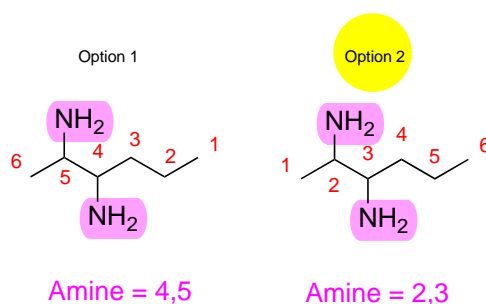
STEP 4: Identify side chains. Count the number of carbons and identify their prefix and suffix

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



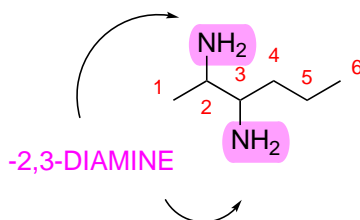
Lowest locants possible ✓

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

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)

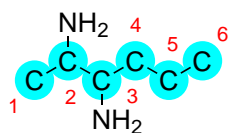


STEP 8: Write the complete name

8.1 Commas are written between numbers

8.2 Hyphens are written between numbers and letters

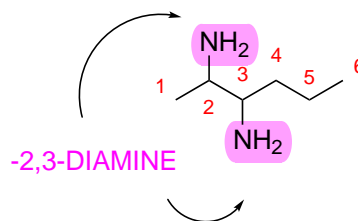
8.3 Successive words are combined into one word



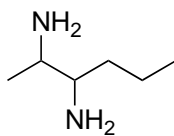
6 C = **HEX**

ALKANE = **-AN-**

Steps 1,2



Steps 3,6,7



hexan-2,3-diamine

Step 8