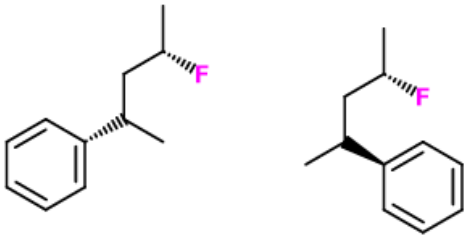
Stereochemistry Relationship Between Molecules:

Practice problems:

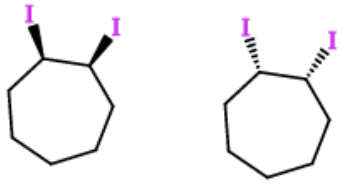
Now try using the schematic above to determine whether the following pairs of molecules are:
(i) enantiomers, (ii) diastereomers, (iii) constitutional isomers, (iv) the same molecule, (v) or different molecules. Worked out examples are shown in the answer key at the end.

1.

2.

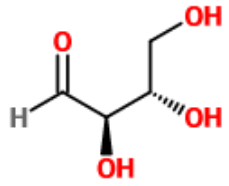


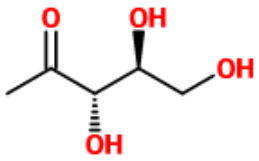
3.



4.

5.





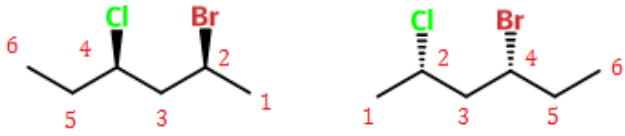
Campus Academic Resource Program

Stereochemistry Relationships Between Molecules

Answer Key

1. ***Constitutional Isomers***

Step 1: Label each carbon in each compound numerically.



Step 2: Determine if the substituents coming off of each similarly numbered carbon is the same.

Are they the same??

No! The 2 and 4 positions have different substituents

Step 3a:

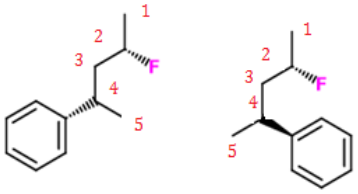
Are the chemical formulas the same?

Yes! Both structures have the chemical formula C_6BrCl

Constitutional Isomers

2. ***Diastereomers***

Step 1: Label each carbon in each compound numerically.



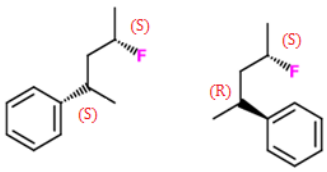
Step 2: Determine if the substituents coming off of each similarly numbered carbon is the same.

Are they the same??

Yes!

Step 3b:

Determine whether each stereocenter is (R) or (S) conformation.



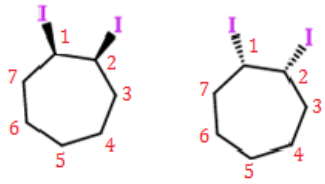
Conformation of Stereocenters

Do the stereocenters switch conformation R to S (or S to R)?

4 switches conformation but 2 does not (see blue box, left)

Diastereomers

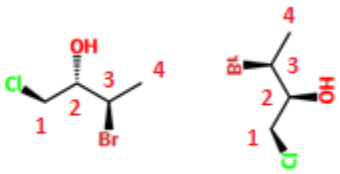
3. *Same Molecule*



This is because you cannot discern between the two iodine substituents (in other words, should the iodine on the left be labelled "1" or the one on the right of the first molecule?) Because the two compounds are both perfectly symmetrical and have the same chemical formula, the compounds are the same (if you do not see this, try making these molecules with a molecular geometry kit!)

4. *Diastereomers*

Step 1: Label each carbon in each compound numerically.



Step 2: Determine if the substituents coming off of each similarly numbered carbon is the same.

Are they the same??

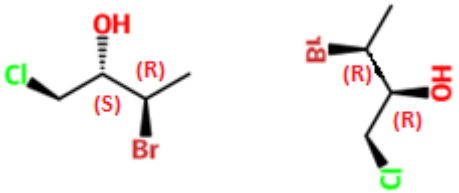
Yes!

Step 3b:
Determine whether each stereocenter is (R) or (S) conformation.

Do the stereocenters switch conformation R to S (or S to R)?

2 switches but 3 does not (see box, left)

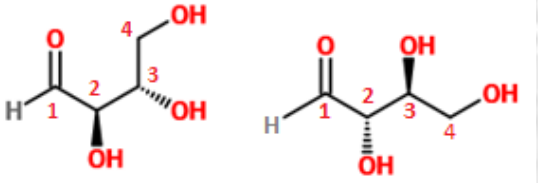
Diastereomers



Conformation of Stereocenters

5. *Enantiomers*

Step 1: Label each carbon in each compound numerically.



Step 2: Determine if the substituents coming off of each similarly numbered carbon is the same.

Are they the same??

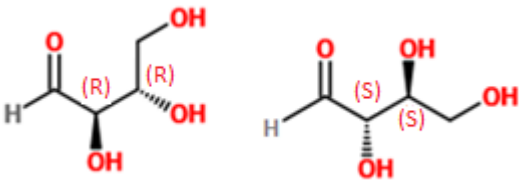
Yes!

Step 3b:
Determine whether each stereocenter is (R) or (S) conformation.

Do the stereocenters switch conformation R to S (or S to R)?

All stereocenters switch- 2 and 3 both switch! (see blue box, left)

Enantiomers



Conformation of Stereocenters

References

Meso Compounds. (n.d.). Retrieved December 1, 2014, from http://chemwiki.ucdavis.edu/Organic_Chemistry/Chirality/Meso_Compounds

Shimizu, K. (n.d.). HOW TO: Determine the stereochemical relationship Between two Molecules. Retrieved December 1, 2014, from http://www.chem.sc.edu/faculty/shimizu/333/Chem_333/5a.vi.html

EMolecules Homepage. (n.d.). Retrieved December 1, 2014, from https://www.emolecules.com/

Schore, N.E.; Vollhardt, K. P. C. (2007). *Organic Chemistry: Structure and Function (5th ed.)*. New York: W. H. Freeman and Company.