CHM1321: Organic Chemistry I
Experiment 2: Stereochemistry

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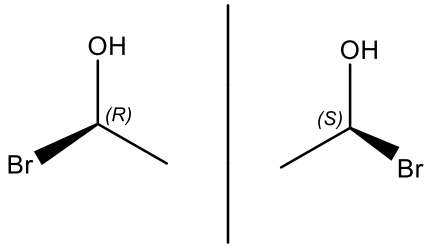
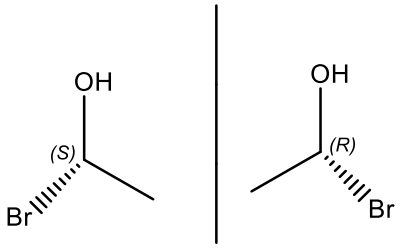
Enantiomers and Diastereomers

1. BrCH(OH)CH3



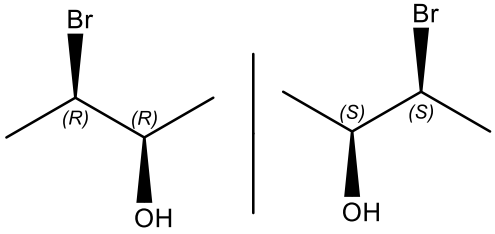
This molecule is an enantiomer because is cannot be superimposed. The chirality of the carbon in the original image is called (R). This is because the first-priority group, through the second, to the third is made in a clockwise direction. In the mirror image, the carbon is called (S), since the direction of priority goes counterclockwise. The priority of the groups would be in the order of : 1) Br 2) OH

3) $CHCH_3$

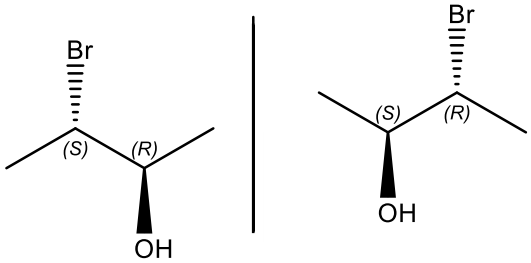


This molecule cannot be superimposed therefore it is a enantiomer. The chiral carbon of the original image is called (S), since the direction of the priority points counterclockwise. The mirror image, the chiral carbon is called (R). This is because the priority points clockwise. Since they are stereoisomers, this compound has the same sequence of priority groups as the compound drawn above.

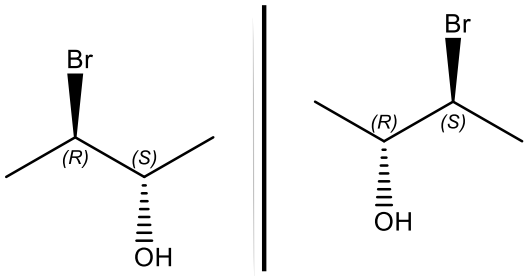
2. CH3CH(Br)CH(OH)CH3



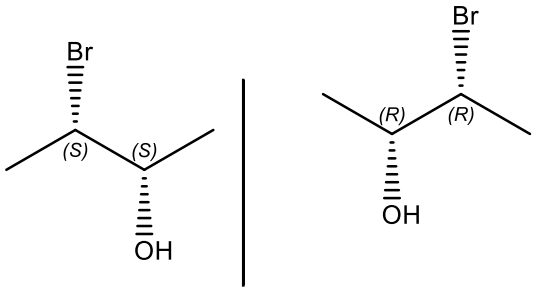
This molecule cannot be superimposed therefore it is a enantiomer. On each molecule there are two chiral carbons, called (R). This is because the first-priority group, through the second, to the third is pointed in a clockwise direction. Both chiral carbons in this molecule are called (R). The first chiral carbon priority is as follows:1)Br 2)CH 3)CH(OH) 4)H. In the mirror image, both chiral atoms are called (S). The second chiral carbon has the priority as follows; 1)OH 2) $CH_3CH(Br)CH(OH)$ 3)CH_3 4)H. In the mirror image, both chiral atoms are called (S). This is because the directions of the priority are directed counterclockwise.



This molecule cannot be superimposed therefore it is a enantiomer. There are 2 chiral carbon on the original image, the first, is called (S), since the direction of the priority points counterclockwise. The other the chiral carbon is called (R). This is because the priority points clockwise. In the mirror image, the direction of the priority groups point clockwise on the higher chiral carbon, therefore it is called (R). The lower chiral carbon is called (S) since this direction now points counterclockwise. Because their stereoisomers they contain the same sequence of priotity groups as the compounds above.

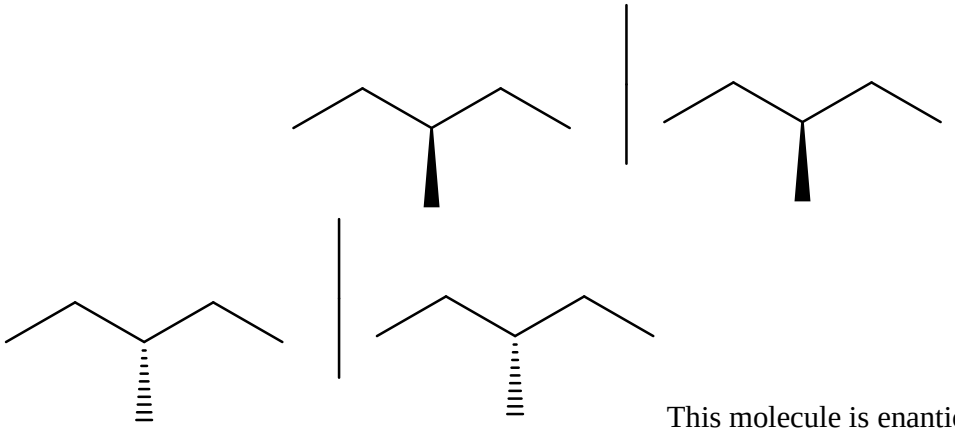


This molecule cannot be superimposed therefore it is a enantiomer. There are 2 chiral carbon on the original image, the first, is called (R), since the direction of the priority points clockwise. The other the chiral carbon is called (S). This is because the priority points counterclockwise. Since they are stereoisomers, this compound has the same sequence of priority groups as the compound drawn above. In the mirror image, the direction of the priority groups point clockwise on the lower chiral carbon, therefore it is called (S). The higher chiral carbon is called (R) since this direction now points counterclockwise.



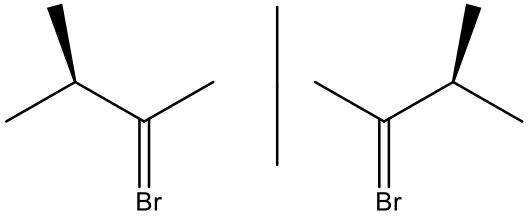
This molecule can not be superposed, therefore it is an enantiomer. There are two chiral carbons on the molecule. In the original image, it is called (S). This is because the first-priority group, through the second, to the third is pointed in a counterclockwise direction. Both chiral carbons in this molecule are called (S). In the mirror image, the direction of the priority groups point clockwise, therefore they are called (R). This is true for both chiral carbons as well. Since they are stereoisomers, this compound has the same sequence of priority groups as the compound drawn above.

3) CH3CH2CH(CH3)CH2CH3



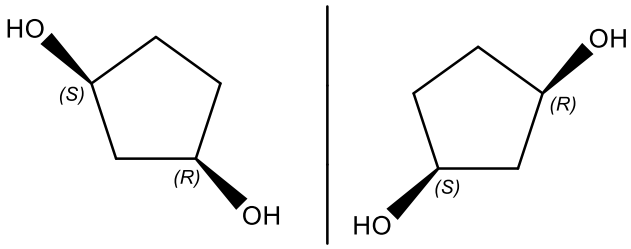
This molecule is enantiomer because it cannot be superimposed. There are two chiral carbons on the molecule. There are no stereocenters because there are no carbons in which different groups are attached.

4) CH3CH(CH3)CHBrCH3

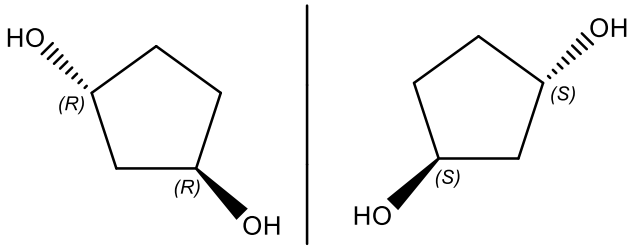


This molecule can not be superposed, therefore it is an enantiomer. There are no stereocenters because there are no carbons in which different groups are attached.

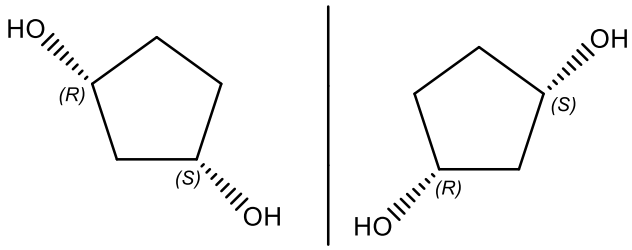
5) penta-1,3-diol



This molecule can be superimposed therefore it is not an eantiomer. Since there are two stereocenters and it is superimposable this molecule is a Meso Compound. There are 2 stereocenters in this molecule. The chiral carbon in the right side of the original image is called (R). This is because the first-priority group, through the second, to the third is made in a clockwise direction. The out most left asymmetric carbon on the original image is called (S), since the direction of priority goes counterclockwise. These names are inverted for the mirror image, since the direction of the prioritized groups are turned around. The priority for (S) is as follows: 1)OH 2)$CH_2CH(OH)CH_2$ 3) CH_2. This holds true for both stereocentres

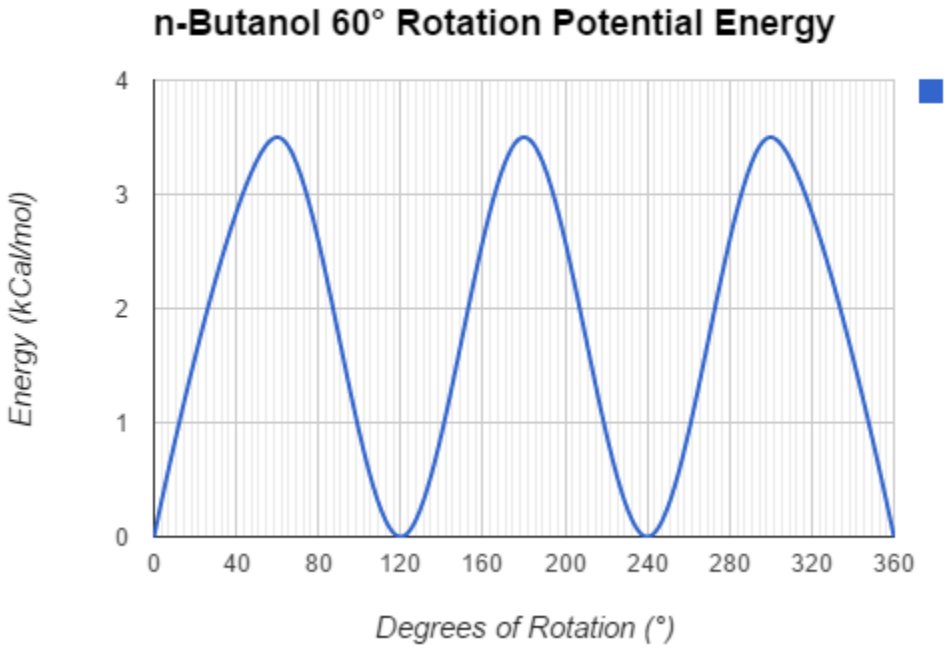


This molecule can be superposed, therefore it is not an enantiomer, but a meso compound. There are two chiral carbons in this molecule. both called (R). This is because the first-priority group, through the second, to the third is made in a clockwise direction. Both asymmetric molecules are called (R) in the mirror image, because the priority is counterclockwise. These names are inverted for the mirror image, since the direction of the prioritized groups is turned around. Since this is a stereoisomer of the above compound, the priority of groups is the same.



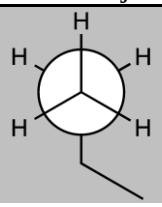
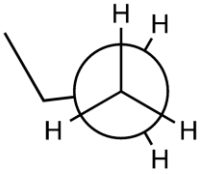
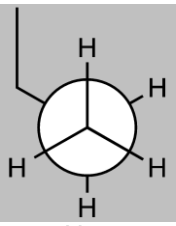
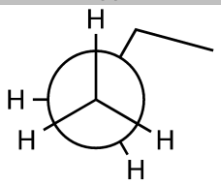
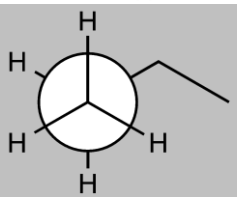
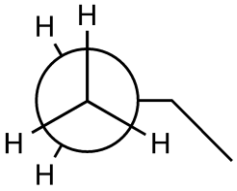
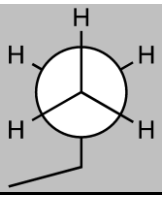
This molecule can be superposed, therefore it is not an enantiomer. There are two chiral carbons in this molecule. The out most left asymmetric carbon on the original image is called (R), since the direction of priority goes clockwise. Chiral carbon in the right side of the original image is called (S). This is because the first-priority group, through the second, to the third is made in a counterclockwise direction. These names are inverted for the mirror image, so the direction of the group priorities is turned around. This is an stereoisomer of the group above so, the priority of groups is the same.

PART 2- NEWMAN PROJECTIONS



1.

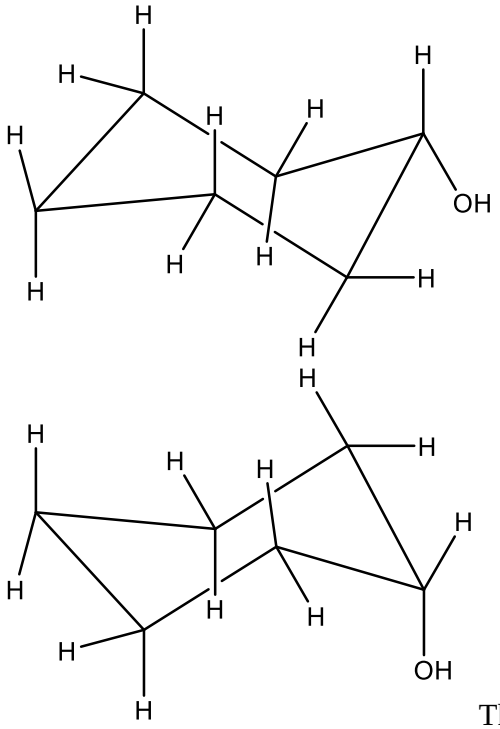
2.

Axis of Rotation	Newman Projection
0	
60	
120	
180	
240	
300	
360	

3. The amount of energy difference would have to be 0 for the two most stable conformers, because there is not just one conformer that can make a stable structure that wouldn't produce energy. The projections would be at the rotations of 120 & 300.

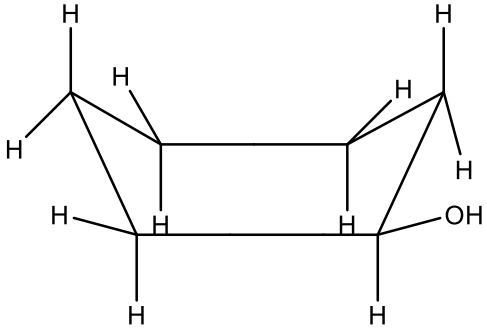
Part 3

Cyclohexanol



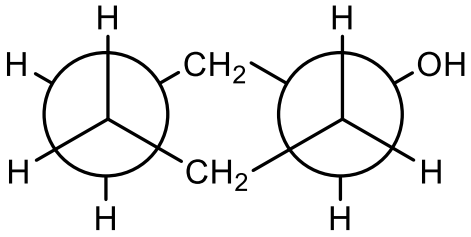
This is the most stable form of cyclohexane. The alcohol group in the equatorial position, where wont form steric interactions.

This shows the flipped chair conformation from above. Now that it has been flipped any axials and axial bonds are now equatorial and equatorial bonds. This is more unstable than the previous chair, because the alcohol group is in axial formation. This allows it to it to form a steric interaction known as the “1,3 diaxial interaction, a very unstable interaction.

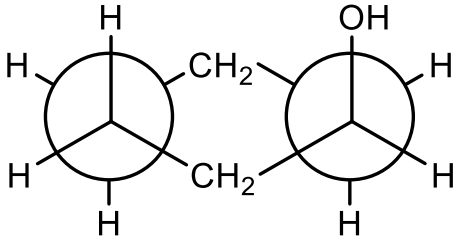


Boat Formation

Like the chair formation the boats form can be converted. This version is a stable formation. However, changing this into the other boat form will cause similar consequences to flipping a chair conformation. If the boat is flipped it causes the formation to become more unstable because the alcohol is now in an axial position.



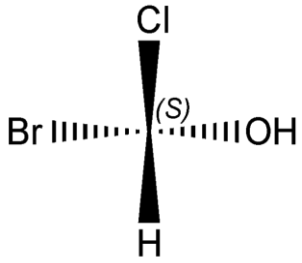
Here the alcohol group is in the axial position, with its projection to the unstable chair formation.

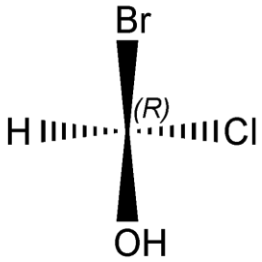


This shows the alcohol in the stable equatorial position. This is the most stable form of the chair

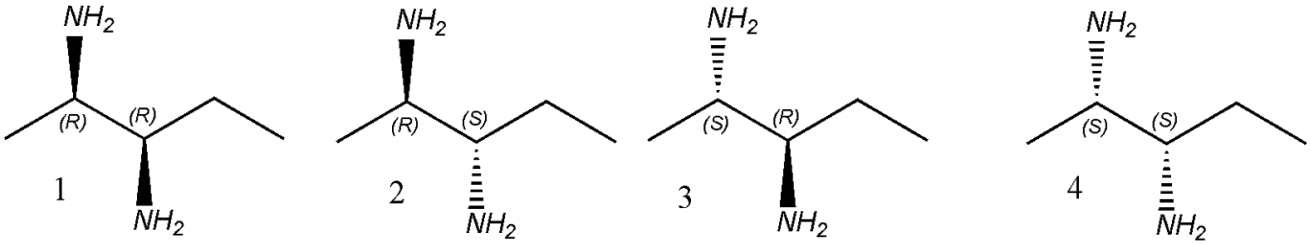
Questions

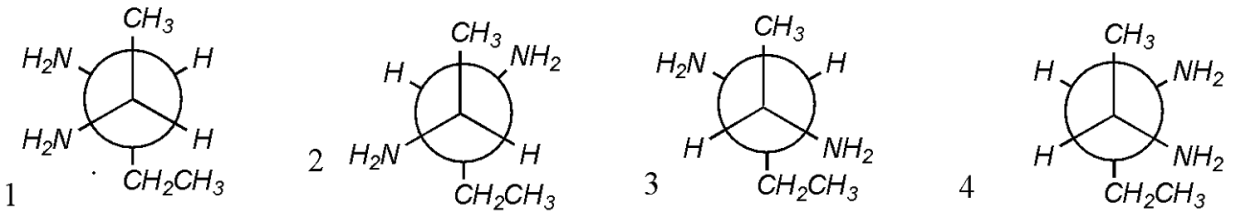
1.





2.





3. These are the eight conformers