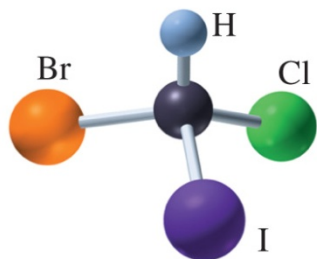
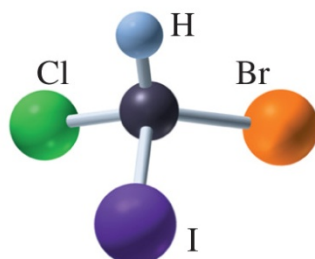


Chiral Molecules

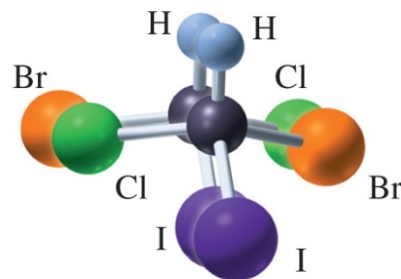
Are these two molecules with the formula CHBrClI , identical (what do we mean by identical)?



(a)



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(b)

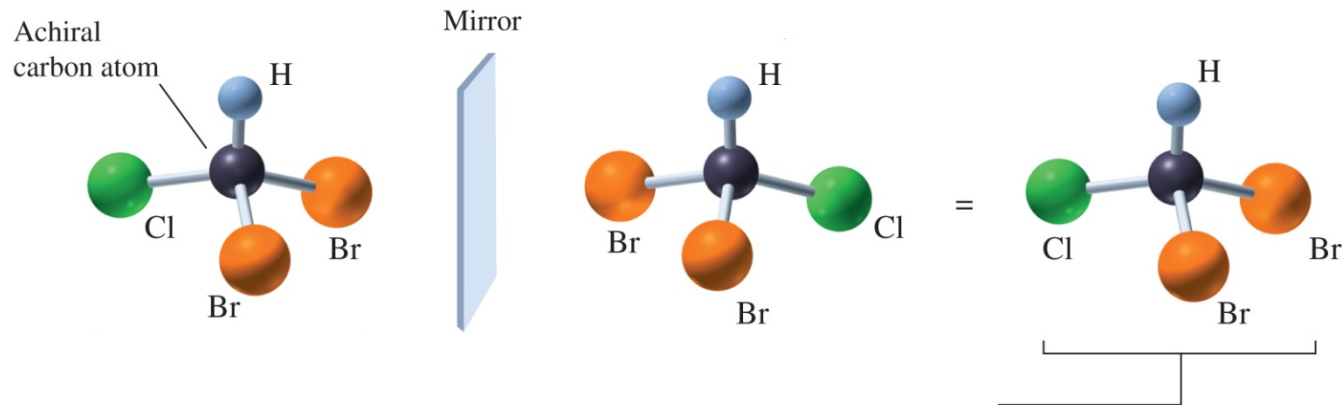
superimpose the two objects

Are these two hands identical ?



What is one criterion used to identify identical objects?

Are these two views, views of the same molecule or of different molecules?



These are the same structures.
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Whenever we have a chiral carbon (a carbon atom with 4 (not 3 or 2) different substituents) we have the possibility of having two molecules with identical groups that only differ in the arrangement of these groups in space; these molecules are different although most physical and chemical properties of the two forms called enantiomers are identical

These two forms or enantiomers do behave differently only when they encounter another chiral object. Enantiomers are also often called optical isomers because light often used to identify and to differentiate between them.

Some Everyday Chiral and Achiral Objects

Chiral objects are objects not superimposable on their mirror image

Achiral objects are objects that are superimposable on their mirror image



Chiral



Golf club, chiral

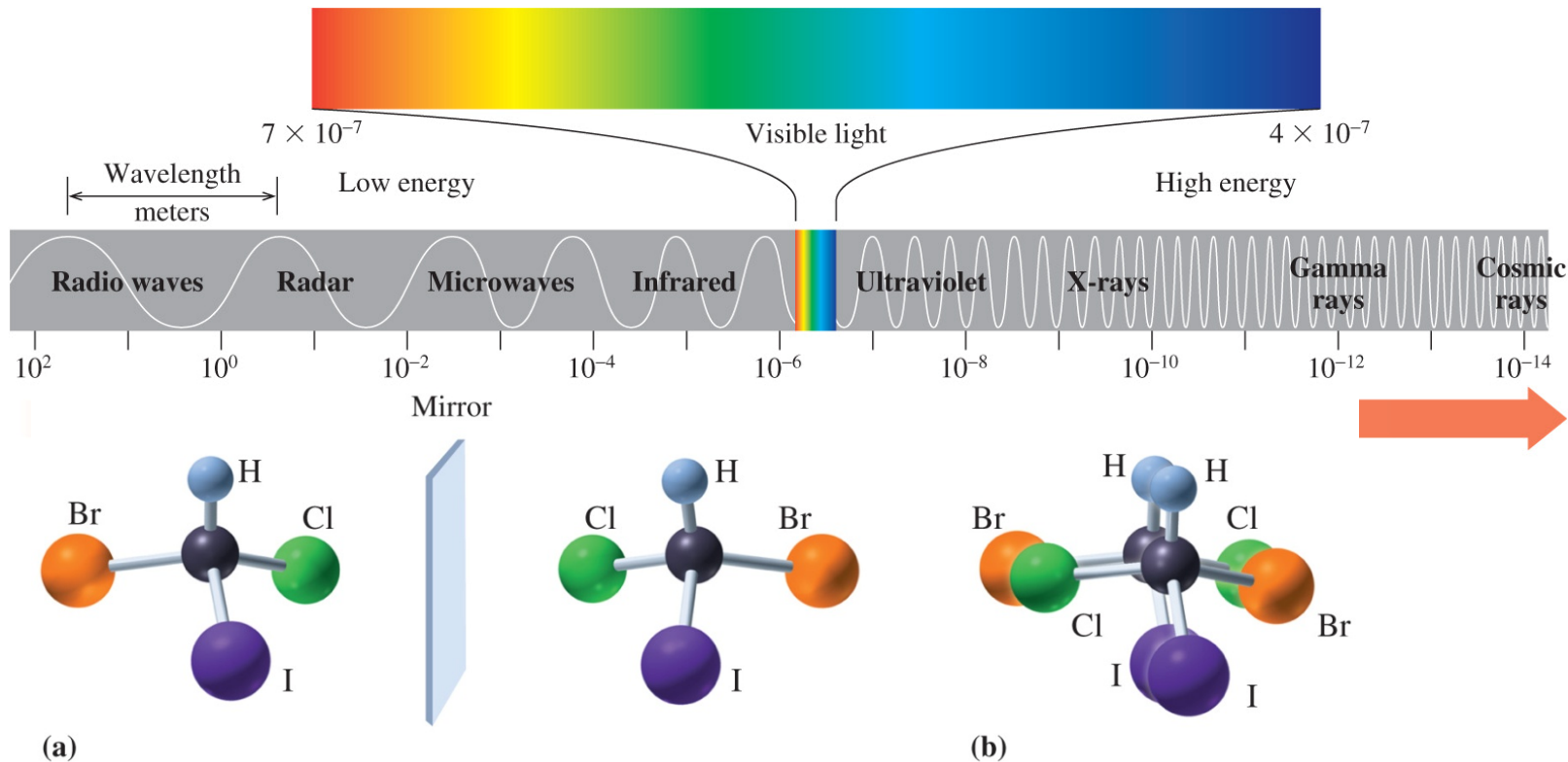


Achiral



Chiral

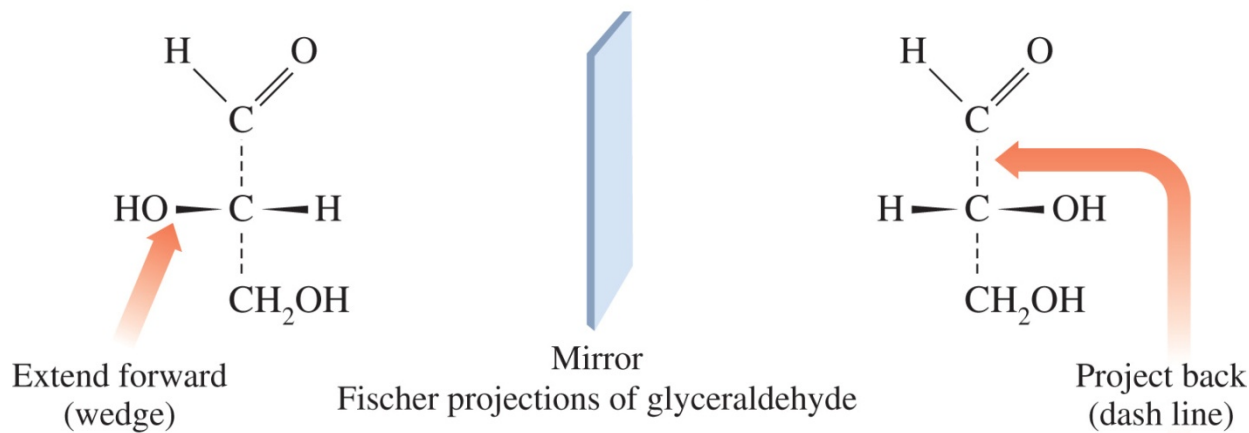
Your left hand/foot could differentiate between a left and right handed glove/shoe. A person could easily differentiate between a golf club for a right or left handed golfer, but not the glass shown on the lower left.



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One form rotates the plane of polarization in one direction; the other in the opposite direction. The symbol (+) or (d) are used for clockwise rotation, (-) or (l) for counterclockwise rotation.

Dash-wedge structures of glyceraldehyde

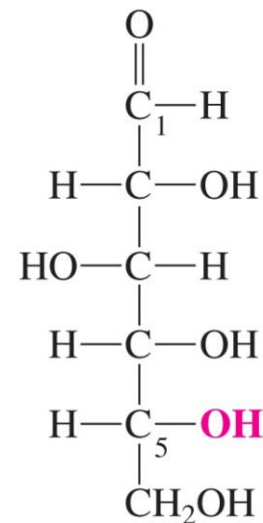


L-2,3-dihydroxypropanal

L-Glyceraldehyde

D-2,3-dihydroxypropanal

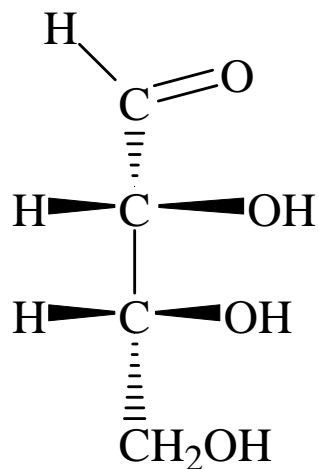
D-Glyceraldehyde



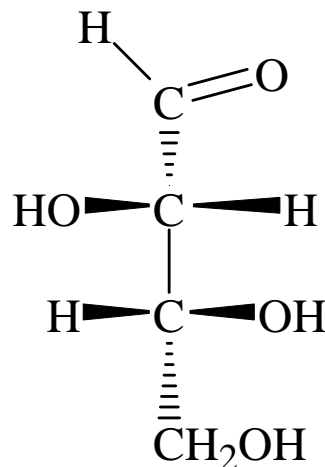
D- Glucose

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D and L have a different meaning from (d) and (l); the former deals with the absolute orientation of the groups in space and the latter with the clockwise or counterclockwise rotation of the plane of polarized light. Most sugars have the D orientation.



D-erythrose



D-Threose

stereoisomers: Isomers which differ only in how the groups are orientated in space

chiral carbon: a carbon with 4 different substituents

What do you think is the relationship between these two structures?

Are they the same?

Are they different?

If they are different, are they mirror image isomers or just different?

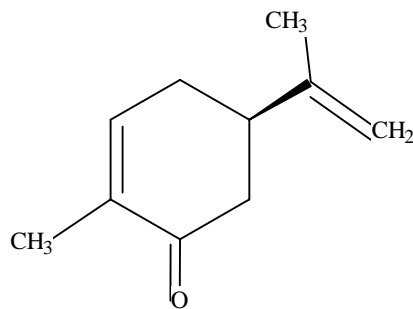
Are they both D isomers?

How many chiral carbon atoms are there?

2

What is the maximum number of stereoisomers

$2^n = 4$

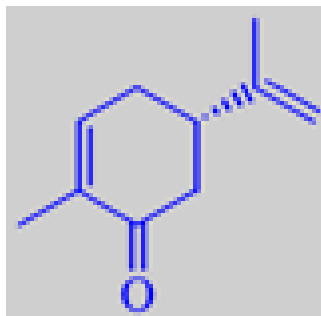


Spearmint ((*l*)-carvone)
Mentha spicata (Labiatae).
Over 10 species have been identified, all natives of Eurasia. They are fast-growing perennial herbs with strongly odoriferous essential oils.

Identify the chiral carbon



In Europe, the main producers of caraway seeds are Poland and Hungary. The aromatic seeds are used as a spice in bread, cheese and Sauerkraut. In Denmark, the traditional dram 'Roed Aalborg' has a caraway flavour, originally used to hide the off-flavour of the raw spirits.



(+)-Carvone and (+)-limonene are the major ingredients of caraway essential oil.