Stereochemistry Assignment

2/7/2014

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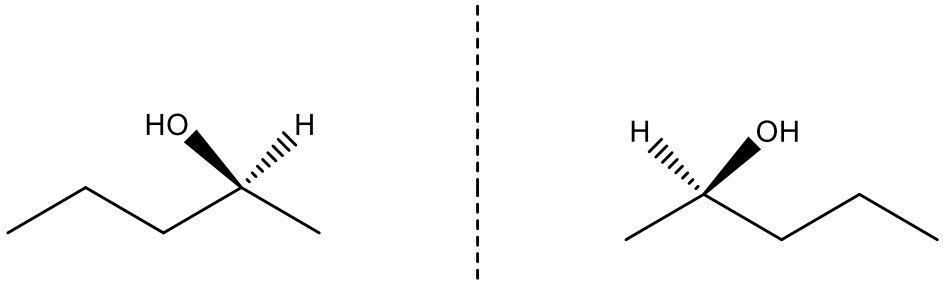
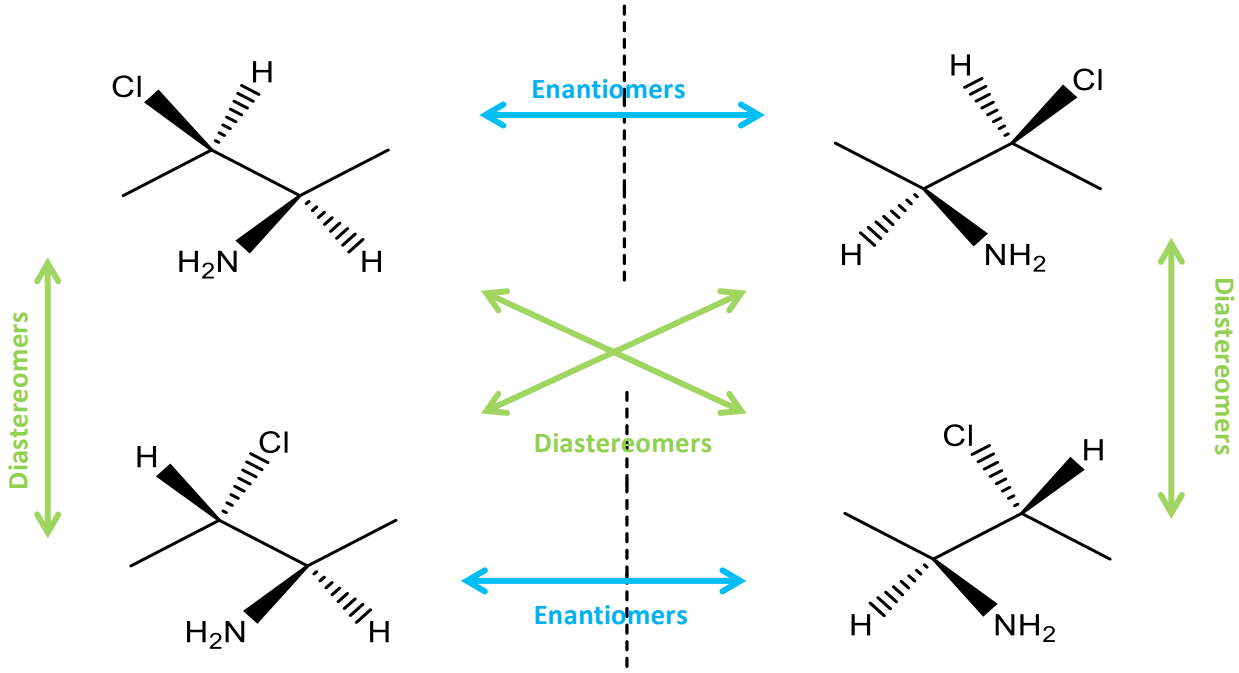
a) $CH_3CH_2CH_2CH(OH)CO_3$



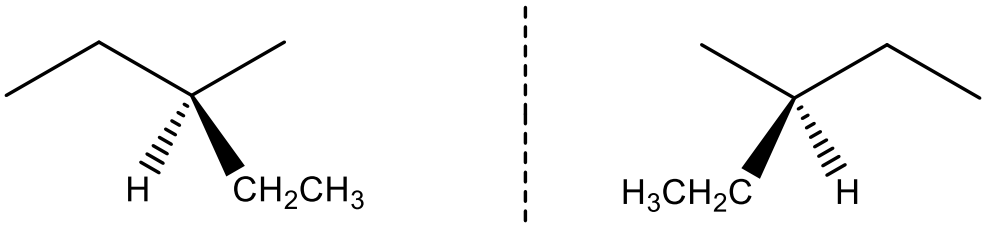
There is one chiral center on this molecule. The molecules are not superimposable mirror images, therefore they are enantiomers.

b) $CH_3CClHCH(NH_2)CH_3$



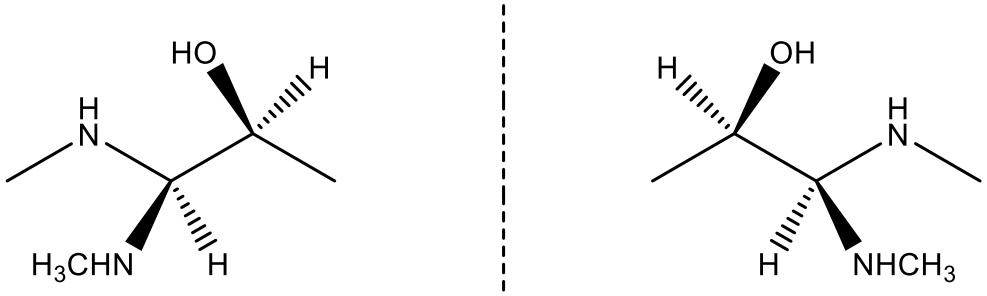
The first molecule and its mirror image are not superimposable so they're enantiomers. The two stereoisomers drawn under are also enantiomers to each other. Other than those two pairs, all the molecules are diastereomers of each other, which means they are not mirror images of each other and therefore not enantiomers because they have different 3D configurations in space.

c) $CH_3CH_2CH(CH_2CH_3)CH_3$



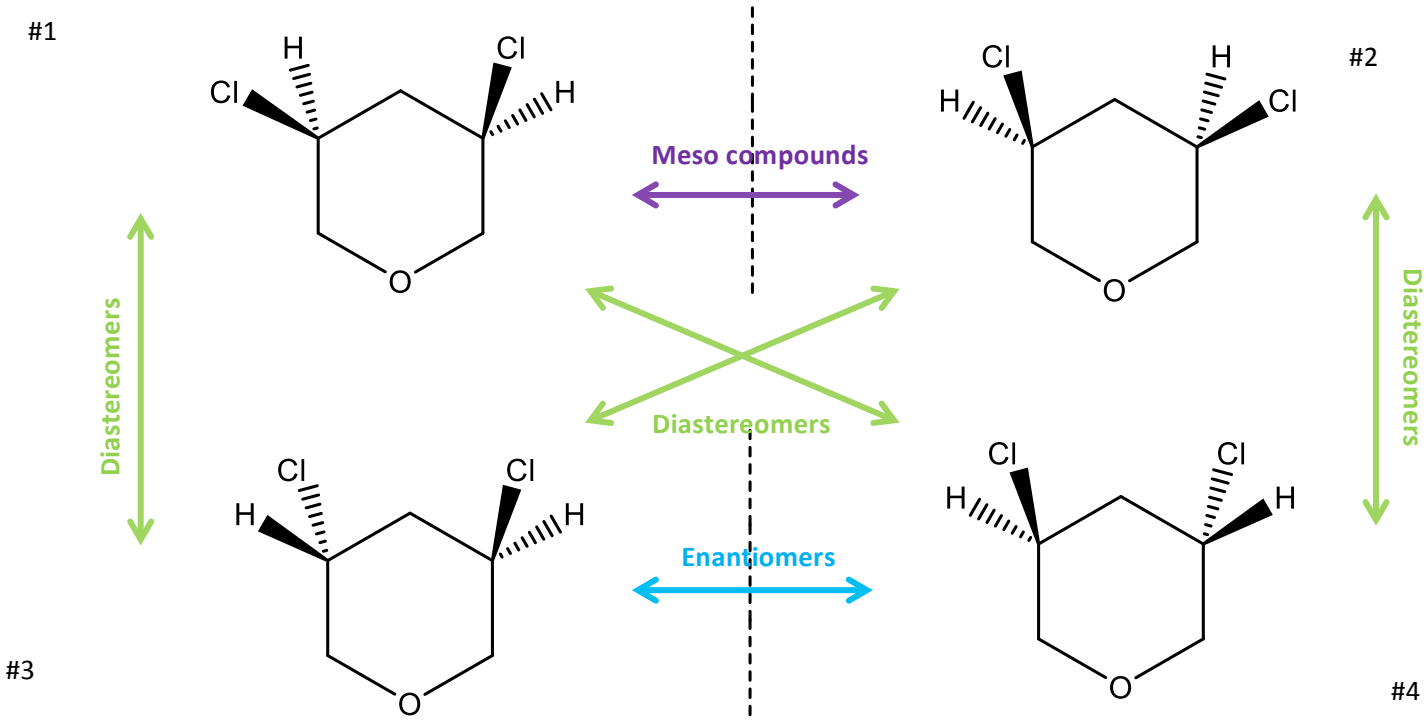
There is no chirality center in this molecule and the images are superposable to each other. Thus, these molecules are not enantiomers, they are achiral (they are the same molecule).

d) $CH_3NHCH(NHCH_3)CHOHCH_3$



There is one chiral center on this molecule, they are not superposable so they are enantiomers.

e)

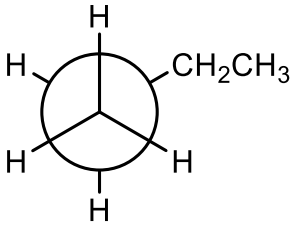


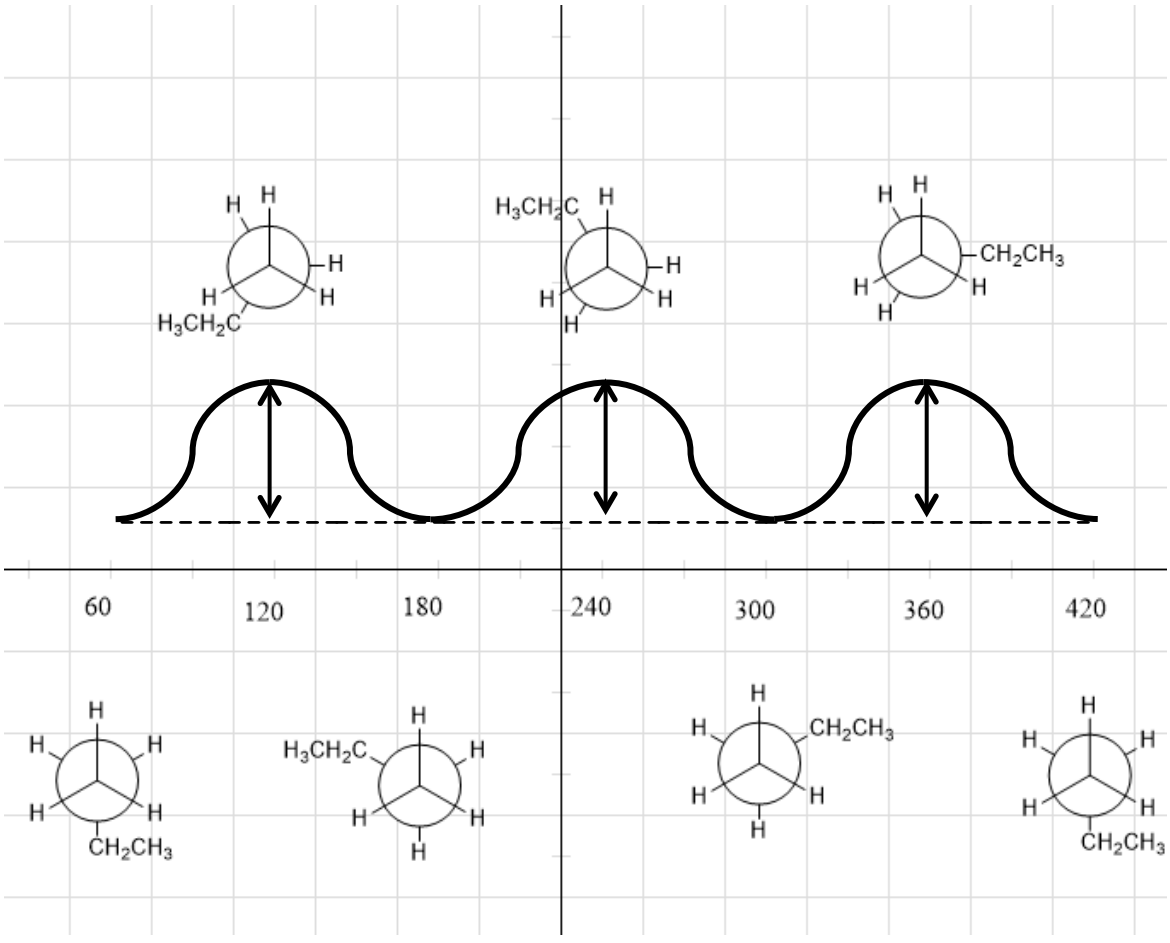
The first molecule and its mirror image are superposable; in fact they are the same molecule. Because there are two chiral centers on the molecule, we refer to them as meso compounds.

The third molecule is a diastereomer of the first and second one, because the first Cl is now in the back and the H is in the front, but the other chiral center remains unchanged.

The fourth molecule is the mirror image of the third molecule, and they are non superposable so they are enantiomers. The fourth molecule is also a diastereomer of the first molecule, as well as of the second one.

N-butane:

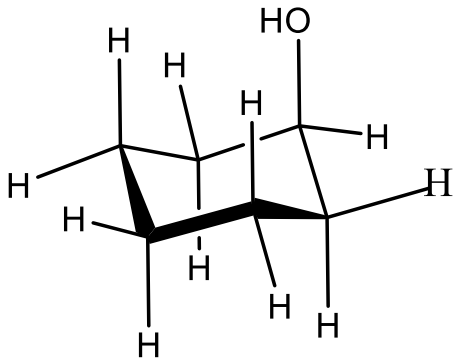




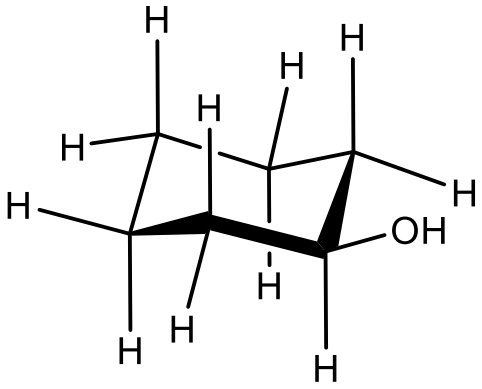
There is only one stable conformation, it's the staggered conformation. The most stable conformations are therefore all the different staggered conformations, which have no energy difference between each other.

Cyclohexanol:

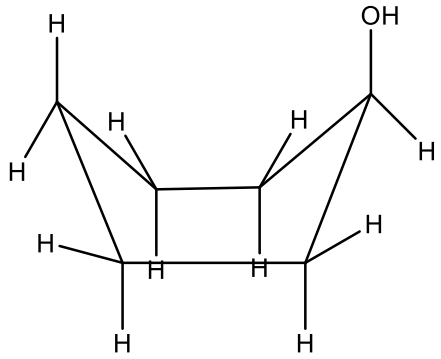
2)



4)

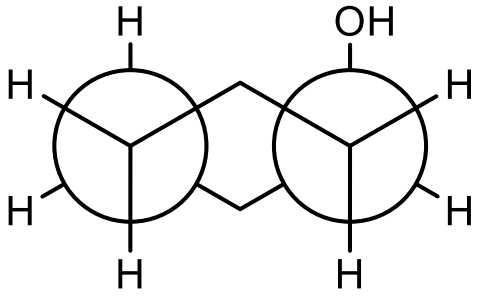


7)

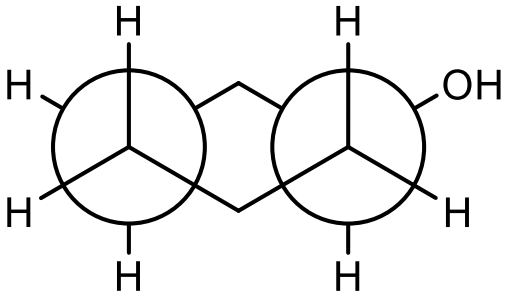


8) Yes, it can be converted into a twist-boat.

9)



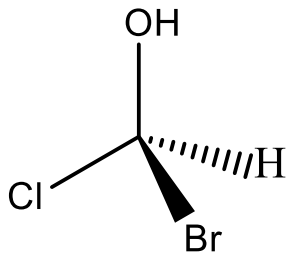
10) Flipped:



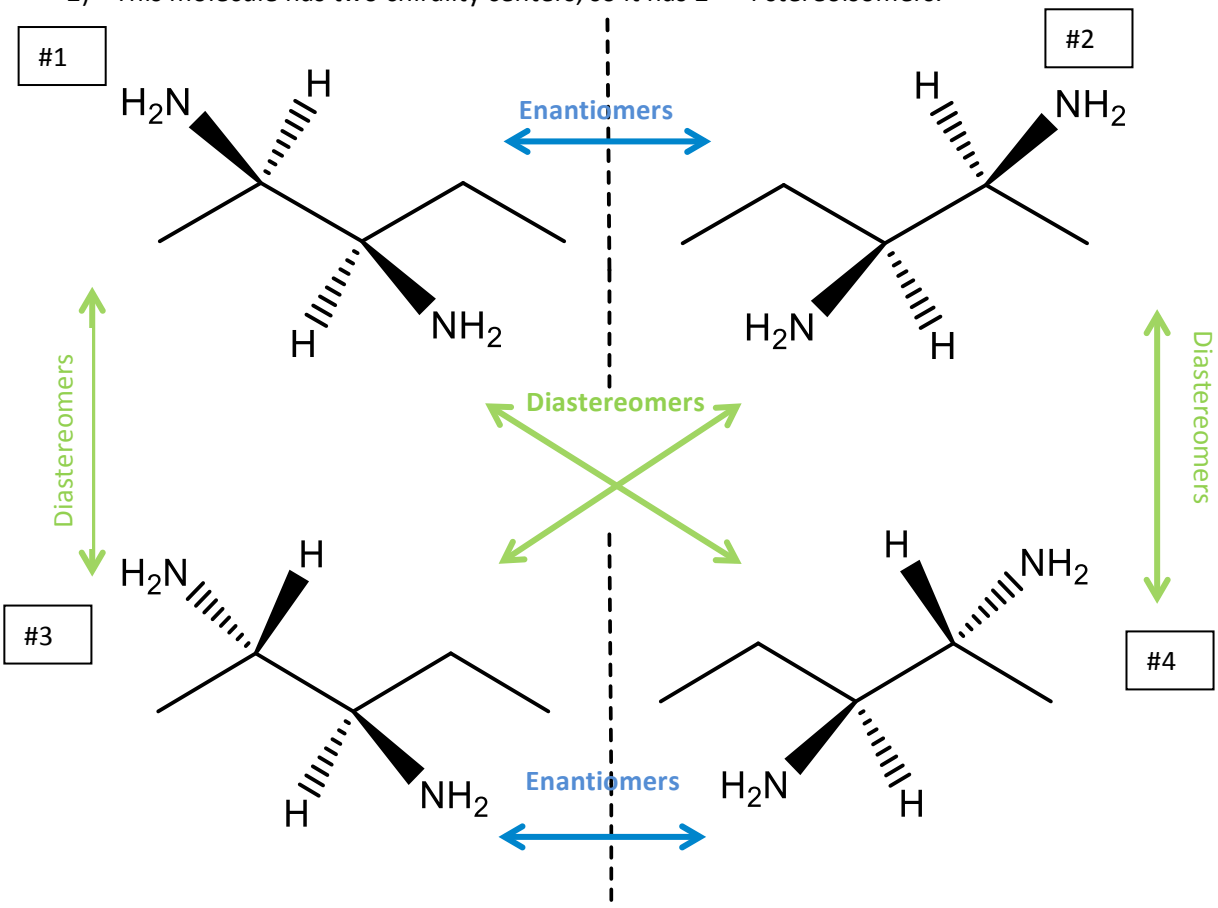
The difference between these two Newman projections is the difference in angle. In the first one, the OH group is axial but on the second it's equatorial. Molecules with equatorial substituents are preferred, so the second one is a better conformer.

Questions

1)



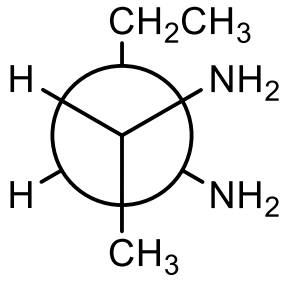
2) This molecule has two chirality centers, so it has $2^2 = 4$ stereoisomers.



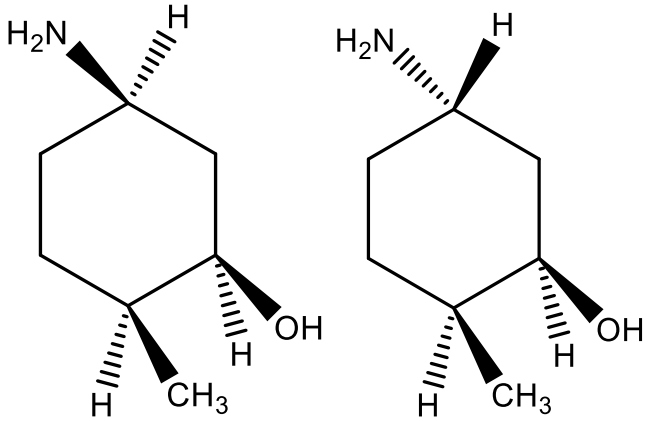
The initial molecule (#1) has two chirality centers.

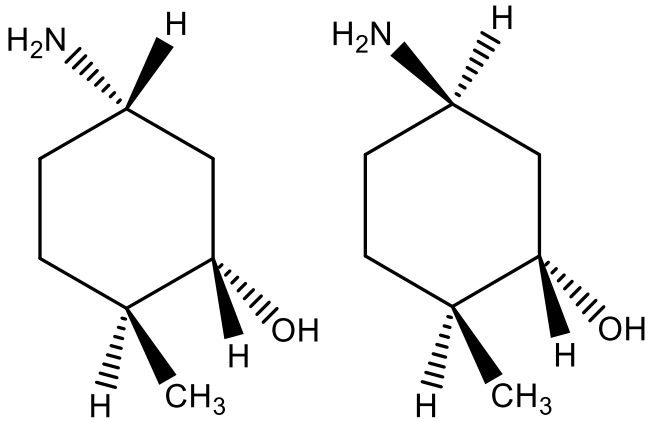
#1 and #2 are mirror images that are non-superimposable so they are enantiomers.

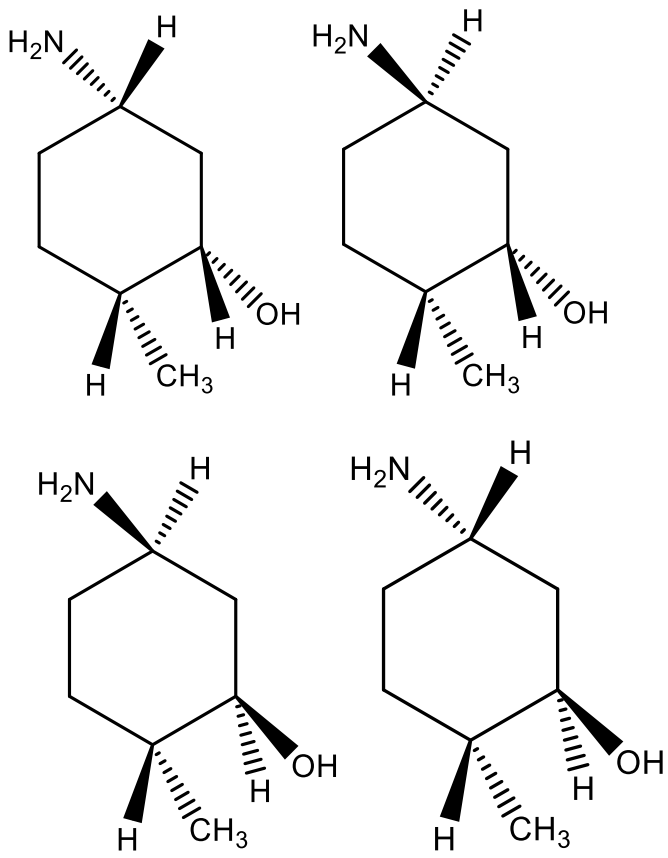
#3 and #4 are diastereomers of the first molecule, because they are not mirror images or superimposable. However, they are enantiomers to each other, because they are non superposable mirror images.



3) This molecule has three chirality centers, so there are 2^3=8 isomers possible:






H2N
H
OH
H
H
CH3
H2N
H
OH
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CH3
H2N
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OH
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