

IUPAC NAMING SYSTEM

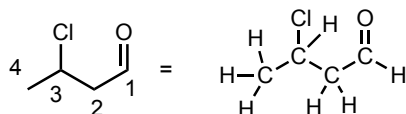
1. Introduction

Remember – the aim of these rules is to ensure one name corresponds to a unique and unambiguous structure (one molecule!).

Fundamentally, there are *three* parts to a molecule's name:

- the substituents (and their locants, or carbon of longest chain where substituent is placed), indicated first
- the longest parent alkane chain
- the suffix, representing the name of the highest priority functional group in the molecule

Example: 3-chlorobutanal



Before starting, there are things you will need to know:

- 1) How to name the length of the longest parent chain (Table 1)
- 2) How to name functional groups, their corresponding suffix and order of priority (Table 2)
- 3) Names of substituents (Table 3)

2. Naming Summary

The name of the compound is **written out** in this sequence:

- First, the substituents (in alphabetical order, preceded by their locants (carbon number) without consideration of di-, tri-, tetra- for alphabetical ordering if a type of substituent appear more than once)
- Second, the name of the base parent chain
- Third, the suffix of highest priority functional group

No spaces are put in the name. Commas separate numbers. Numbers and letters are separated by dashes.

3. Naming Roadmap

Sequence of steps before writing out the name of a molecule:

1. Find the highest priority functional group, this will be your suffix!
2. Highlight the longest carbon chain – its number of carbons will give your parent chain name

3. Number the chain to obtain **the lowest possible number on the highest priority functional group**
4. Identify all substituents and their locants
5. Now we write out the name!
 - a. Is your molecule a **Benzene** or **Phenol** (with no other higher priority functional groups on it (higher than alkanes) ?) – if no move to b. if yes:
 - i. Name substituents and their locants, in alphabetical order, with their locants making sure to number the chain to have lowest numbers possible. Add di-,tri-,tetra- if applicable to substituents
 - ii. Add phenol or benzene at the end of the name, after the substituents.
 - b. *If the highest priority functional group is an amide or ester, start by naming the substituent on the oxygen or nitrogen, followed by a space.*
 - c. If the highest priority functional group is not an amide or an ester, **start by naming the substituents, in alphabetical order, preceded by the carbon number where they are placed on the chain.**
 - i. Include the number of repeating identical substituents if there are more than one of the same, along with each of their carbon number location! (di-,tri-, tetra-). These come right before the substituent name, and are not included in the alphabetizing.
 - d. Is your molecule a cyclic alkane? If yes, write cyclo- , if not move to e.
 - e. **Write out the name of the parent chain**
 - f. **End with the suffix for the highest priority functional group!** (include its carbon number placement before the suffix).
6. Double check your name by drawing the structure from what you wrote!


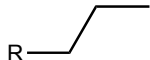

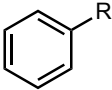
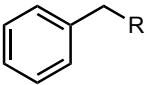
Table 1: parent chain names according to number of carbons

Number of Carbons	Name
1	Meth-
2	Eth-
3	Prop-
4	But-
5	Pent-
6	Hex-
7	Hept-
8	Oct-
9	Non-
10	Dec-
11	Undec-
12	Dodec-

Table 2: Functional groups and suffixes

R = H, or alkyl chain with or without substituents R' = alkyl chain with or without substituents (not H)					
	Group	Name	Suffix	Naming Notes	
Highest Priority ↑		carboxylic acid	-oic acid		
		ester	-oate	R' is stated first, before R	
		acid chloride	-oyl chloride		
		amide	-amide	Substituent on nitrogen is stated first, preceded by N- (to indicate it is on the nitrogen)	
		nitrile	-nitrile		
		aldehyde	-al		
		ketone	-one		
		alcohol	-ol		
		thiol	-thiol		
		amine	-amine		
		alkene	-ene		
		alkyne	-yne		
	Lowest Priority		alkane	-ane	

Table 3: Substituents names (to be utilized when substituent is not highest priority within molecule)

	Substituent	Name (Prefix)
	R = alkyl chain with or without substituents	
Halides	$R-Br$	Bromo-
	$R-F$	Fluoro-
	$R-I$	Iodo-
	$R-Cl$	Chloro-
Alkyl Substituents	$R-$	Methyl-
		Ethyl-
		Propyl-
		Nitro-
	$R-O-R$	<u>Alkoxy-</u>
		Phenyl-
		Benzyl-

(Alk is substituted by name for length of alkyl chain, ex: methoxymethane if R=CH₃ on both sides of oxygen)

This is considered benzene, unless R is a substituted alkyl chain.