Alkenes and Cyclic Structures

Alkenes, carbon chains with at least one double bond, are named the same way as alkanes, but with the "-ene" ending. The placement of the double bond will need to be noted in the name, except for the case of ethene and propene.

For example, C-C=C-C would be a butene, due to the four carbons and double bond. Its full name is 2-butene, as the double bond starts at the second carbon. C=C-C-C would be 1-butene. These are the only possible butene isomers. The more carbons there are, the greater the variety of isomers.

For this alkene, 1-butene would be the parent chain—the carbon based name and double bond placement. Substituents are added the same way as in with alkanes. Example:

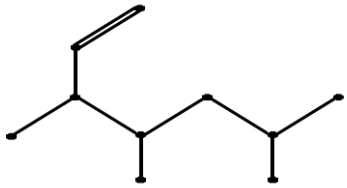


Figure 1. Alkene chain

Here, the parent chain would be the seven carbon chain including a double bond. The double bond takes precedence of substituents, so the parent is counted at the start of the double bond, even though the substituents will have higher numbers. All substituents are methyl, so this structure is 3,4,6-trimethyl-1-heptene.

If we were to add another double bond, we would add the placement of that bond as well to the list.

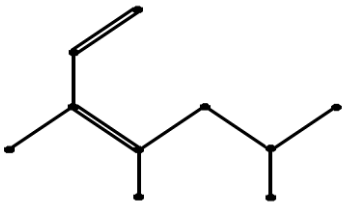
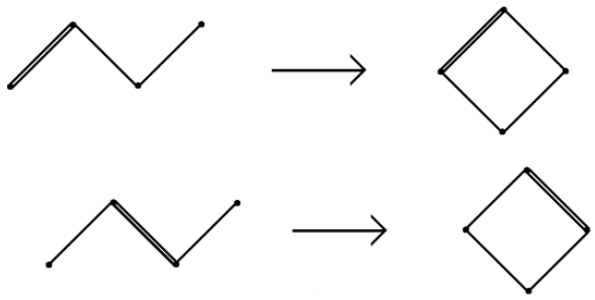


Figure 2. Alkene chain with two double bonds

This structure would be 3,4,6-trimethyl-1,3-heptene.

Cyclic structures are simply straight chains that are connected, usually to form a ring. "Cyclo-"is added as a prefix to the parent chain once they are connected. 1-butene and 2-butene would both be considered cyclobutene. Since there is only one double bond and no substituents, the double bond is the only occurrence to note. On a cyclic chain, there is no left or right point to start numbering the carbons at. Whichever functional group has the highest priority, will be denoted as the first carbon. Once again, to add substituents you just identify them and include their placement!



When cyclized, 1-butene and 2-butene become analogous.

Figure 3. Cyclizing butenes

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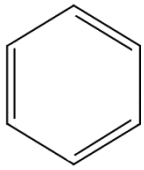

Figure 4. Benzene

A notable molecule is both an alkene and a cyclic structure. Six carbons, with three alternating double bonds, form a hexagon. This structure could be called 1,3,5-cyclohexene, it is more commonly referred to as benzene. Many of the more complicated and common structures have been given their own names.

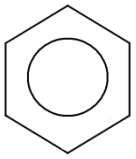

Figure 5. Simplified benzene

Benzene can also be drawn like the picture to the right. This is due to its aromatic properties—the electrons taking part in the double bonds are moving around the ring like a circuit. This electron movement is represented by the center circle.

The following is a list of other benzene derived molecules:

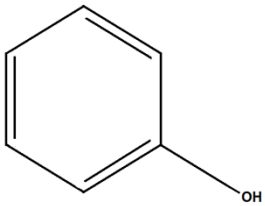

Figure 6. Phenol / Benzenol / Carbolic Acid

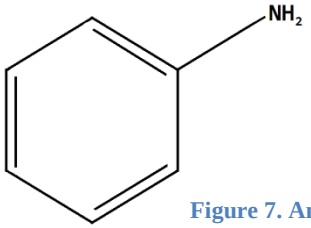

Figure 7. Aniline

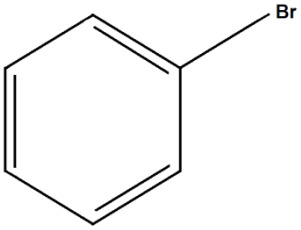

Figure 8. Bromobenzene

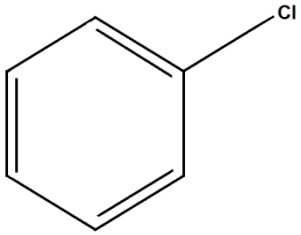

Figure 9. Chlorobenzene

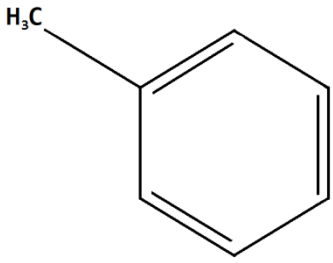

Figure 10. Methylbenzene / Toluene

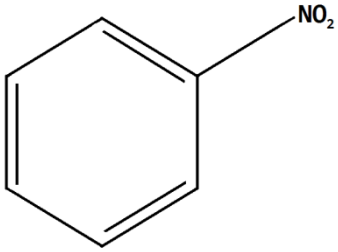

Figure 11. Nitrobenzene