

Chemistry

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1 Carbon

Notes about carbon and organic chemistry!

1.1 What is it?

Carbon is an element which is characterized for being the 4th most abundant element in the universe. It is considered a fundamental pillar as it can form 4 covalent bonds which allows it to combine in various forms.

Substances that have Carbon:

- Hydrocarbons (Ethane)
- Carbohydrates (Glucose)
- Proteins (Amino Acids)
- Lipids (Phospholipids)
- Nucleic Acids

1.2 Alkalines with Carbon

There are 2 types of nomenclature for alkalines with carbon:

- Lineal: The carbon atoms are in a line
- Ramified: The carbon atoms are in a branched structure

The naming for alkalines with carbon is done by the number of carbon atoms in the chain. The prefixes are:

- Meth-: 1 carbon atom
- Eth-: 2 carbon atoms
- Prop-: 3 carbon atoms
- But-: 4 carbon atoms
- Pent-: 5 carbon atoms
- Hex-: 6 carbon atoms
- Hept-: 7 carbon atoms
- Oct-: 8 carbon atoms
- Non-: 9 carbon atoms
- Dec-: 10 carbon atoms

- Undec-: 11 carbon atoms
- Dodec-: 12 carbon atoms
- Tridec-: 13 carbon atoms
- Tetradec-: 14 carbon atoms
- Pentadec-: 15 carbon atoms
- Hexadec-: 16 carbon atoms

The other prefixes for general number naming are:

- Di-: 2 atoms
- Tri-: 3 atoms
- Tetra-: 4 atoms
- Penta-: 5 atoms
- Hexa-: 6 atoms
- Hepta-: 7 atoms
- Octa-: 8 atoms
- Nona-: 9 atoms
- Deca-: 10 atoms
- Undeca-: 11 atoms
- Dodeca-: 12 atoms
- Trideca-: 13 atoms
- Tetradeca-: 14 atoms
- Pentadeca-: 15 atoms
- Hexadeca-: 16 atoms

1.2.1 Lineal

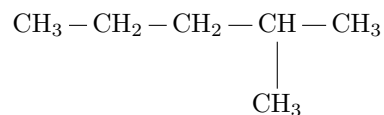
The lineal alkalines are the simplest form of alkalines with carbon. They are named using the prefix corresponding to the number of atoms and then -ane. They are characterized for having the carbon atoms in a line.

Examples:

- Methane: CH_4
- Ethane: $\text{CH}_3 - \text{CH}_3$
- Propane: $\text{CH}_3 - \text{CH}_2 - \text{CH}_3$
- Butane: $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$

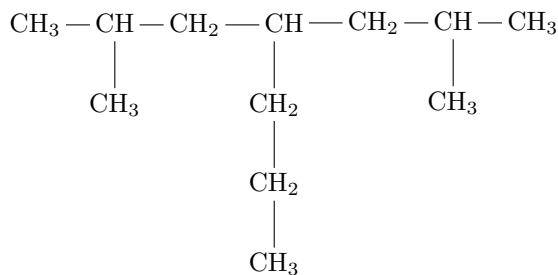
1.2.2 Ramified

The ramified alkalines are a more complex form of alkalines with carbon. The naming is more complicated and it is done by the number of atoms in the longest chain and then the number of atoms in the branches. The branches are named by the number of atoms and then the position in the chain. For example, 2-Methylbutane has 4 carbon atoms in the longest chain and 1 carbon atom in the branch in the 2nd position.



2-Methylbutane (2-Metilbutano)

Nomenclature of ramified alkalines



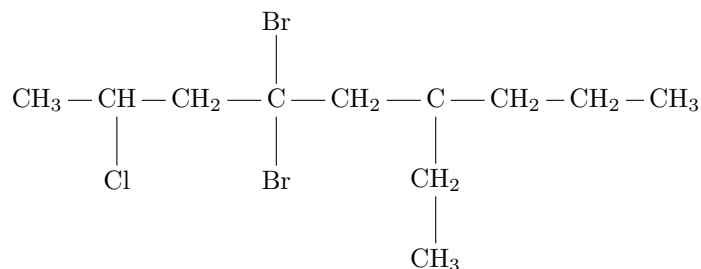
2,6-Dimethyl-4-Propylheptane (2,6-Dimetil-4-Propilheptano)

1.2.3 Substitutions

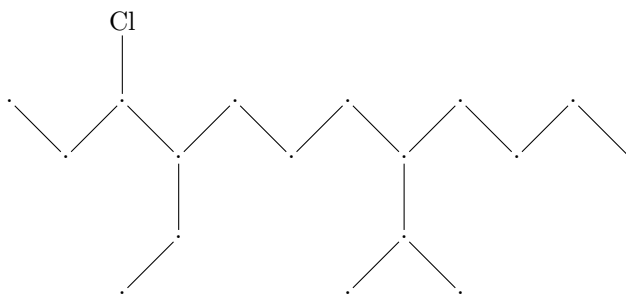
The substitutions are the atoms that are not carbon or hydrogen. They are named by the number of atoms and then the position in the chain. For example, 2-Chloroethane has 2 carbon atoms and 1 chlorine atom in the 2nd position. The substitutions are halogens and are made up of:

- Fluorine (Fluoro)
- Chlorine (Cloro)
- Bromine (Bromo)
- Iodine (Yodo)

Nomenclature of substitutions (haloalkanes) (haloalcanos)



4,4-Dibromine-2-Chlorine-6-Ethylnonane (4,4-Dibromo-2-Cloro-6-Etilnonano)



3-Chlorine-4-Ethyl-8-Isopropyldodecane (3-Cloro-4-Etil-8-Isopropildodecano)

Note that there is a secondary carbon in the 8th position so the naming includes the prefix iso. The nomenclature of substitutions is the same where we first find the longest chain and then the branch with that is the shortest distance from the end. Always start the naming with the substitutions and they are in alphabetical order. If like in the second figure there is a secondary branch, a prefix is added like iso, neo, or sec.

1.3 Ismeros

Ismeros son un tipo de radical que se forma por la reorganización de los átomos en una molécula. Los isómeros son moléculas que tienen la misma fórmula molecular, pero diferente estructura. Los isómeros se pueden clasificar en dos

tipos: isómeros estructurales y isómeros espaciales. Los isómeros estructurales son moléculas que tienen la misma fórmula molecular, pero diferente estructura.

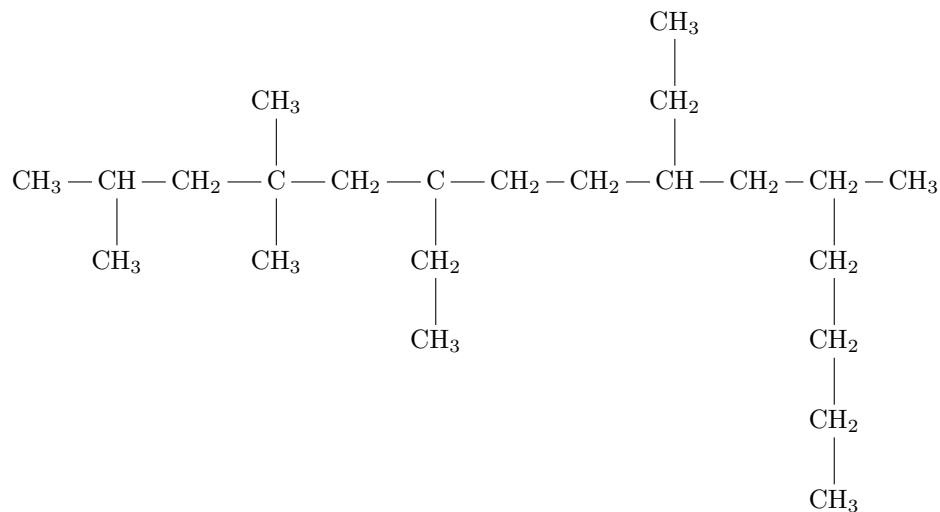
Ejemplo con CH₁₂

- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH}_2 - \text{CH}_3$, Pentano
- $\text{CH}_3 - \text{CH}_2 - \text{CH}_2 - \text{CH} - \text{CH}_3$, 2-Metilbutano



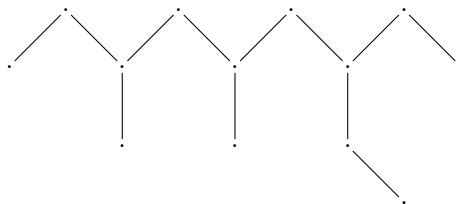
- $$\begin{array}{c} \text{CH}_3 \\ | \\ \bullet \text{ CH}_3 - \text{C} - \text{CH}_3, \text{ 2,2-Dimetilpropano} \\ | \\ \text{CH}_3 \end{array}$$

Ejemplo con $C_{23}H_{48}$



6,9-Dietil-2,4,4,11-Tetrametilpentadecano

Ejemplo con diagrama ramificada



3-Ethyl-5,7-DimethylNonane (3-Etil-5,7-Dimetilnonano)

Start numbering from the side closest to the first branch, if the 2 1st branches are at the same distance, try the second farthest branch. If all the branches are the same distance from the ends, try alphabetically. In this example you would start from the right and then go to the left because the 1st and 2nd distanced branches are the same for both sides and then you start alphabetically which would be Ethyl from the right.