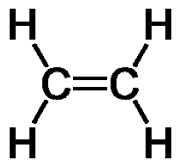
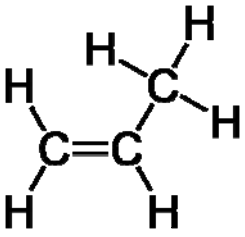
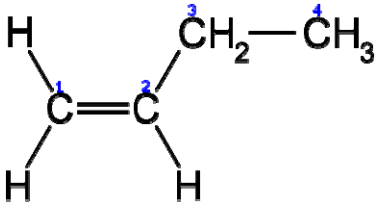
3.2 Naming Alkenes

To name alkenes, we count the number of C atoms in the longest unbranched chain, take the name of the corresponding alkane and **change –ane to -ene.**

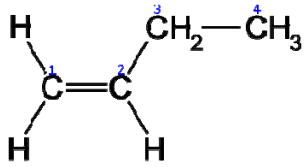
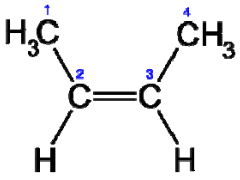
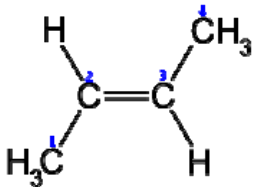
Thus   

Systematic: ethene propene butene

Common Name: ethylene propylene butylene

When we put a double bond into butane, naming gets a little more complicated. There are two places where we can put a double bond: between the first and second carbons, or between the second and third C atoms. Furthermore we have the possibility for cis-trans isomers when the double bond is between the 2nd and 3rd C atoms. Can you see why there are no cis-trans isomers when the double bond is between 1st and 2nd C's? In order for cis-trans isomers to exist, there must be two different groups attached to <u>both</u> C atoms of the C-C double bond.

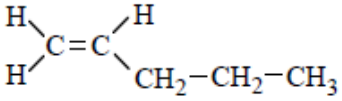
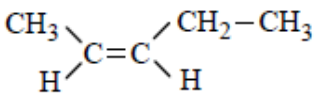
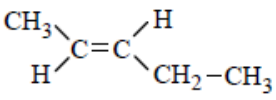
To name molecules with double bonds, pick out the longest chain containing the double bond. **Start numbering the chain from the end closest to the double bond** even if it results in larger numbers for other groups branching off the main chain.To indicate where the double bond is, specify the number of the **first** C in the double bond. The three isomeric butenes are:

1-butene cis-2-butene trans-2-butene

(Any cis/trans isomers on 1-butene?)

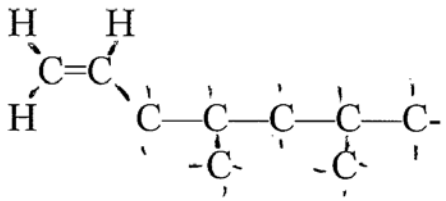
Let's take a second example; drawing all the isomeric pentenes:

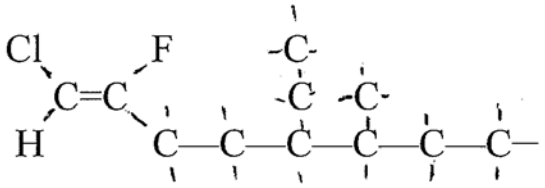
  

1-pentene cis-2-pentene trans-2-pentene

If we move the C=C between the #3 and # 4 C you will see that in fact it is the same molecule (flipped from left to right) as the 2-pentenes.

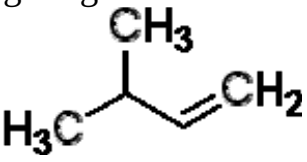
Naming Branched Alkenes



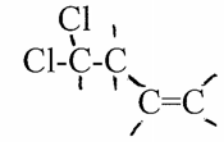


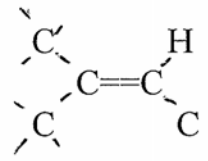
4,6-dimethyl-1-heptene 1-chloro-5-ethyl-2-fluoro-6-methyl-1-octene

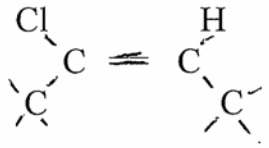
In the above examples, giving the smallest number to the C=C takes priority over giving a small number to the methyl branch.



The name for this molecule is 3 methyl-1-butene. Note we start numbering from right to left in this molecule to give the alkene the smallest value. As in the previous examples, giving the smallest number to the C=C takes priority over giving a small number to the methyl branch. Name the molecules below



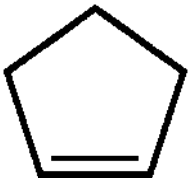




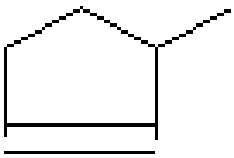
Are there geometric isomers of the above two structures?

Double bonds commonly occur in rings. The numbering automatically starts from the double bond and goes around the ring so as to make the C=C numbering 1 and

2. If there are other groups on the ring, number around the ring in the direction that gives the smallest sumof numbers.



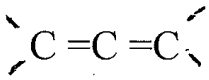
Cyclopentene



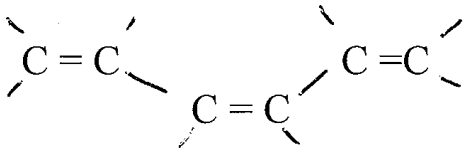
3 methyl cyclopentene

4-methylcyclohexene

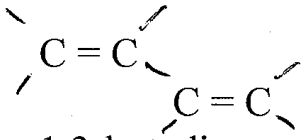
Some molecules think that if one double bond is good, two double bonds are better. We indicate this by putting a prefix directly in front of the -ene at the end of the name:
Two double bonds = -diene (You think you are diene!)
Three double bonds = -triene (But you should keep on triene!)
Four double bonds =-tetraene
Five double bonds = -pentaene
Six double bonds = -hexaene
Examples:



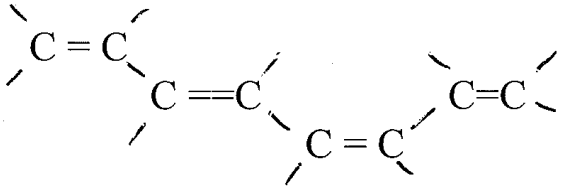
(1,2) propadiene



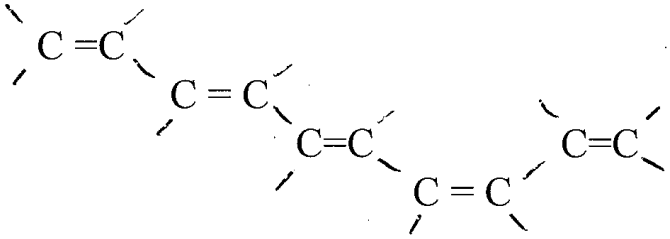
1, cis-3,5-hexatriene



1,3-butadiene

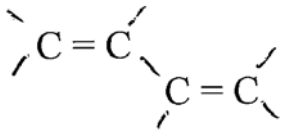
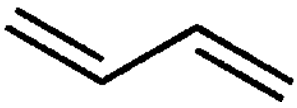


1, trans-3, cis-5, [illegible]-7-octatetraene

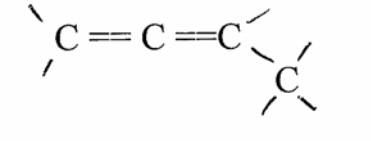


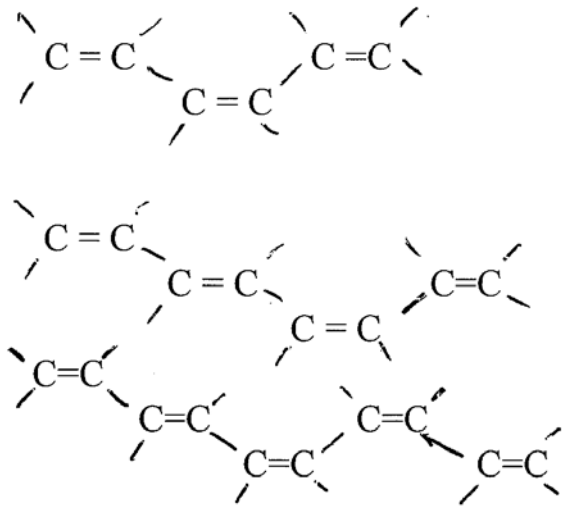
1,trans-3, trans-5,cis-7,9-decapentaene

The shorthand notation for double bonds is shown below

 is written 

Draw the shorthand notation and **name** the molecules shown below:





Alternate double and single bonds are called **conjugated** double bonds and are very common in nature; they have distinctive chemical properties, often absorb visible light, and as a result are often colored compounds.