

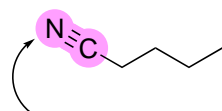
# Nitriles

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## Summary

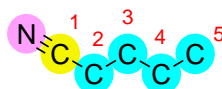
Functional Group	General Formula	Structure	Prefix	Suffix
Nitrile	$\text{-C}\equiv\text{N}$	$\text{N}\equiv\text{C}-\text{R}$	cyano-	-nitrile



Nitriles consist of a nitrogen atom triple bonded to a carbon atom

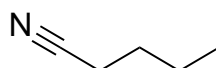
Considerations for counting the parent chain with nitrile substituents.

If nitrile is the highest priority, the carbon that is triple bonded to the nitrogen (part of the nitrile group) is counted in the parent chain.



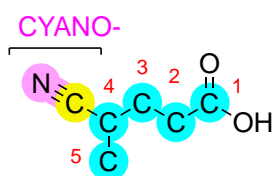
5 C = **PENT-**

Nitriles are the only functional group covered in the year 11-12 chemistry curriculum that require the 'e' from the alkane prefix not to be dropped.



**pentanenitrile**  
'e' kept

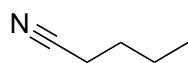
If the nitrile group is not the highest priority group, the carbon that is triple bonded to the nitrogen (part of the nitrile group) is not counted in parent chain. It is considered part of the cyano- prefix.



**4-cyanopentanoic acid**

## Worked Examples

### Pentanenitrile

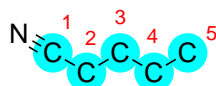


**STEP 1:** Identify the parent hydrocarbon chain

**1.1** It should have the functional group with the highest priority

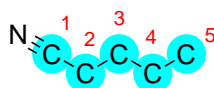
**1.2** It should have the maximum length

Option 1



- Functional group ✓
- Longest chain ✓

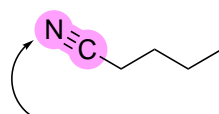
**STEP 2:** Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix



5 C = PENT

ALKANE = -AN-

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



NITRILE = -NITRILE

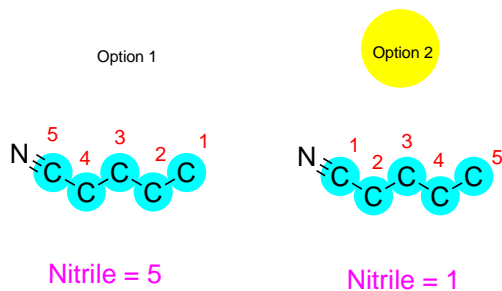
**STEP 4:** Identify side chains. Count the number of carbons and identify their prefix and suffix

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



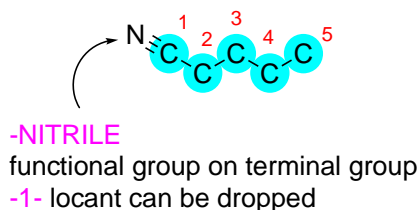
Lowest locants possible ✓

**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)

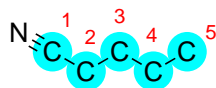


**STEP 8:** Write the complete name

**8.1** Commas are written between numbers

**8.2** Hyphens are written between numbers and letters

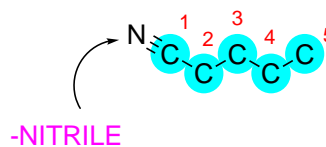
**8.3** Successive words are combined into one word



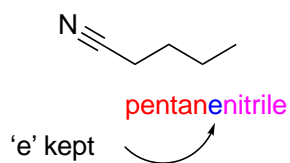
5 C = PENT

ALKANE = -AN-

**Steps 1,2**

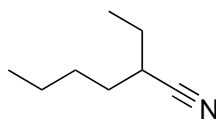


**Steps 3,6,7**



**Step 8**

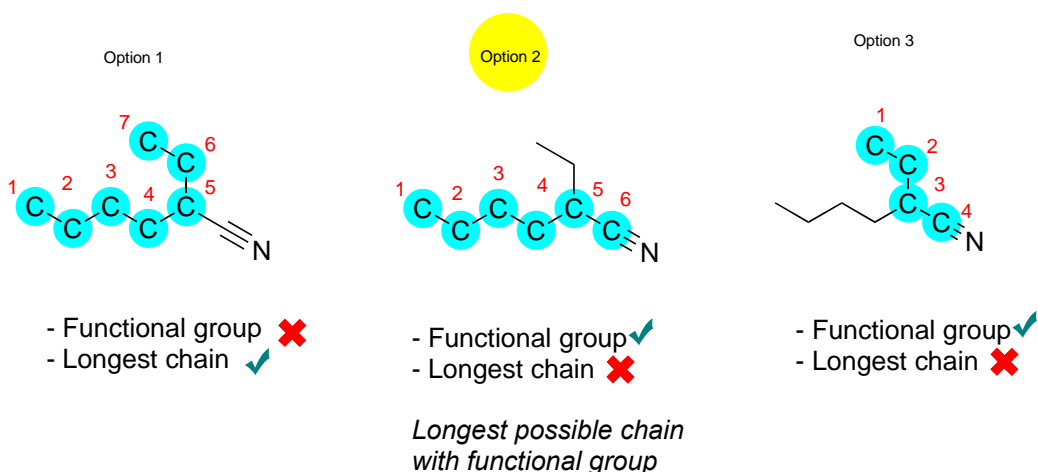
## 2-ethylhexanenitrile



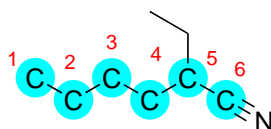
### STEP 1: Identify the parent hydrocarbon chain

1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length



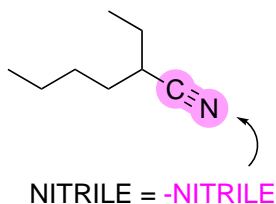
**STEP 2:** Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix



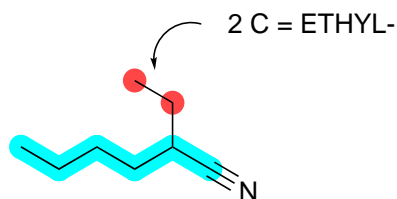
6 C = **HEX**

ALKANE = **-AN-**

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



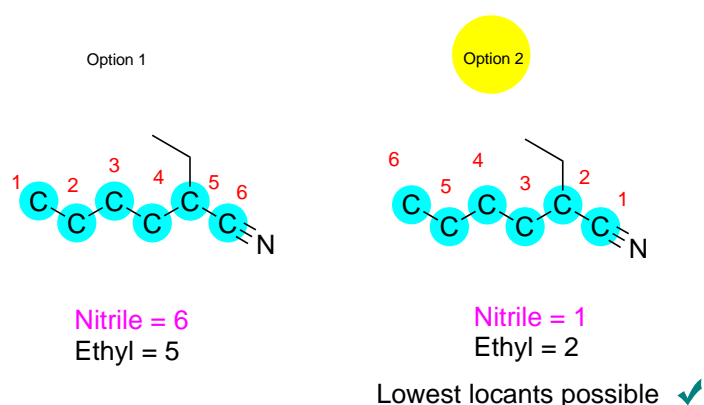
**STEP 4:** Identify side chains. Count the number of carbons and identify their prefix and suffix



**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

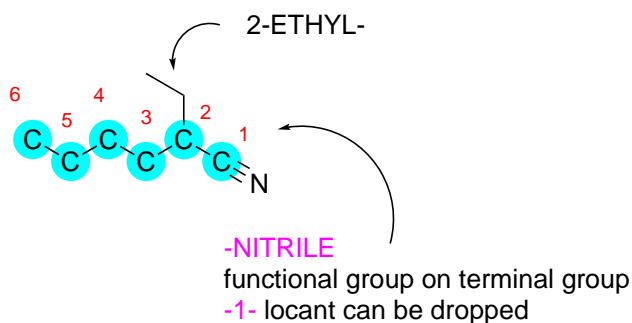


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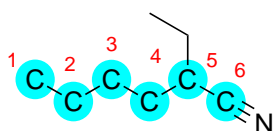


**STEP 8:** Write the complete name

**8.1** Commas are written between numbers

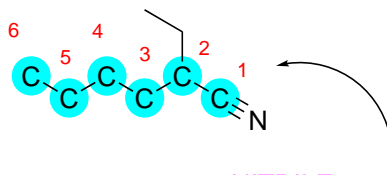
**8.2** Hyphens are written between numbers and letters

**8.3** Successive words are combined into one word



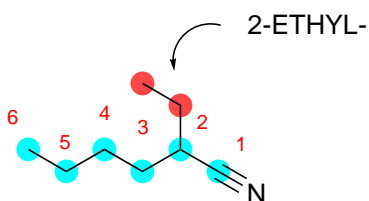
6 C = **HEX**  
ALKANE = **-AN-**

**Steps 1,2**

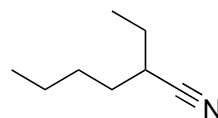


**-NITRILE**  
functional group on terminal group  
**-1-** locant can be dropped

**Steps 3,6,7**



**Steps 4,6,7**

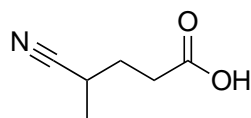


2-ethyl**hexane**nitrile

**Step 8**



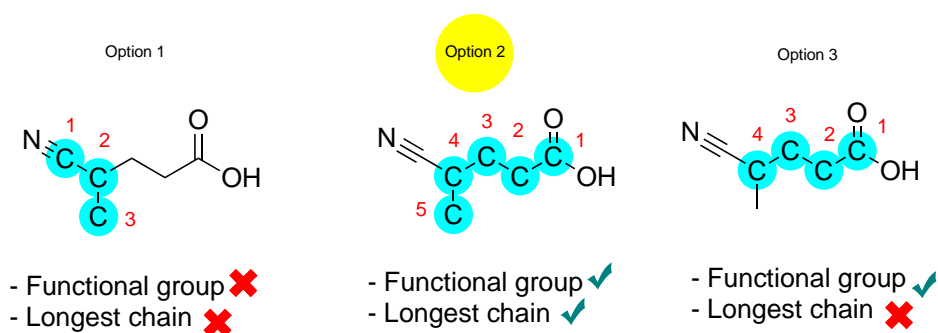
## 4-cyanopentanoic acid



### STEP 1: Identify the parent hydrocarbon chain

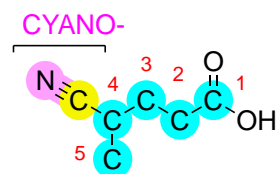
1.1 It should have the functional group with the highest priority

1.2 It should have the maximum length

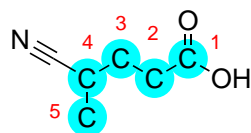


Carboxylic acid > Nitrile > Alkane

*As the nitrile is not the priority functional group, the carbon triple bonded to the nitrogen is considered part of the cyano- group and thus cannot be counted in the parent chain*



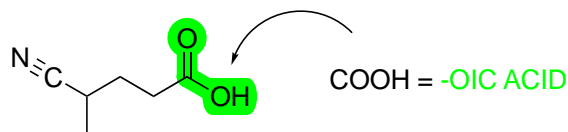
**STEP 2:** Count the number of carbons in the parent hydrocarbon chain and identify the appropriate prefix. If the parent chain is an alkane, add the -an suffix



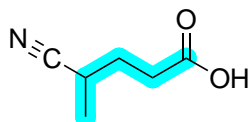
5 C = PENT-

ALKANE = -AN-

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

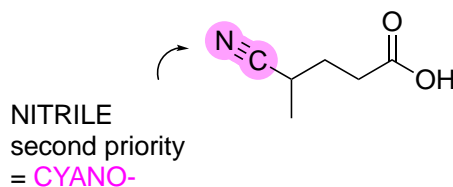


**STEP 4:** Identify side chains. Count the number of carbons and identify their prefix and suffix

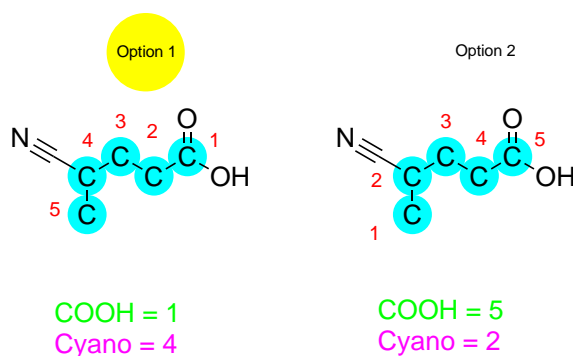


None

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



**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



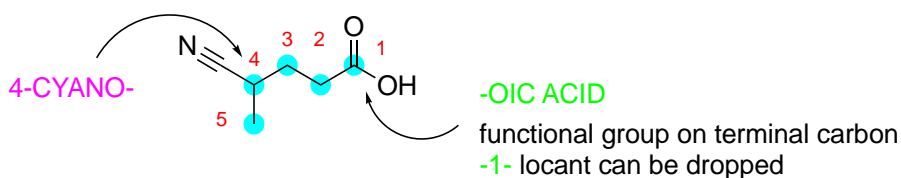
Lowest locants possible ✓  
Priorities followed ✓

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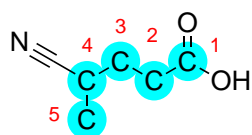


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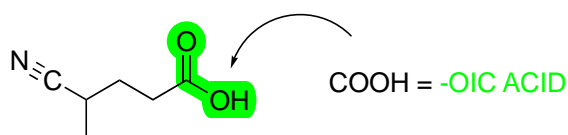
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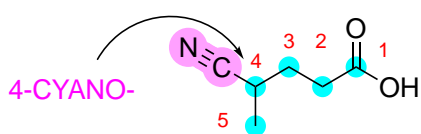
5 C = PENT-

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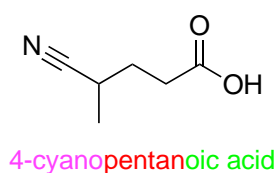
**Steps 1,2**



**Step 3**



**Steps 5,6,7**



**Step 8**