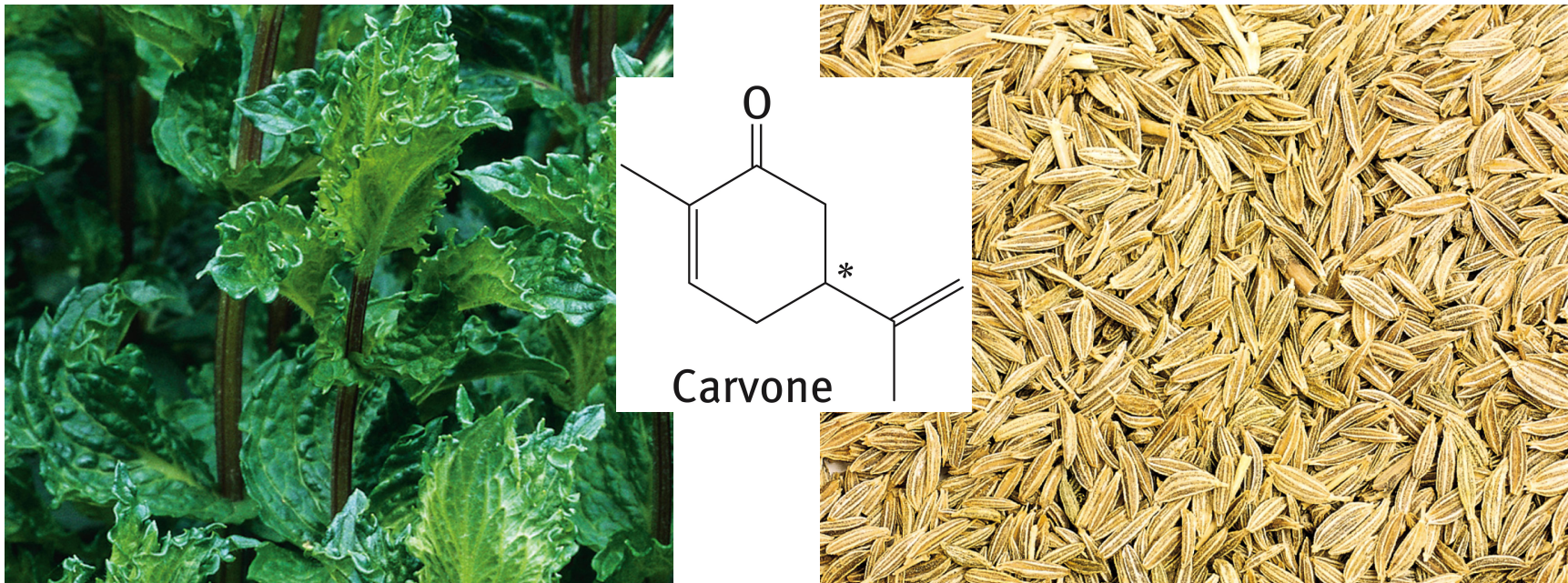


Chapter 5: Stereoisomerism

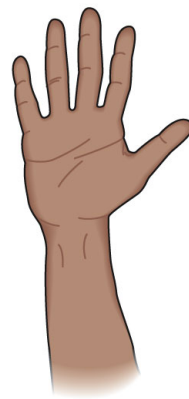
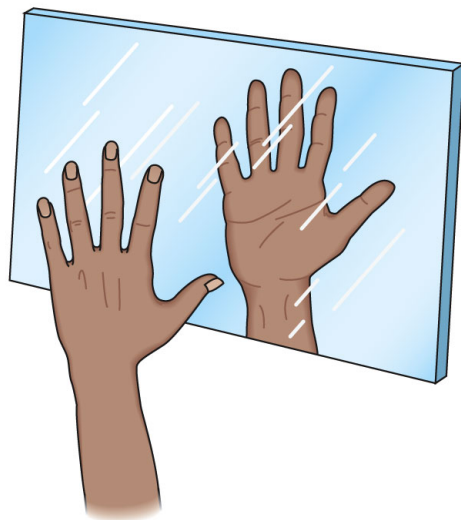
Stereoisomers are compounds that have the same structural formula in terms of order of attachment, but differ in arrangements of the atoms in space.



The difference in odor between caraway seeds and mint leaves arises from two stereoisomers of carvone due to different arrangement of atoms at the carbon (*)

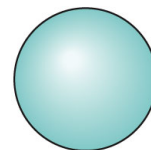
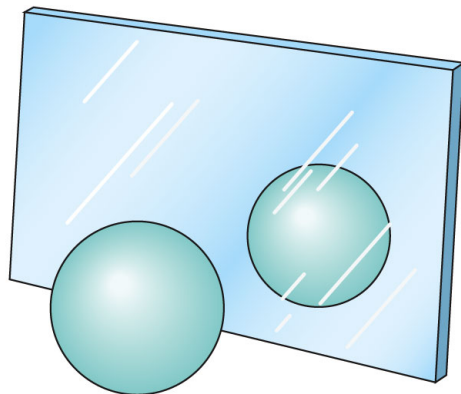
Mirror-image relationship of chiral and achiral objects

The mirror image of a left hand is not a left hand, but a right hand.

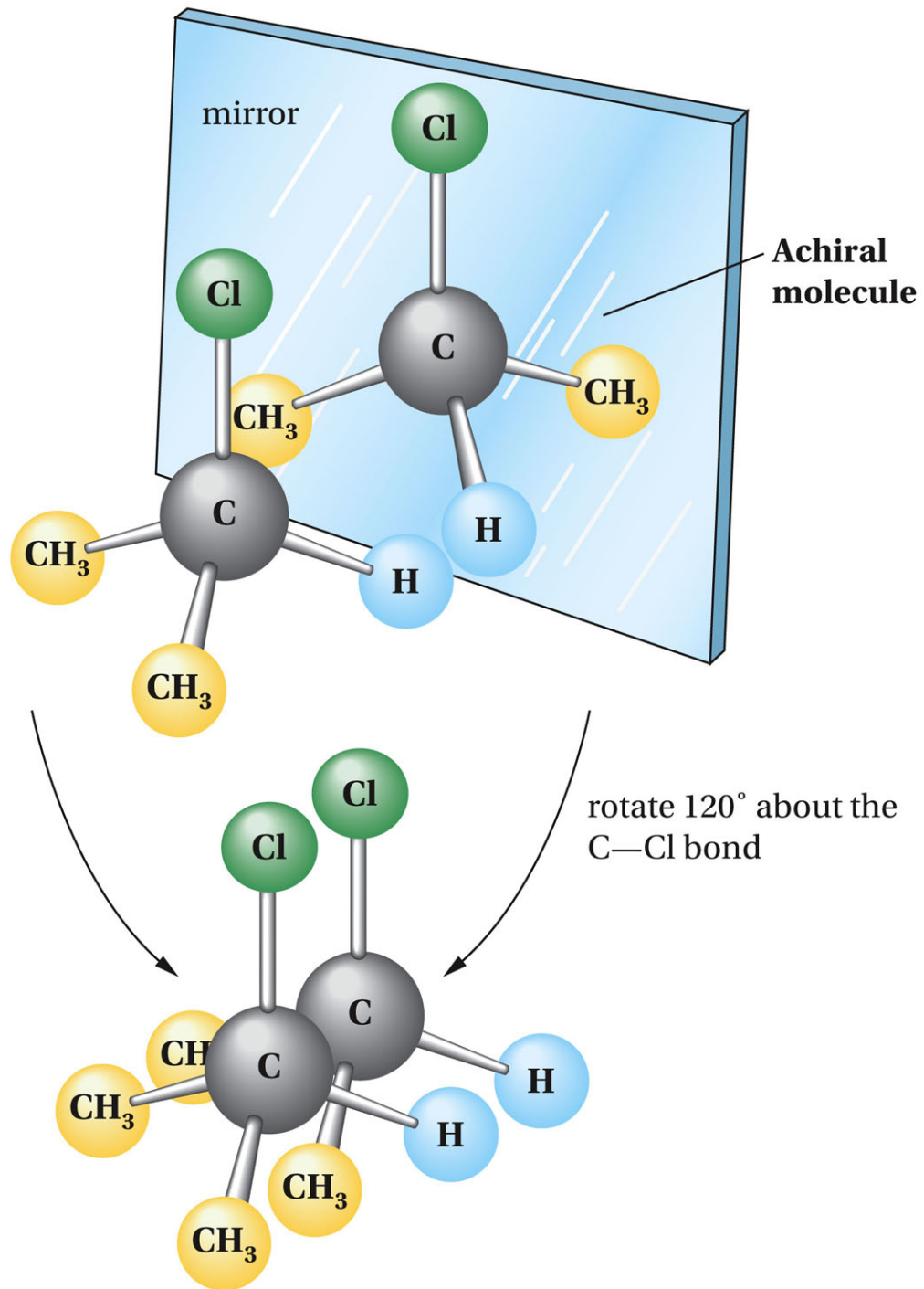


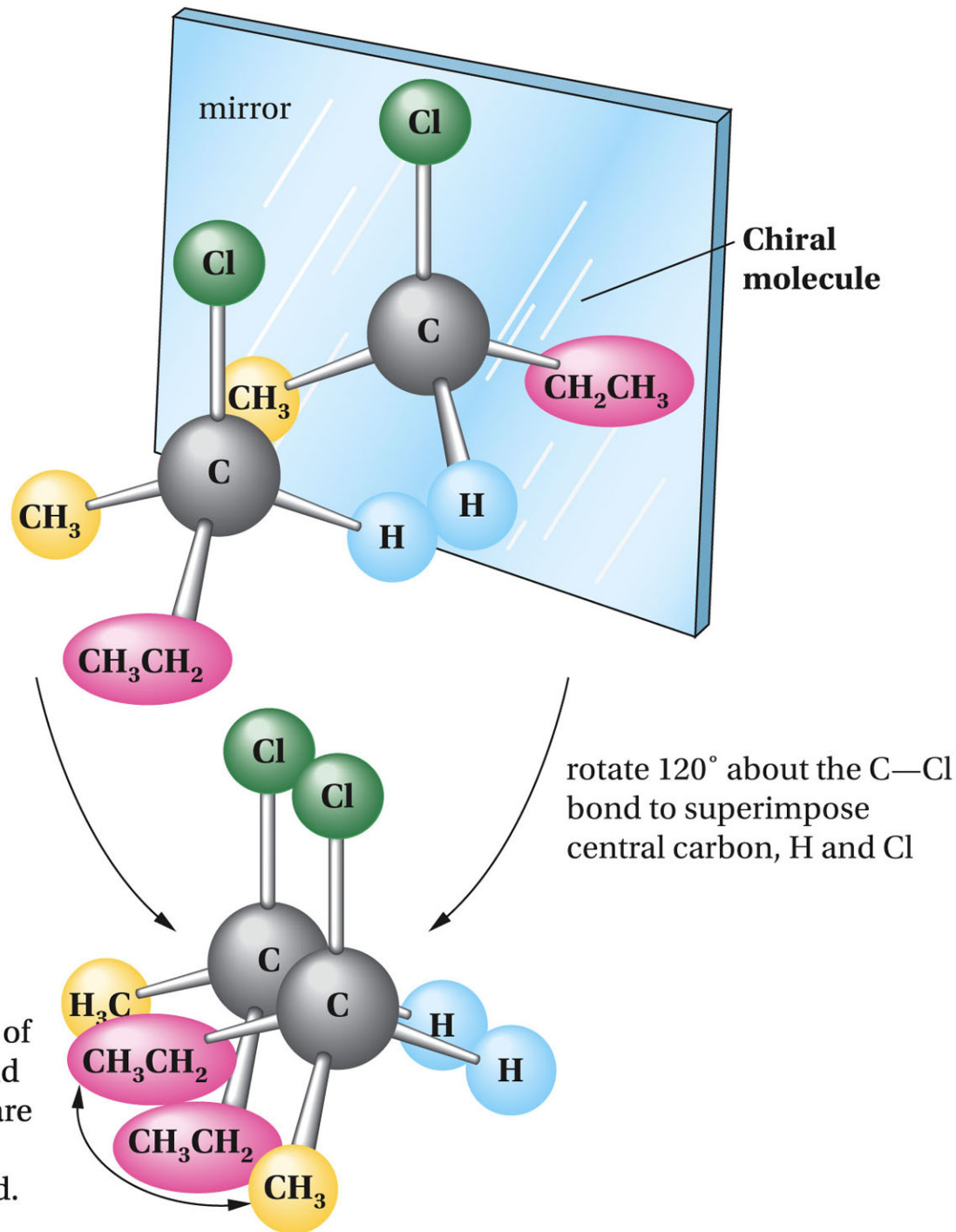
Chiral object

The mirror image of a ball is identical with the object itself.



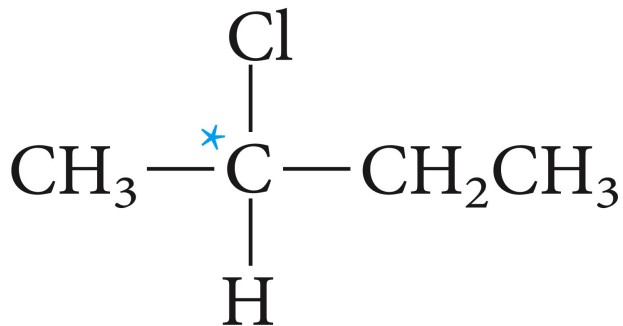
Achiral object



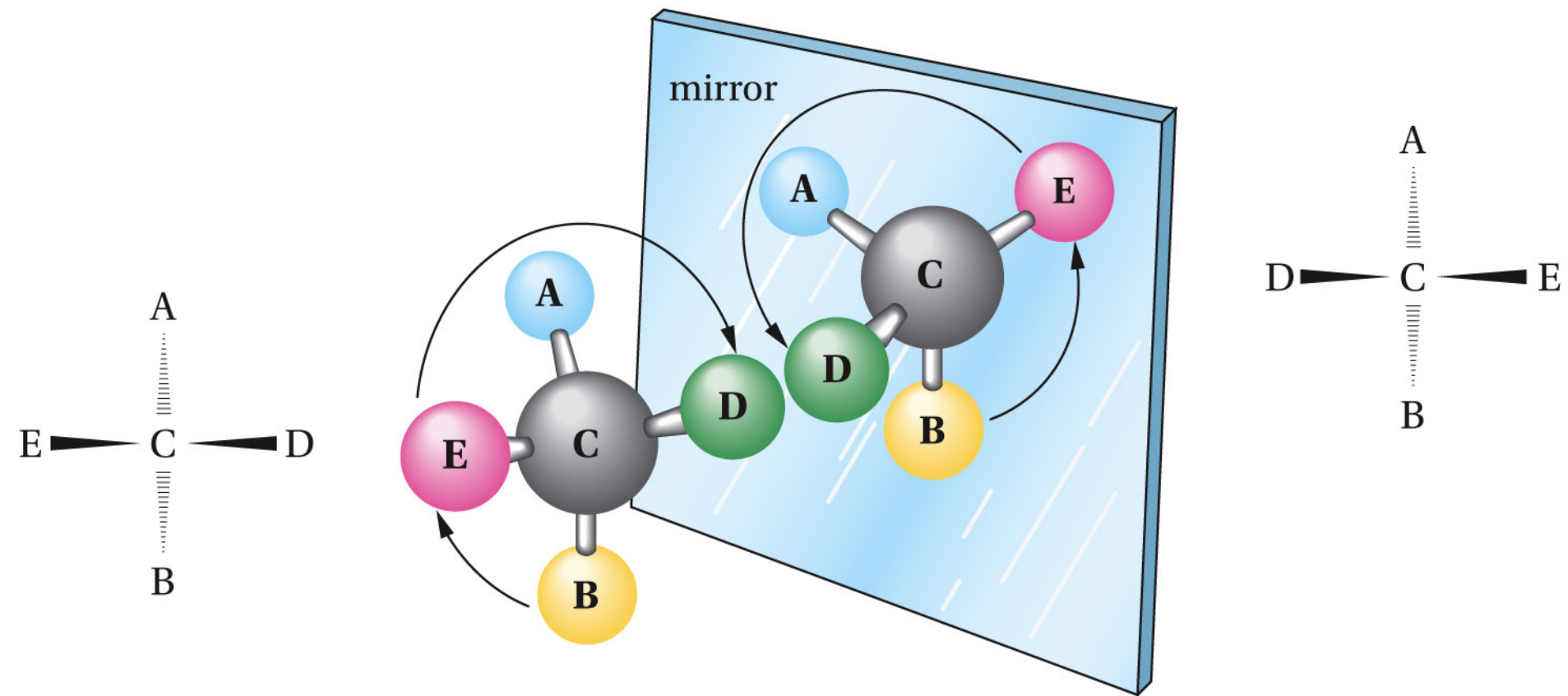


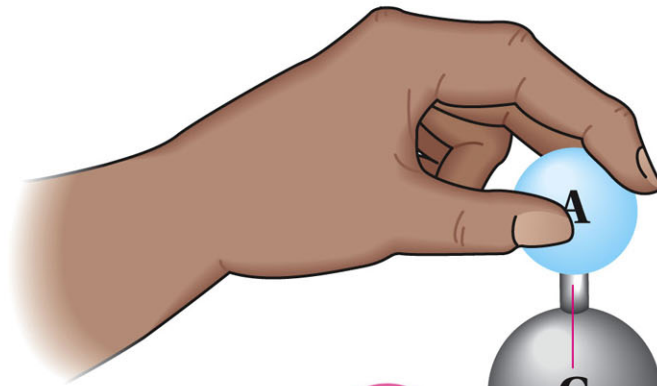
The positions of the methyl and ethyl groups are *not* superimposed.

Stereogenic Centers: the Stereogenic Carbon Atom

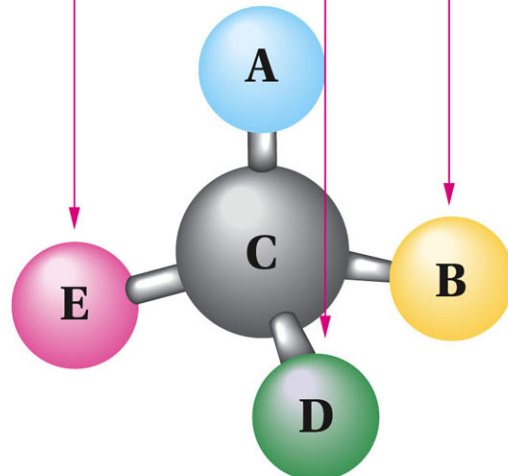
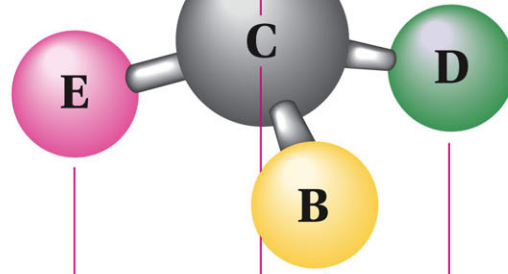


Carbon atoms with four different groups attached to them are called stereogenic carbon atoms (also called chiral carbon)

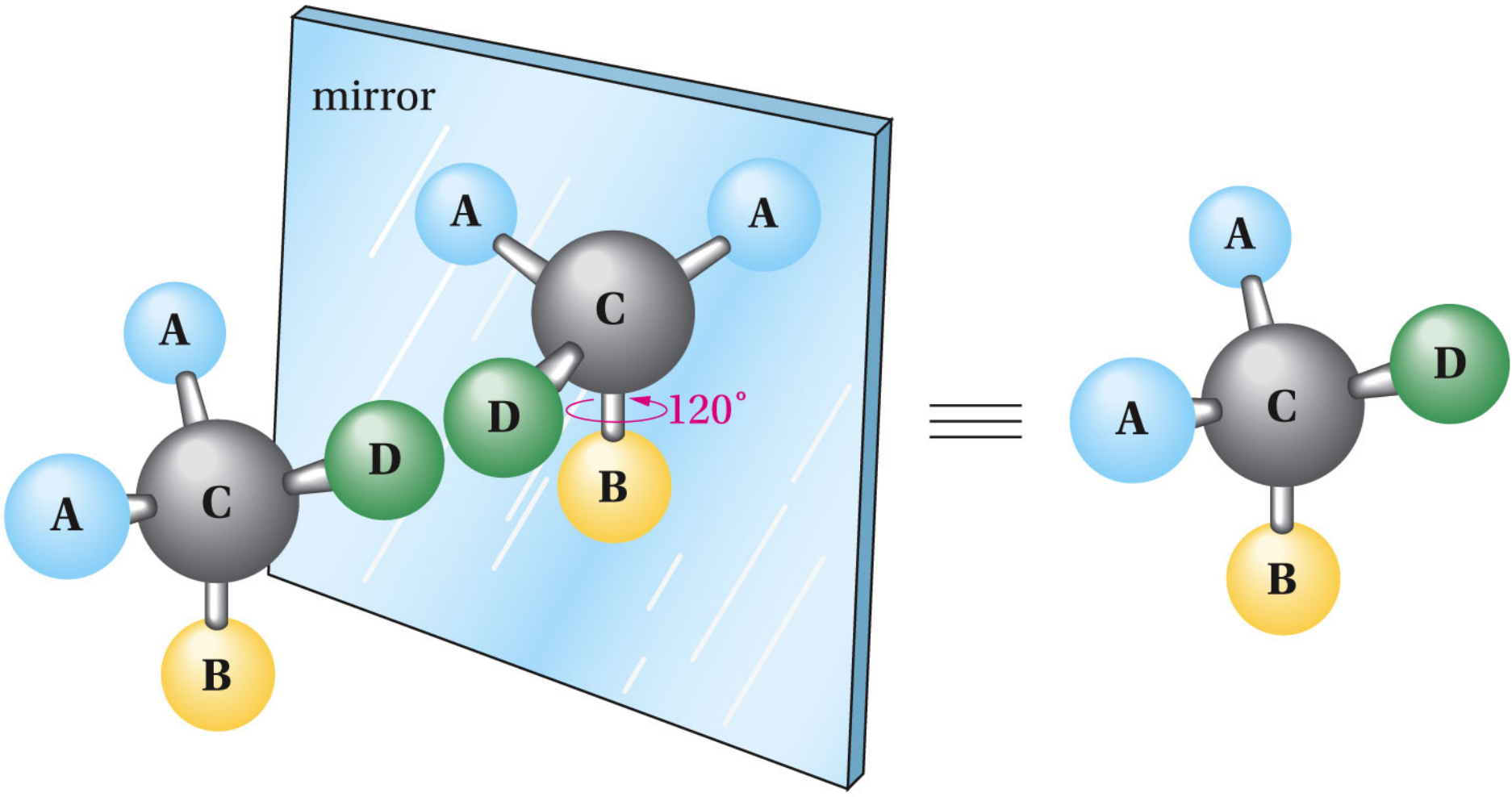


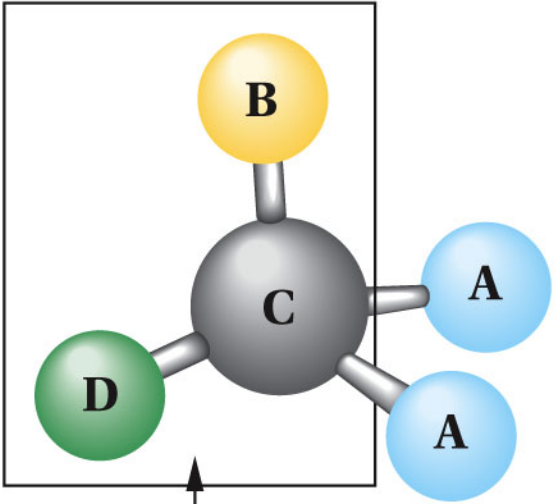


molecule in the
mirror in Figure 5.4

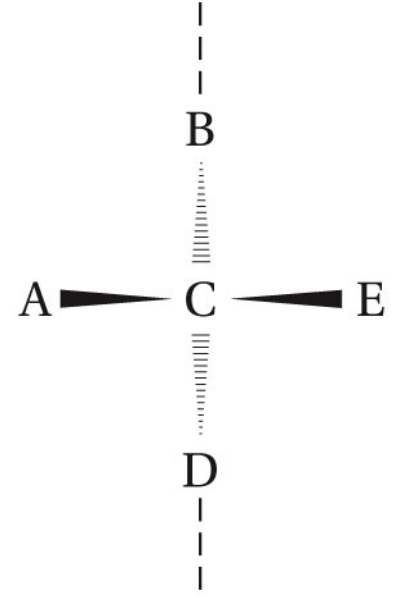
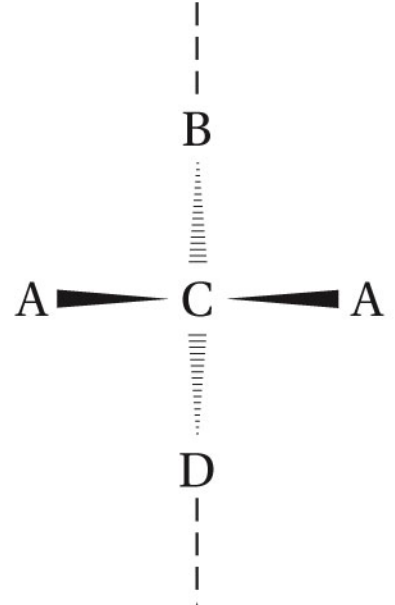


molecule to left of mirror
in Figure 5.4





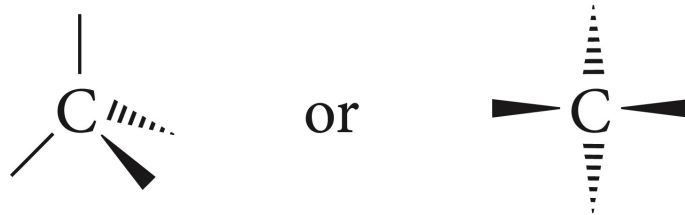
≡

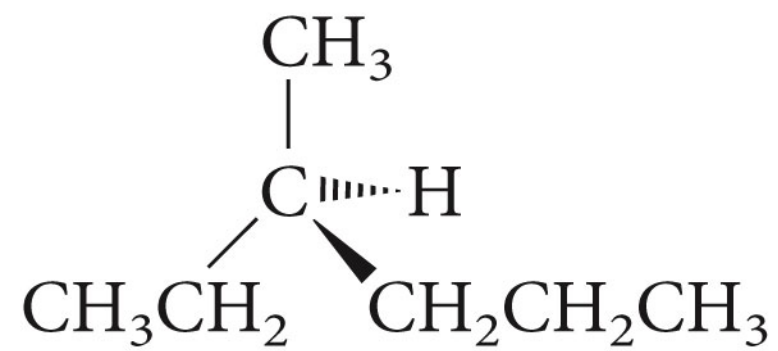


plane of symmetry
(achiral)
[molecule C(A₂BD)
from Fig. 5.6]

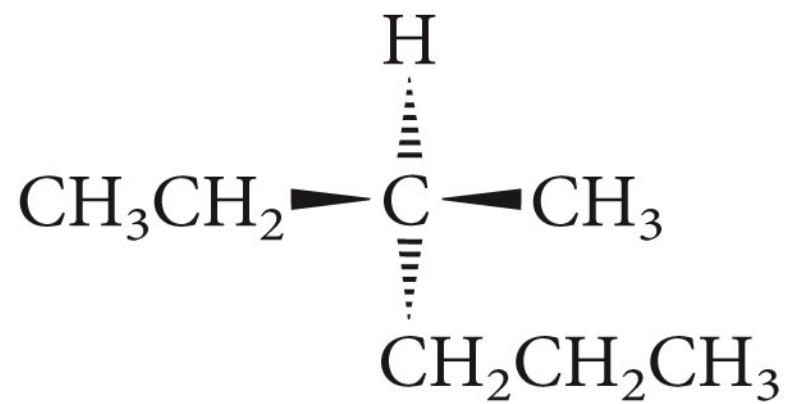
not a plane of symmetry
(chiral)
[molecule C(ABDE)
from Fig. 5.4]

Locate the stereogenic center in 3-methylhexane and draw the two enantiomers of 3-methylhexane.

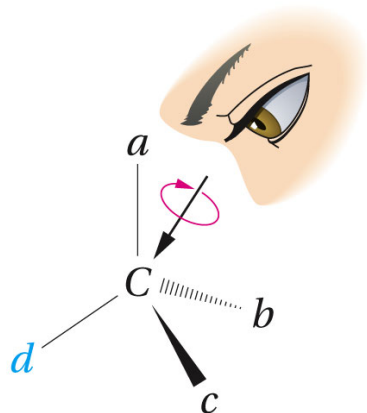




or

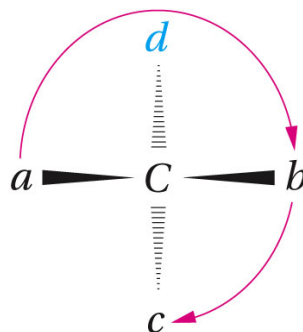


Configuration and the R-S Convention

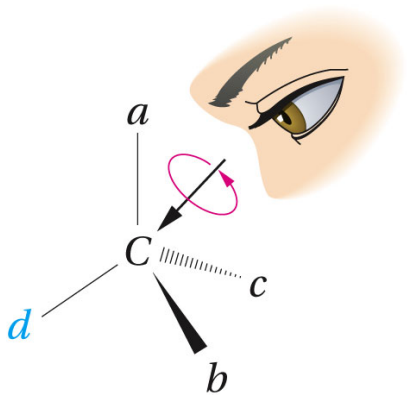


$a \rightarrow b \rightarrow c$ clockwise
 R

or

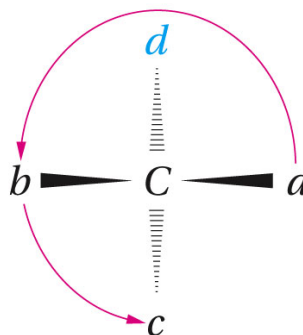


$a \rightarrow b \rightarrow c$ clockwise
 R



$a \rightarrow b \rightarrow c$ counterclockwise
 S

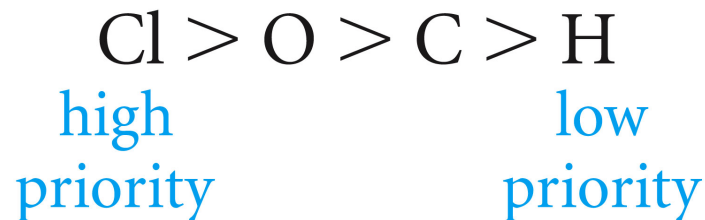
or



$a \rightarrow b \rightarrow c$ counterclockwise
 S

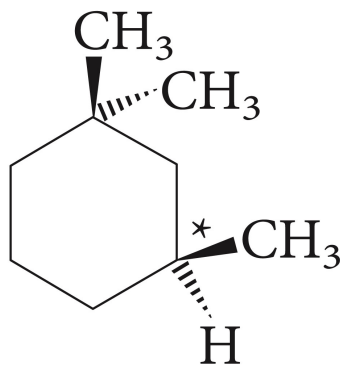
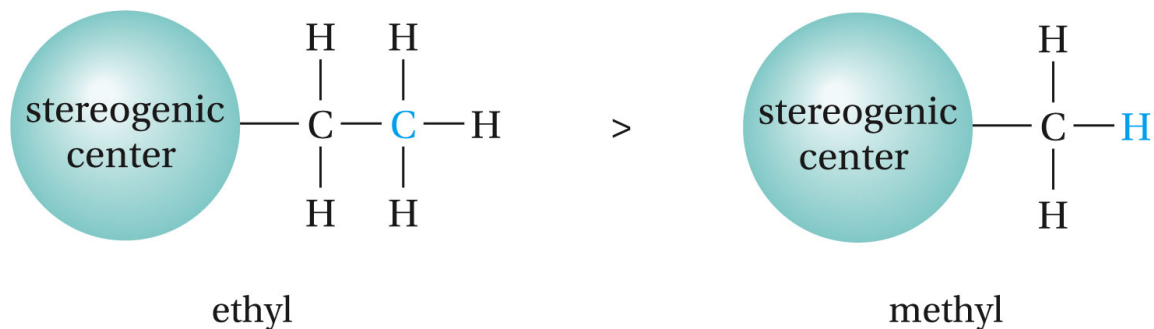
Rule 1

The atoms directly attached to the stereogenic center are ranked according to atomic number. The higher the atomic number, the higher the priority



Rule 2

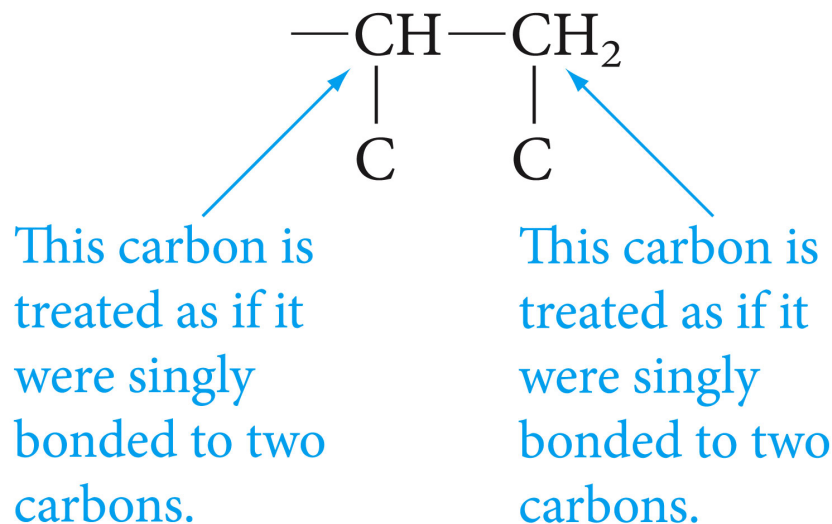
If a decision cannot be reached with rule 1, work outward from the stereogenic center until a decision is made. Example of ethyl and methyl below.

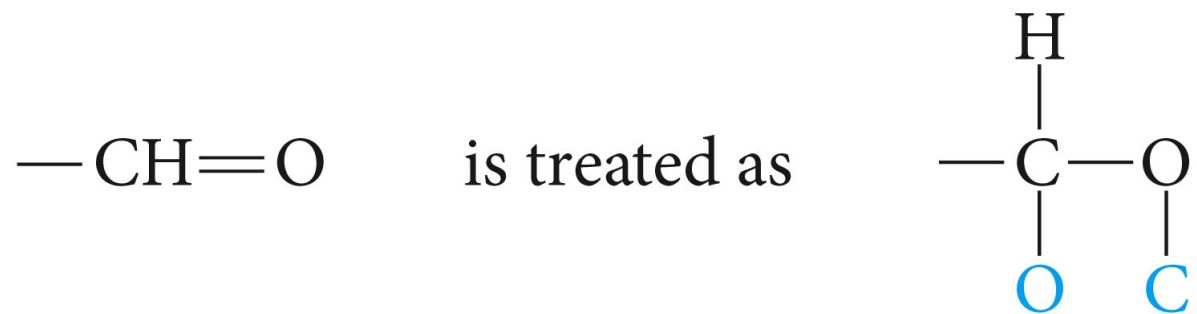
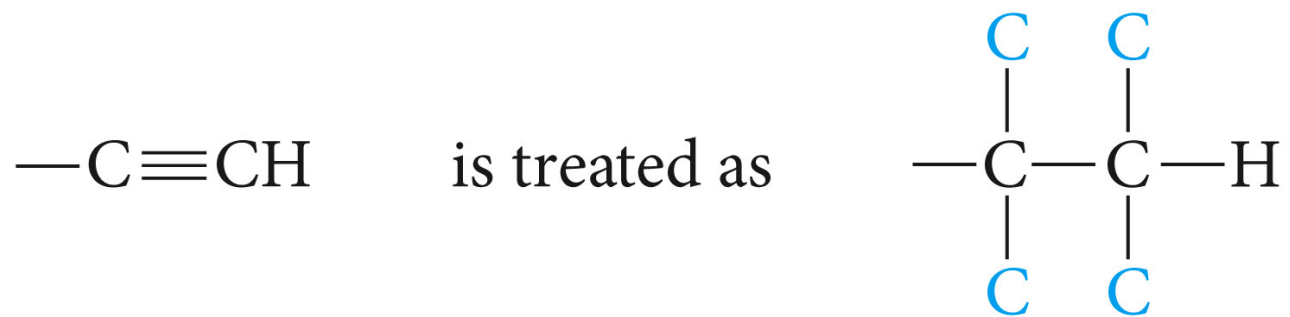


1,1,3-trimethylcyclohexane

Rule 3

Multiple bonds are treated as if they were an equal number of single bonds.





Which group has the higher priority, isopropyl or vinyl?



Assign the configuration (R or S) to the following enantiomer of 3-methyl-hexane

