Recall:

Nomenclature of Alkene

- Note that there is no free rotation around C=C.

Rules:

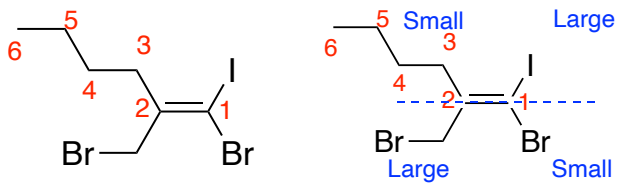
1. Find longest chain
2. Number from end to contain both ends of C=C and give lowest number to 1st C of C=C
3. Change "ane" to "ene" precede with number to indicate first double bond position

E/Z Nomenclature

E - Entegegen - Opposite
Z - Zusammen - Together

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

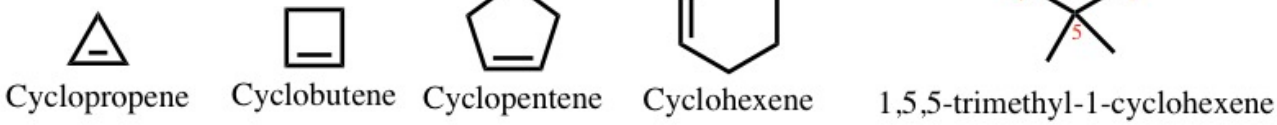
Example:



Substituents: 1-iodo; 1-bromo; 2-(1-bromomethyl)
Parent: Hex-1-ene or 1-Hexene

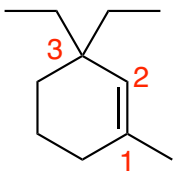
Name: *E*-1-bromo-2-(1-bromomethyl)-1-iodo-1-hexene

Nomenclature of Cycloalkenes



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

Example:



3,3-diethyl-1methyl-1-cyclohexene or
3,3-diethyl-1methylcyclohex-1-ene

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

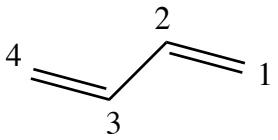
Multiple C=C

2 Diene

3 Triene

4 Tetraene

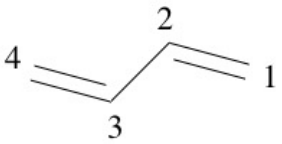
…etc



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

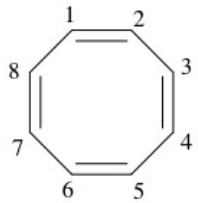
Drop -ne and add "diene", "triene", etc.

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.

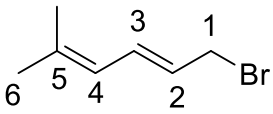


Buta-1,3-diene
1,3-Butadiene

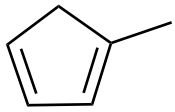
1,3-Cylcobutadiene



1,3,5,7-Cyclooctatetraene (All *Z*)
COT

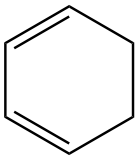


3E-1-bromo-5-methyl-2,4-hexadiene

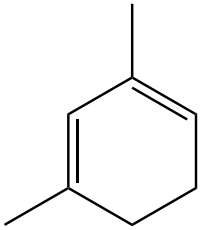


1-methyl-1,3-cyclopentadiene

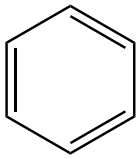
Other examples:



1,3-cyclohexadiene

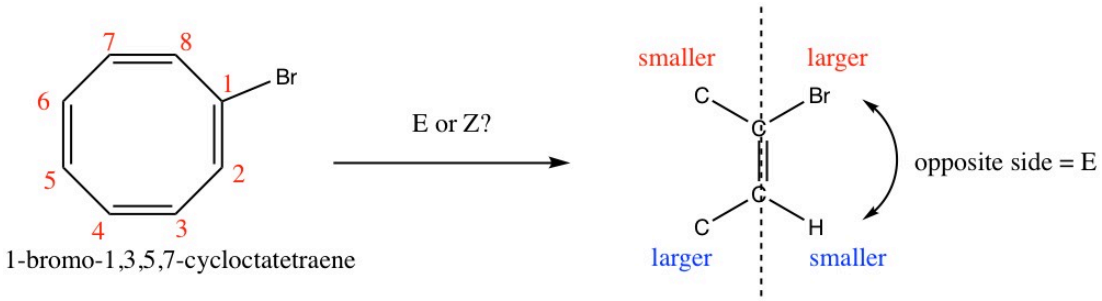


1,3-dimethyl-1,3-cyclohexadiene



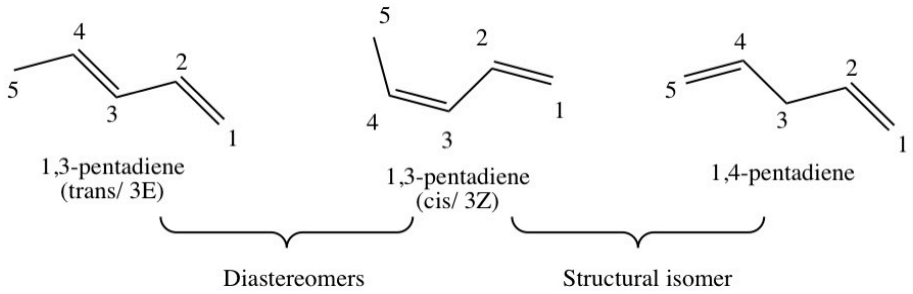
benzene
(NOT a cyclohexatriene)
(aromatic)

Abbrev:
PhH or C_6H_6 or ϕH



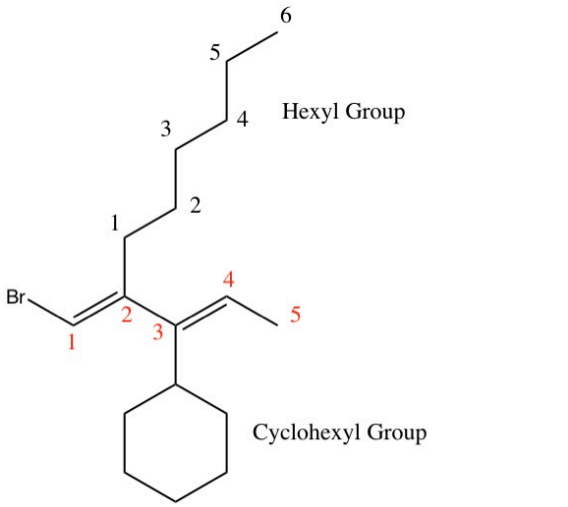
1-bromo-1,3,5,7-cyclooctatetraene

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



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

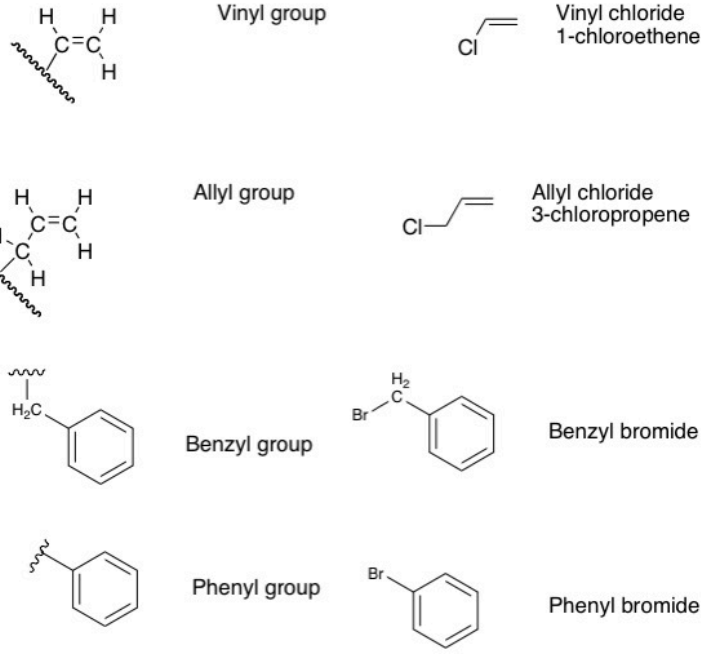
1,3-pentadiene (cis) = (Z)-1,3-pentadiene



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:

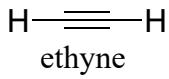


Note: phenyl bromide is commonly called bromobenzene

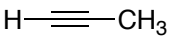
Nomenclature of Alkynes (also known as acetylenes)

Rules:

- Find longest chain with max number of multiple bonds
- Number from end to give 1st <u>multiply</u> 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 bon



ethyne
acetylene

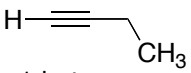


propyne

methylacetylene (common name)

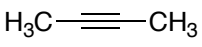
1-propyne

Structural isomers



1-butyne

ethylacetylene



2-butyne

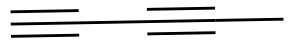
dimethylacetylene

Multiple alkynes end with:

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

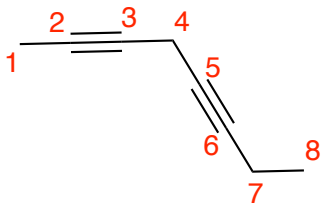
Mixed double and triple bond containing compounds are "eneynes."

Example 1:



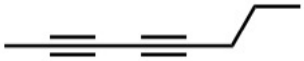
penta-1,3-diyne (1,3-pentadiyne)

Example 2



2,5 - Octadiyne
(octa-2,5-diyne)

Example 3:

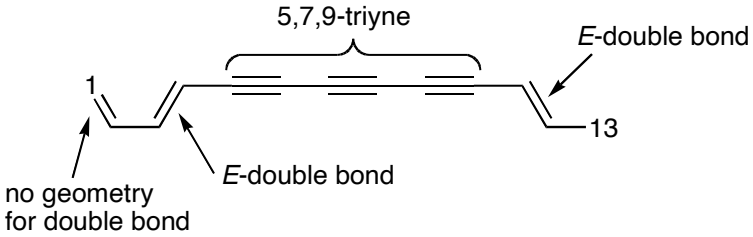


2,4 - Octadiyne
(octa-2,4-diyne)

Example 4:

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.

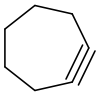


3*E*,11*E*-trideca-1,3,11-triene-5,7,9-triyne

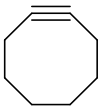
Note: alkene stereochemistry can go right to the numbers indicating positions of double bonds: **trideca-1,3*E*,11*E*-triene-5,7,9-triyn**

Cyclic Structures with Triple Bonds

extremely unstable
Cyclohexyne



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

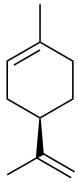


Cyclooctyne

- 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)

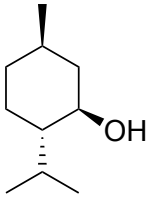
Terpenes or Isoprenoids or Terpenoids

isoprene
2-methyl-1,3-butadiene
C_5 unit

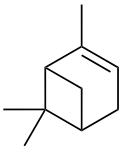


limonene
citrus
C_{10} (two C_5 units)

1 C_5 Hemiterpene
2 C_5 Monoterpene
3 C_5 Sesquiterpene
4 C_5 Diterpene
5 C_5 Sesterterpene
6 C_5 Triterpene



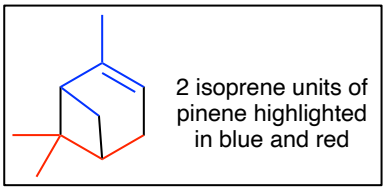
menthol
monoterpene



pinene
monoterpene

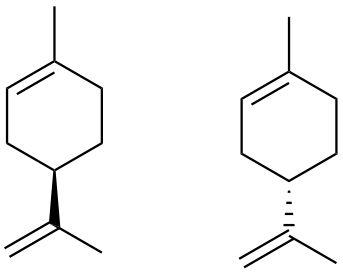
- Steroids are made from triterpenes

-Pinene is made from two isoprene units

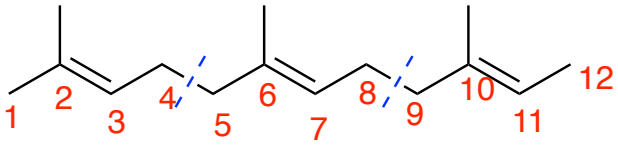


- Leopold Ruzicka: did significant work with terpenes

Examples:



Enantiomers of Limonene



2,6,10-trimethyldodeca-2,6,10-triene

2,6,10-trimethyl-2,6,10-dodecatriene