**Cheat-Sheet to Name Organic Compounds (IUPAC Rules)**

In general, the base part of the name reflects the **number** of carbons in what you have assigned to be the **parent chain**. The **suffix** of the name reflects the type(s) of functional group(s) present on (or within) the parent chain. Other groups which are attached to the parent chain are called **substituents**.

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| **Number of Carbons in Parent Chain** | **Prefix** |  | **Organic Compounds** | **Suffix** | **Prefix** |  | **Functional Group** | **Prefix** | **Suffix** |
| 1 | Meth- |  | **Hydrocarbons** |  |  |  | Carboxylic acids |  | -oic acid |
| 2 | Eth- |  | Alkane | -ane |  |  | Aldehydes |  | -al |
| 3 | Prop- |  | Alkene | -ene |  |  | Ketones |  | -one |
| 4 | But- |  | Alkyne | -yne |  |  | Alcohols | hydroxy- | -ol |
| 5 | Pent- |  |  |  |  |  | Amines | amino- | -amine |
| 6 | Hex- |  | Cyclic |  | cyclo- |  | Amides |  | -amide |
| 7 | Hept- |  |  |  |  |  | Nitriles |  | -nitrile |
| 8 | Oct- |  | Esters | -oate |  |  | Ethers | alkoxy- | -ether |
| 9 | Non- |  |  |  |  |  |  |  |  |
| 10 | Dec- |  | **Alkyl Groups** | **Formula** |  |  | **Haloalkanes** | halo- |  |
| 11 | Undec- |  | Methyl- | -C |  |  | fluorine | fluoro- |  |
| 12 | Dodec- |  | Ethyl- | -CC |  |  | chlorine | chloro- |  |
|  |  |  |  |  |  |  | bromine | bromo- |  |
|  |  |  |  |  |  |  | iodine | iodo- |  |

**Assigning locants**

There are strict IUPAC guidelines for numbering carbon atoms in the name of a molecule.

• Assign the suffix the lowest possible locant.

• When there are multiple substituents, number the positions from left to right or right to left so that they have the lowest value.

• When there are multiple branches and there are no points of difference, list the substituents in alphabetical order.

If there are more than one substituent of the same type, then use a **multiplier** alongside the substituent to communicate how many there are.

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| **Number of Substituents** | **Prefix** |
| 2 | **di-** |
| 3 | **tri-** |
| 4 | **tetra-** |
| 5 | **penta-** |

**IUPAC Naming Summary**

**These rules get complicated, but we've tried to simplify them using 6 steps:**

* Locate the longest carbon chain in our compound – this is called the main chain.
* Name that parent chain (find the root word) using the prefix representing that number
* Determine the ending (suffix) using the functional groups.
* Number your carbon atoms from the end closest to the functional group.
* Name the side groups with their locants.
* Put the side groups in alphabetical order.
* Separate letters and numbers with a dash.
* Separate 2 numbers with a comma.

**Functional Groups**

Organic compounds are classified by *Functional Groups*, which are responsible for chemical behaviour. Functional groups are involved in naming organic compounds. **R** is the general abbreviation for the "rest of the molecule".

**Key**: R = a hydrocarbon chain and , etc = another hydrocarbon chain, X = halogen

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| **Class Name** | **General Formula** | **Functional Group Name** | **Functional Group Structure** | **Naming** | Examples |
| **Carboxylic Acid** | RCOOH | Carboxyl |  | -oic acid | CCOOH Shape  Description automatically generated with medium confidence  Ethanoic acid Propanoic acid |
| **Ester** | COO | Ester  (note: Alkyl is not OH or H) |  | -oate | Shape  Description automatically generated with medium confidence  Methyletanoate Ethylethanoate |
| **Amide** | RCON | Amide |  | -amide | Shape  Description automatically generated with medium confidence CCO N  Cyclohexylamide ethanamide |
| **Nitrile** | RCN | Nitrile |  | -nitrile or cyano- | CCN  Ethane Nitrile |
| **Aldehyde** | RCHO | Aldehyde  (or Carbonyl) |  | -al | Shape  Description automatically generated with medium confidence  Ethanal Cyclohexylmethanal |
| **Ketone** | C(O) | Ketone  (or Carbonyl)  (note: is not OH or H) |  | -one | A black and red molecule  Description automatically generated Shape  Description automatically generated with medium confidence  Propanone butanone |
| **Alcohol** | ROH or  OH | Hydroxyl |  | -ol | OH  Ethanol Butanol Propanol |
| **Amine** | RN  (either H can be an R) | Amino |  | -amine | CC N  Trimethyl amine propyl amine ethyl amine |
| **Alkyne** |  | Carbon-carbon triple bond |  | -yne | Shape  Description automatically generated with medium confidence Shape  Description automatically generated with medium confidence CC≡C C  Prop-1-yne Hex-3-yne But-2-yne |
| **Alkene** |  | Carbon-carbon double bond |  | -ene | Shape  Description automatically generated with medium confidence C=C  2,3 dimethylbut-2-ene pent-1,3-diene ethene |
| **Alkane** |  | None |  | -ane | C CCCC  Ethane Methane Butane |
| **Haloalkane** | X | Halo |  | flouro-, chloro-, bromo-,iodo- | Cl CC  Chloro-Ethane |

R is often used to represent an atom or group of atoms when there are multiple possibilities for what it could be. In the above structures R shows how the functional groups are part of a larger molecule and R itself is not part of the functional group. R' and R" follow the same concept and indicate that these groups of atoms may be different from the other R groups.

