Recall:

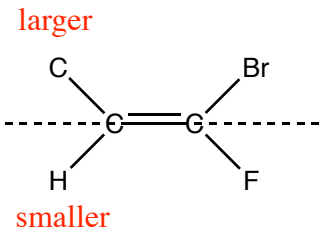
E, Z - Nomenclature

E - Entegegen - Opposite
Z - Zusammen - Together

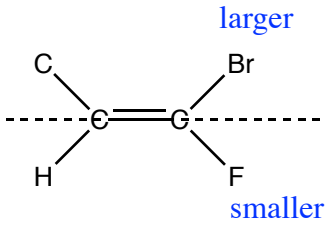
Naming based on atomic number, similar process to identifying S/R stereochemistry

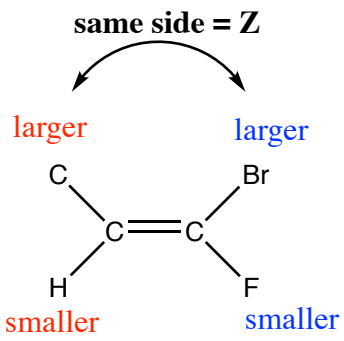
Example 1: 1-bromo-1-fluoro-1-propene
- compare the atomic no. of the adjacent atoms.

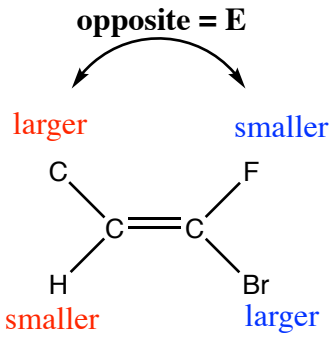
Compare the left side of the C=C bond



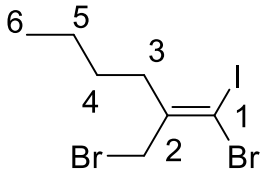
Compare the right side of the C=C bond







Example 2:



1-E-1-bromo-1-iodo-2-(bromomethyl)-1-hexene

Iodine is on the opposite side to the bromomethyl (highest priority groups on either side of the alkene) and so the stereochemistry is deemed E.

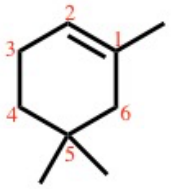
Nomenclature of Cycloalkenes

Cyclopropene

Cyclobutene

Cyclopentene

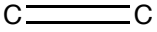
Cyclohexene



1,5,5-trimethyl-1-cyclohexene

Rule: Number the cycloalkene such that the double bond is between C1 and C2 and that the first substituent has the lowest number possible.

Nomenclature of alkenes with multiple carbon-carbon double bonds (poly-enes):

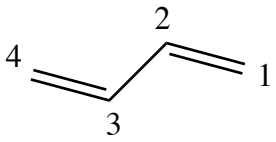
Multiple 

2 Diene

3 Triene

4 Tetraene

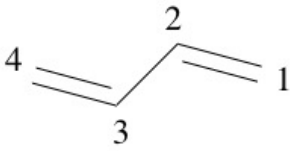
…etc



Buta-1,3-Diene
1,3-Butadiene

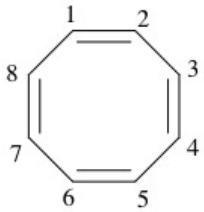
Drop -ne and add “diene”, “triene”, etc.

1) Find the longest chain containing the maximum number of double bonds.
2) Start numbering such that the first doubly bonded position would have the lowest number possible
3) Write out the full name. Number the substituents according to their position in the chain and list them alphabetically.

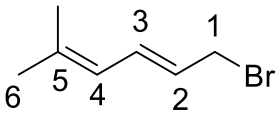


Buta-1,3-diene
1,3-Butadiene

1,3-Cylcobutadiene

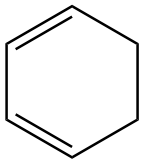


1,3,5,7-Cyclooctatetraene
COT

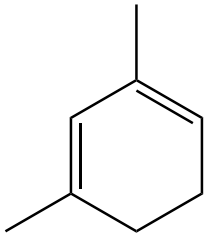


3E-1-bromo-5-methyl-2,4-hexadiene

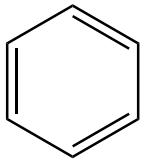
Other examples:



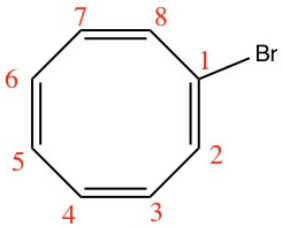
1,3-cyclohexadiene



1,3-dimethyl-1,3-cyclohexadiene

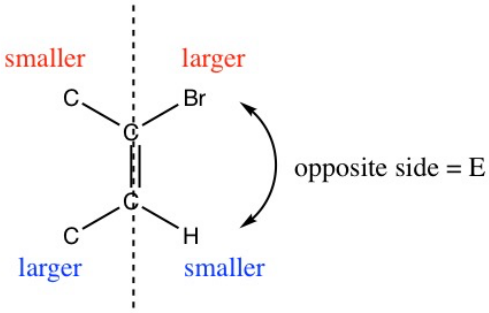


benzene
(NOT a cyclohexatriene)
(aromatic)

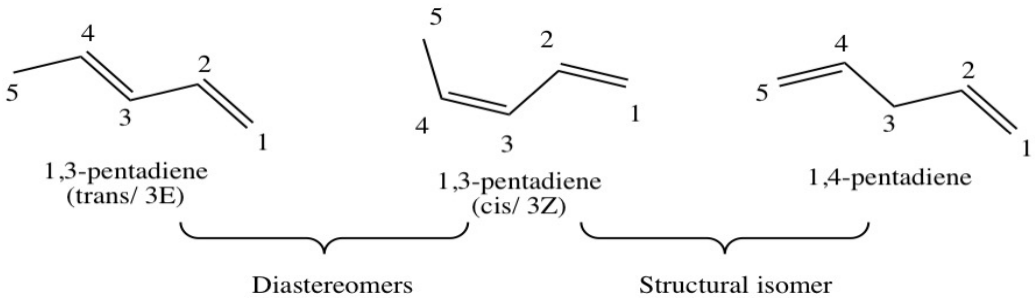


1-bromo-1,3,5,7-cyclooctatetraene

E or Z?

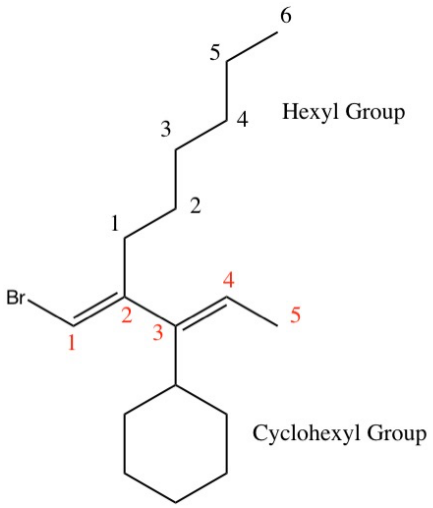


It is therefore (E)-1-bromo-1,3,5,7-cyclooctatetraene



1,3-pentadiene (trans) = (E)-1,3-pentadiene

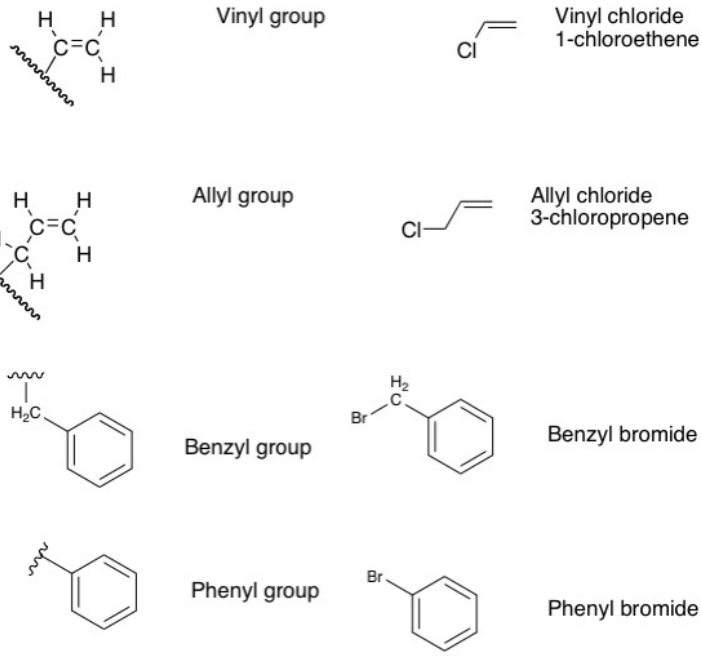
1,3-pentadiene (cis) = (Z)-1,3-pentadiene



1E,3E-1-Bromo-3-cyclohexyl-2-hexyl-1,3-pentadiene

Note: Carbons attached to double and triple bonds are depicted as additional carbon-carbon bonds in the representations above.

Special Nomenclature of Common Groups:



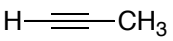
Note: phenyl bromide is commonly called bromobenzene

Nomenclature of Alkynes (also known as acetylenes)

Rules:

- Find longest chain with max number of multiple bonds
- Number from end to give 1st multiply bonded position the lowest number
- Drop "ane" and add "yne"
- For multiple triple bonds, drop "ne" and add "diyne"," triyne", etc.
- Halides and alkyl substituents take lower priority than double or triple bonds

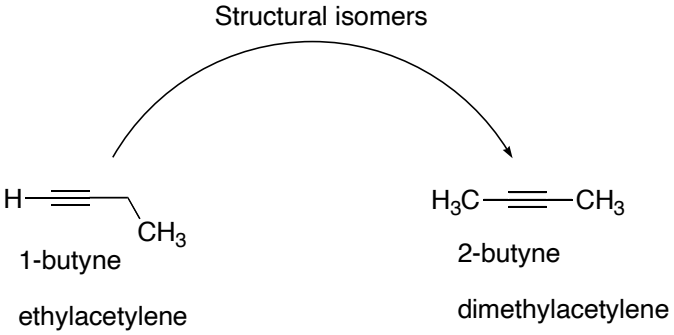
ethyne
acetylene



propyne

methylacetylene (common name)

1-propyne



Multiple alkynes end with:

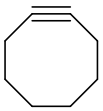
2	C≡C	diyne
3	C≡C	triyne
4	C≡C	tetrayne

Mixed double and triple bond containing compounds are "eneynes."

Cyclic Structures with Triple Bonds

extremely unstable
Cyclohexyne

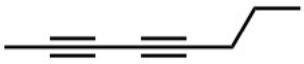
$T_{1/2}$ approx 1 h
very reactive
Cycloheptyne



Cyclooctyne

- Cycloalkynes are very reactive as the triple bonds wants to assume a 180° bond angle.
- Cycloheptyne is more stable as the angle is larger ($T_{1/2}$=1 h)
- Cyclooctyne is known to be relatively stable compound used in azide-alkyne [3+2] cycloadditions (used in biorthogonal coupling – Nobel Prize 2022 Carolyne Betozzi & Barry Sharpless)

Example 1:

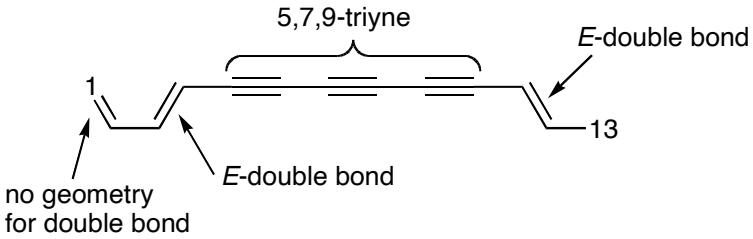


2,4 - Octadiyne
(octa-2,4-diyne)

Example 2:

The below example is from canola – defense substance (anti-nematode)

- Parent alkane of 13 carbons is tridecane – hence trideca
- Start numbering the chain such that the **first multiply bonded position** gets the lowest number possible.



3*E*,11*E*-trideca-1,3,11-triene-5,7,9-triyne

Note: alkene stereochemistry can go right to the numbers indicating positions of double bonds: **trideca-1,3*E*,11*E*-triene-5,7,9-triyne**