

# Geometrical Isomer

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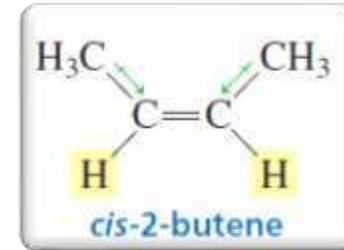
These isomers occur where you have restricted rotation somewhere in a molecule. At an introductory level in organic chemistry, examples usually just involve the carbon-carbon double bond

## ✓ *Geometric Isomers*

- ✓ *Different physical properties – Different arrangement*
- ✓ *(Different density, polarity, solubility, melting point /boiling point)*

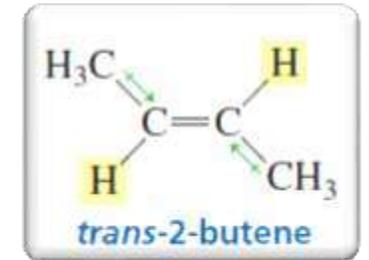
# Cis- trans isomer

## cis isomer



the isomer with the hydrogens on the same side of the double bond

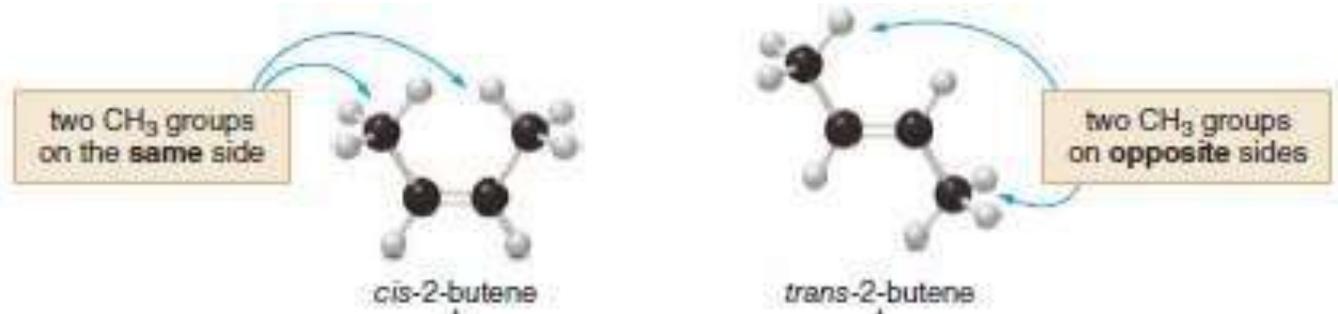
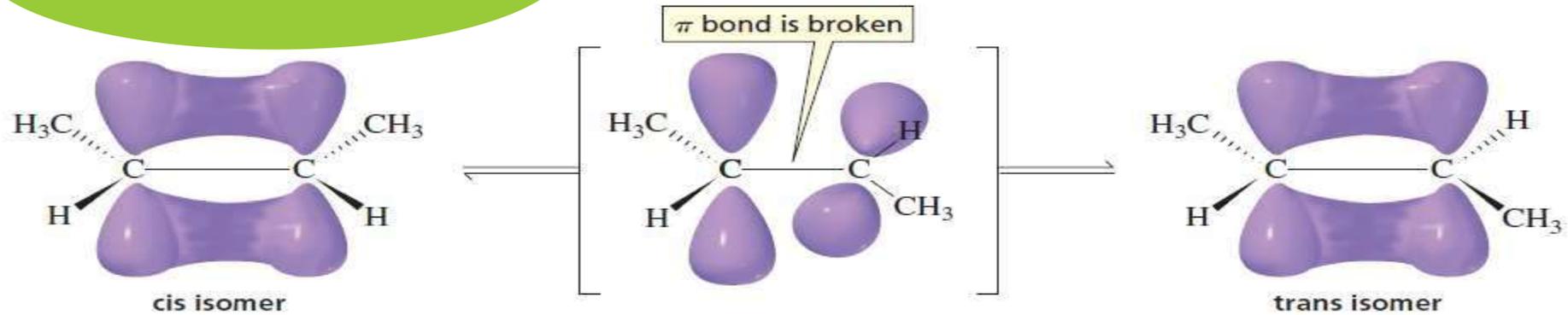
## trans isomer



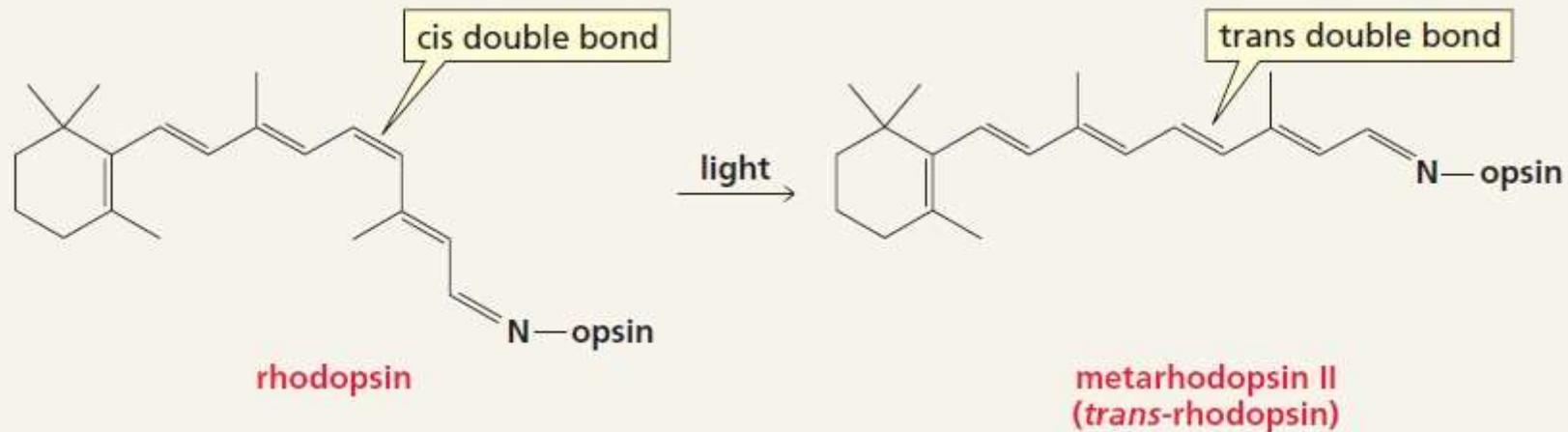
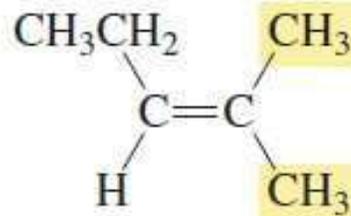
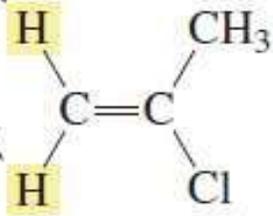
the isomer with the hydrogens on opposite sides of the double bond

# Cis-trans isomer

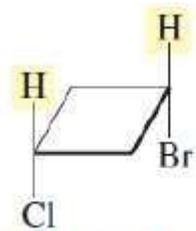
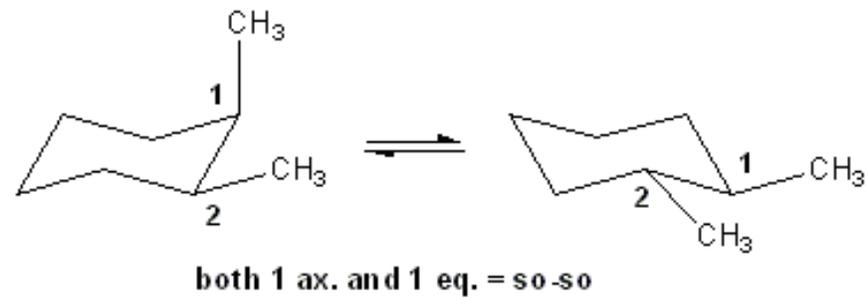
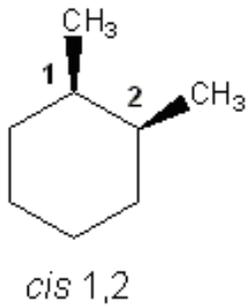
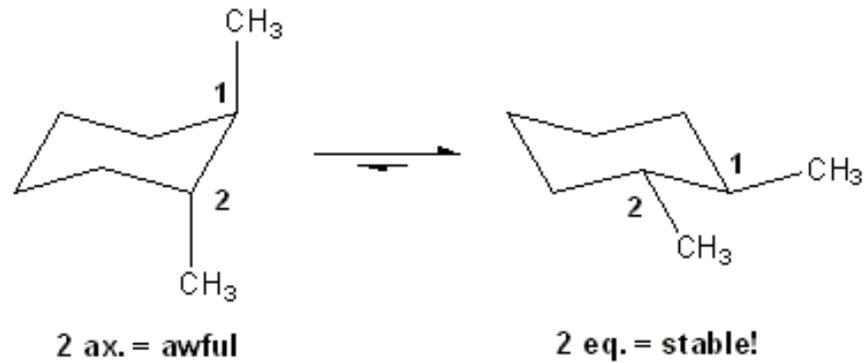
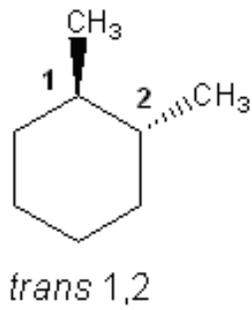
In alkene



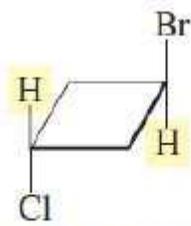
cis and trans isomers are not possible for these compounds because two substituents on an  $sp^2$  carbon are the same



# Cyclo alkane

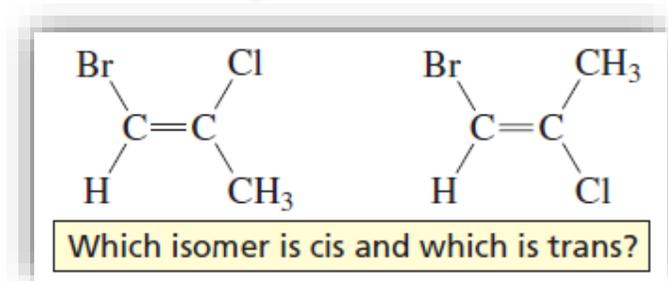


*cis*-1-bromo-3-chlorocyclobutane



*trans*-1-bromo-3-chlorocyclobutane

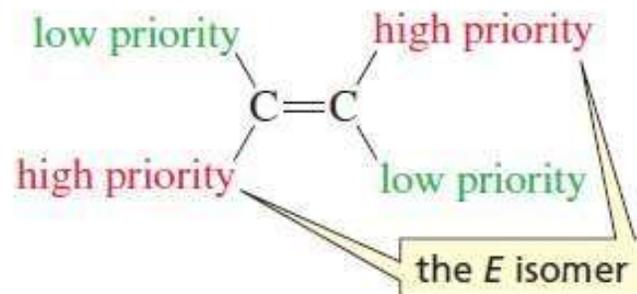
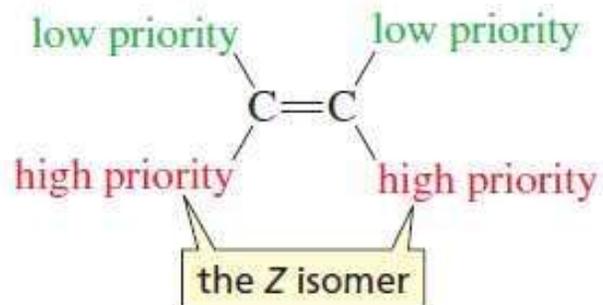
# E-Z system



- The **Z isomer** has the high-priority groups on the **SAME** side.
- The **E isomer** has the high-priority groups on the **OPPOSITE** side.

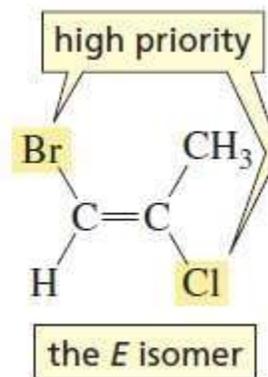
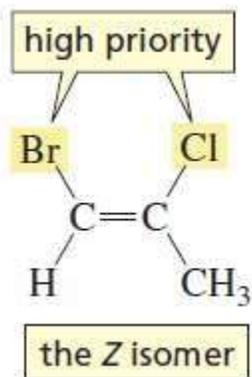
If the **high-priority** groups are on the **same side** of the double bond, the isomer has the **Z configuration** (Z is for *zusammen*, German for “together”).

If the **high-priority** groups are on **opposite sides** of the double bond, the isomer has the **E configuration** (*E* is for *entgegen*, German for “opposite”).

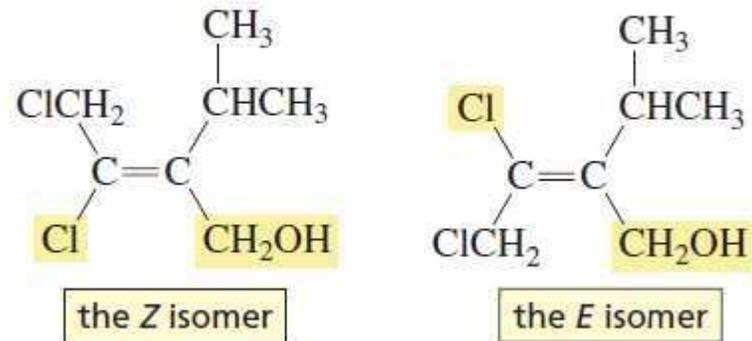


# Rules

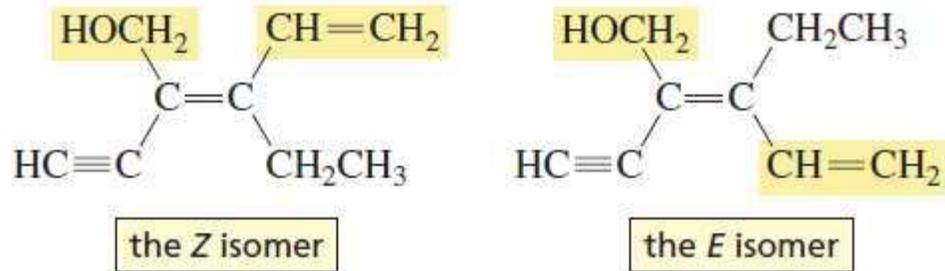
Rule 1: high atomic number high priority



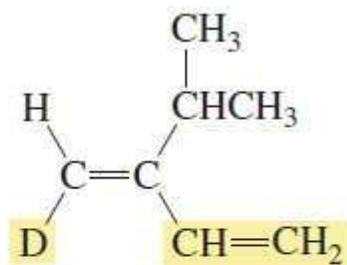
**Rule 2:** If the two substituents bonded to an carbon start with the same atom, move to the next attached group



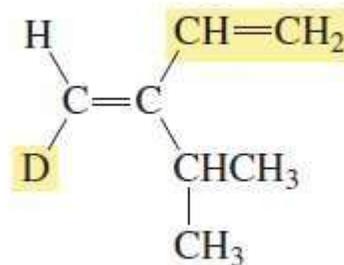
**Rule 3:** If an atom is doubly bonded to another atom, the priority system treats it as if it were singly bonded to two of those atoms. If an atom is triply bonded to another atom, the priority system treats it as if it were singly bonded to three of those atoms.



**Rule 4.** In the case of isotopes (atoms with the same atomic number, but different mass numbers), the mass number is used to determine the relative priorities.



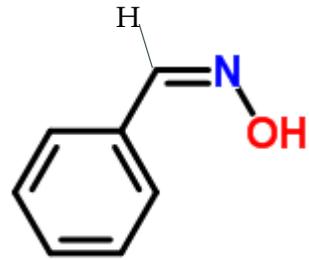
the *Z* isomer



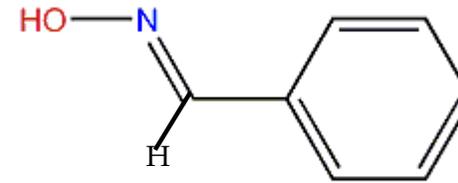
the *E* isomer

# Syn-anti isomer

This type used for stereoisomeric oxime

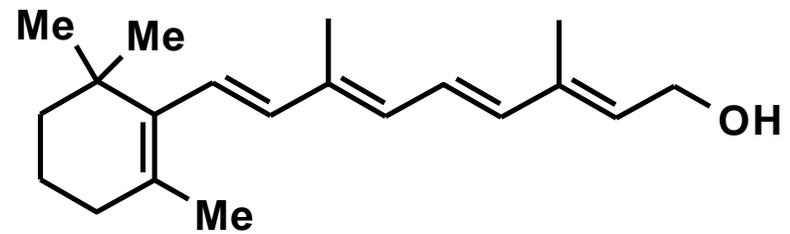
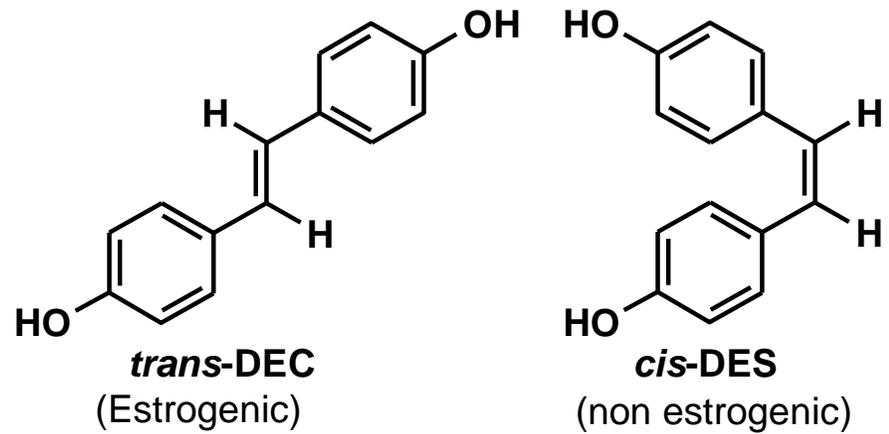


Anti isomer  
Where H and OH is trans



syn isomer  
Where H and OH is cis

# Example in drug action



**Vitamin A has all E double bonds, any Z would make it inactive!**

Thank you