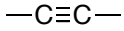
ALKENES AND ALKYNES

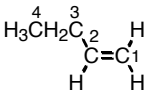
Alkenes and Alkynes – Term olefin comes from: oleum facere
↳ Olefin "oil" + "to make"



Alkene (olefin) Alkyne (acetylene)

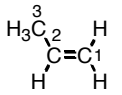
Alkenes – structure and nomenclature

ethylene (common name)
ethene (systematic name)
replace "ane" of corresponding alkane name with "ene"



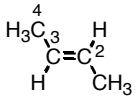
1-butene

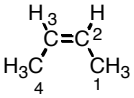
- to name find longest chain containing maximum number of C=C with both multiply bonded carbons in chain



propylene (common name)
or propene(systematic name)

- number from end to give 1st carbon of C=C lowest number, prefix with number to indicate position of first double bonded carbon





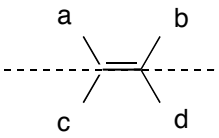
- cis = two large groups on same side
- trans = two large groups on opposite side

trans-2-butene

cis-2-butene

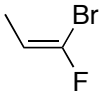
These 2-butenes are structural isomers with respect to the 1-butene above

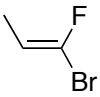
Stereoisomers (Diastereomers)

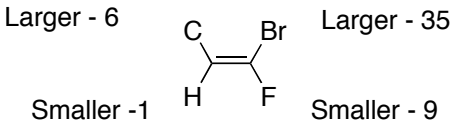


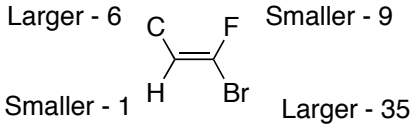
- examine atomic no.'s of elements directly attached to double bond
- compare a and c
- compare b and d
- determine if largest groups or on same side or opposite sides

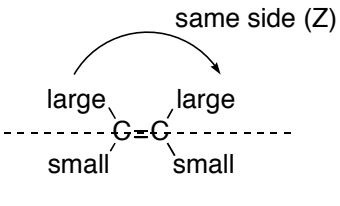
Example 1

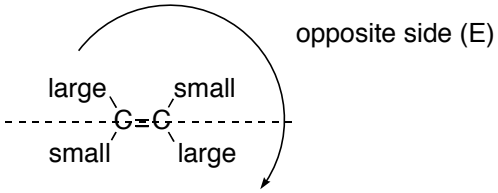








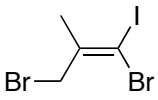




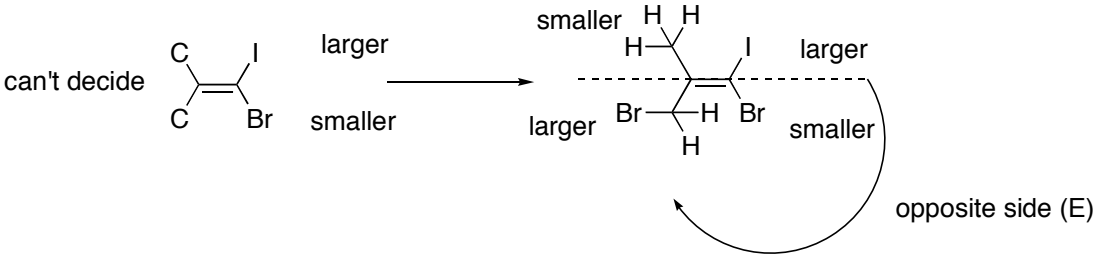
Z-1-bromo-1-fluoro-1-propene

E-1-bromo-1-fluoro-1-propene

Example 2

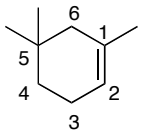


E-1,3-dibromo-1-iodo-2-methyl-1-propene



Nomenclature Alkenes and Alkynes -continued

△ cyclopropene - ringstrain makes this molecule very reactive

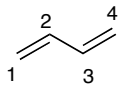


1,5,5-trimethylcyclohexene or
1,5,5-trimethyl-1-cyclohexene

For molecules having multiple double bonds:

2 C=C bonds → diene
3 C=C bonds → triene
4 C=C bonds → tetraene
5 C=C bonds → pentaene

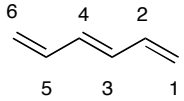
Eg.1



1,3-butadiene

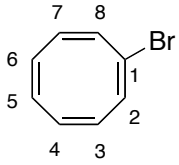
drop "ne" ending of alkane and add "diene"

Eg.2

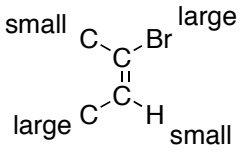


1,3,5-hexatriene

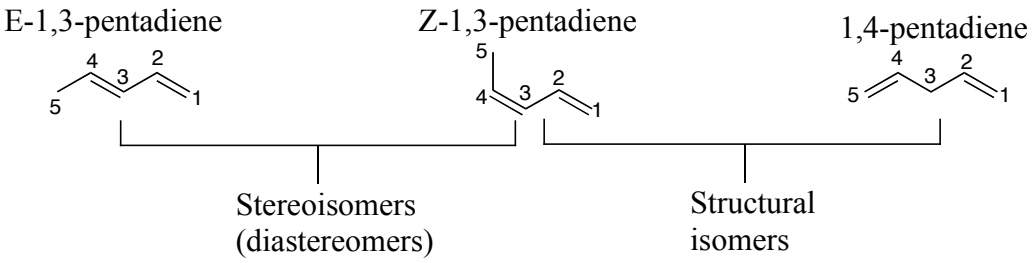
Eg.3



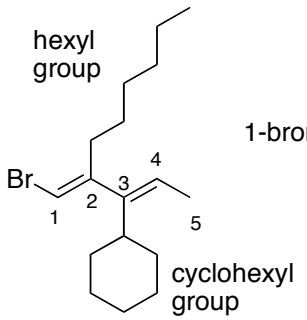
1-E-1-bromo-1,3,5,7-cyclooctatetraene



Eg.4

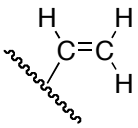


Eg.5



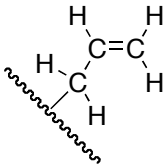
1-bromo-3-cyclohexyl-2-hexyl-1,3-pentadiene

Different groups

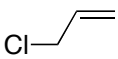


Vinyl group

Vinyl chloride
1-chloroethene



Allyl group



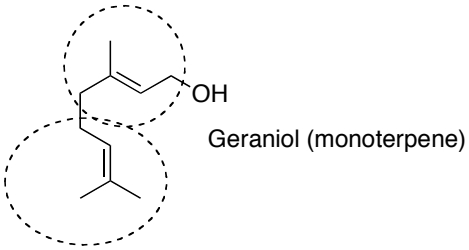
Allyl chloride
3-chloropropene

Natural Alkenes eg. Terpenes/Terpenoids or Isoprenes/Isoprenoids

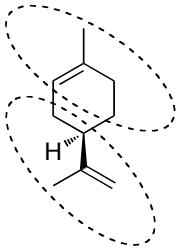
Isoprene
2-methyl-1,3-butadiene

C_5

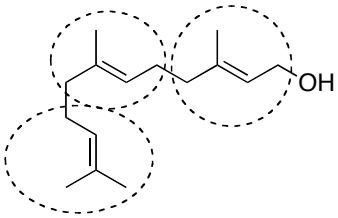
2 C_5 (isoprene units) – monoterpene
3 C_5 (isoprene units) – sesquiterpene
4 C_5 (isoprene units) – diterpene
6 C_5 (isoprene units) – triterpene



Geraniol (monoterpene)



limonene (monoterpene)
C_{10}



Farnesol (sesquiterpene)

Note - Each dotted circle identifies a C_5 unit

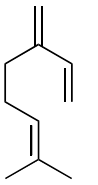
Pheromones (chemical messengers)

From the Greek	Pherein	Horman
	to carry	excitement

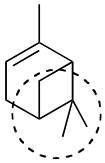
1959 – Adolf Butenandt (Nobel prize for discovery of pheromones)

Sex Pheromones – Insects can detect 10^{-17} moles/L (i.e. 10^{-17} M or 10^{-17} molar)

Alarm Pheromones
Trail Pheromones



myrcene



α-pinene
major component of terpentine

Swarm Pheromones

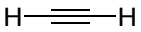
Both of these are monoterpenes

Nomenclature of alkynes

Rule:

- drop “ane” and add “yne”
- for multiple triple bonds, drop “ne” and add “diyne”,” triyne”, etc.

eg.

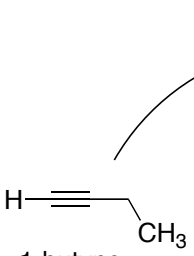


- ethyne / acetylene (common name)

propyne

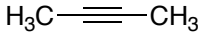
methylacetylene (common name)

Structural isomers



1-butyne

ethylacetylene



2-butyne

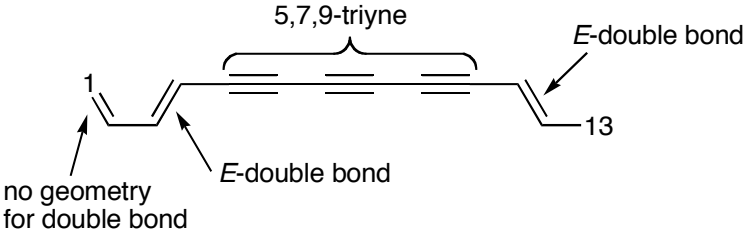
dimethylacetylene

Multiple alkynes end with -

2	C≡C	diyne
3	C≡C	triyne

Mixed double and triple bond containing compounds are “eneynes”

The below example is from Canola – defense substance – anti-nematode



1,3[*E*],11[*E*]-tridecatriene-5,7,9-triyne