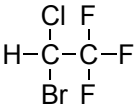
**Physical Properties of Alkyl Halides:**

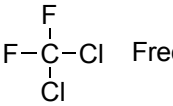
- Governed primarily by dipole-dipole interactions. "Non-polar", but more polar than hydrocarbons.
- High MP and BP relative to hydrocarbons of similar molecular weight
- Good solvents for organic compounds e.g. Methylene chloride ($CH_2Cl_2$) and chloroform ($CHCl_3$)
- Density = ρ (rho) = 1.0 g/cm$^3$ for water
- If % composition > 65% halogen by weight, then more dense than water (ρ > 1.0)
- Immiscible (insoluble) in $H_2O$. $H_2O$ floats on top.

Example: Halothane

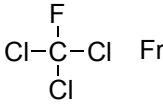


1,1,1-trifluoro-2-bromo-2-chloroethane

Example: Refrigerants



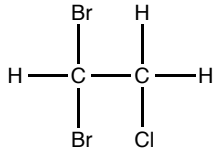
Freon 12



Freon 11

How would you synthesize Freon 11? Fluorinate or chlorinate first? You would chlorinate first. Fluorine is more reactive and it would be difficult to get monofluorinated products.

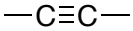
Another Example:



1,1-dibromo-2-chloroethane

Male contraceptive – Sperm count for a healthy male is typically 100 million per mL. This compound can reduce that to 0.

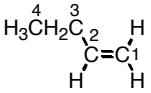
## ALKENES AND ALKYNE NOMENCLATURE



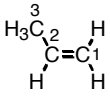
| Alkene (olefin) | Alkyne (acetylene) |
|---|---|
| - $sp^2$ hybridized | - sp hybridized |
| - 120°, planar | - 180°, linear |

### Alkenes – Structure and Nomenclature

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



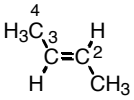
1-butene

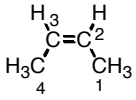


propylene (common name)
or propene(systematic name)

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

- 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

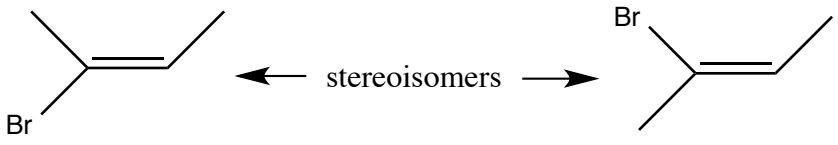
trans-2-butene

cis-2-butene

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

Stereoisomers (Diastereomers)

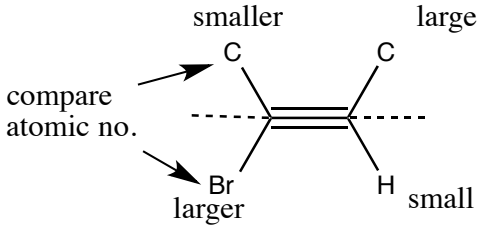
Another example:




2-bromo-2-butene

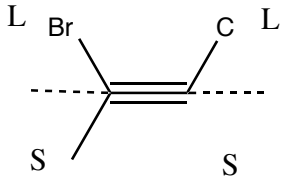
2-bromo-2-butene

**E-Z Nomenclature**

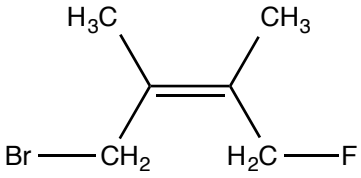



Large groups are on opposite sides on the C=C --> E

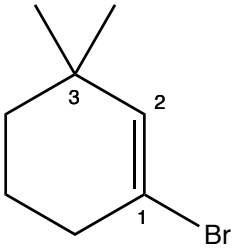
E-2-bromo-2-butene



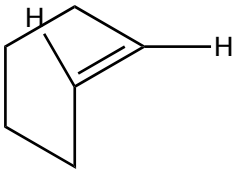

Z-2-bromo-2-butene




Z-1-bromo-2,3-dimethyl-4-fluoro-2-butene




1-bromo-3,3-dimethyl-1-cyclohexene




unstable

"E" though in small rings, double bonds are always cis with respect to the ring atoms.