



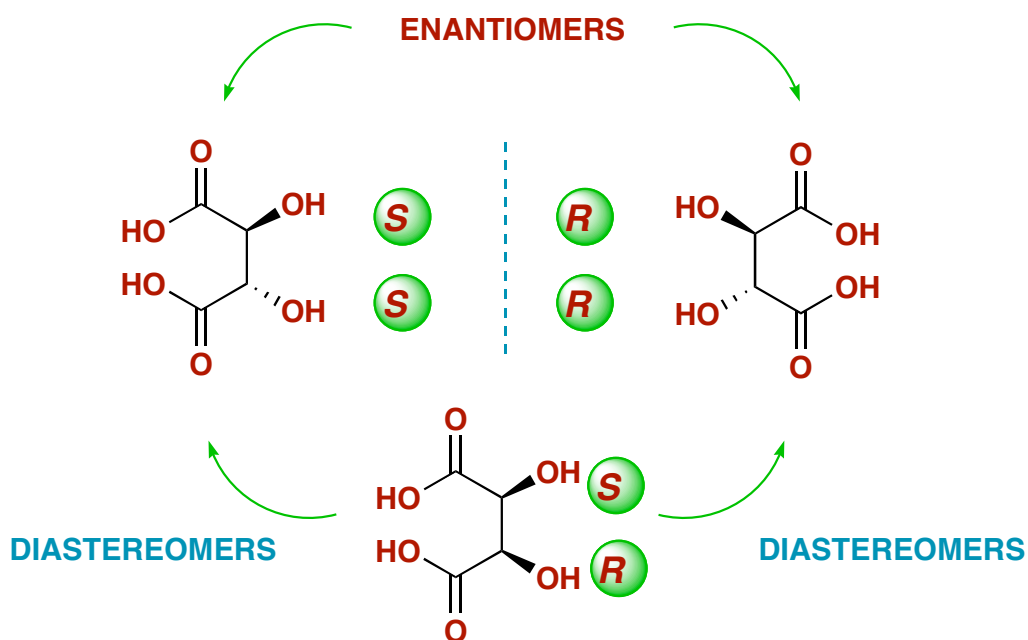
Chem 341 • Organic Chemistry I

Lecture Summary 26 • October 26, 2007

Chapter 9 - Stereochemistry

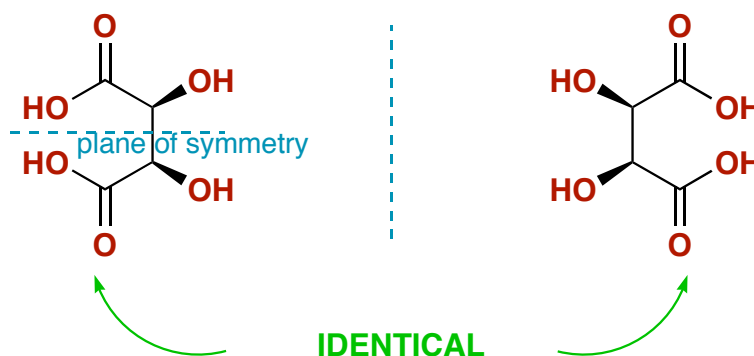
Diastereomers

If a molecule possesses more than one stereogenic center, the possibility for another type of stereoisomer exists. We call stereoisomers that are not mirror images of each other, **Diastereomers**. Note in the example below, a diastereomeric relationship occurs when one, but not both stereogenic centers are changed. Note that *cis/trans* alkenes and cycloalkanes are also a form of diastereomerism.



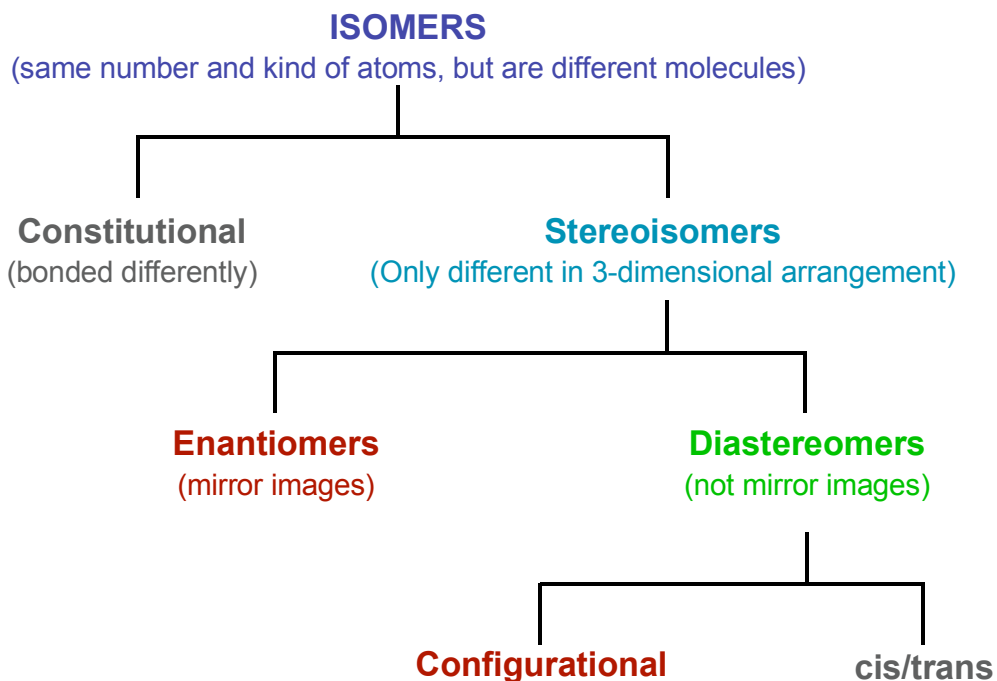
Meso Compounds

Meso Compounds are molecules that contain stereogenic carbons, but are not chiral. Their mirror images are identical. This occurs when there is a plane of symmetry in the molecule.



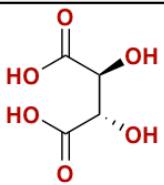
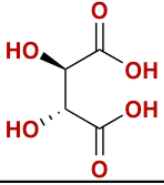
Isomers

Breakdown of different types of isomers.

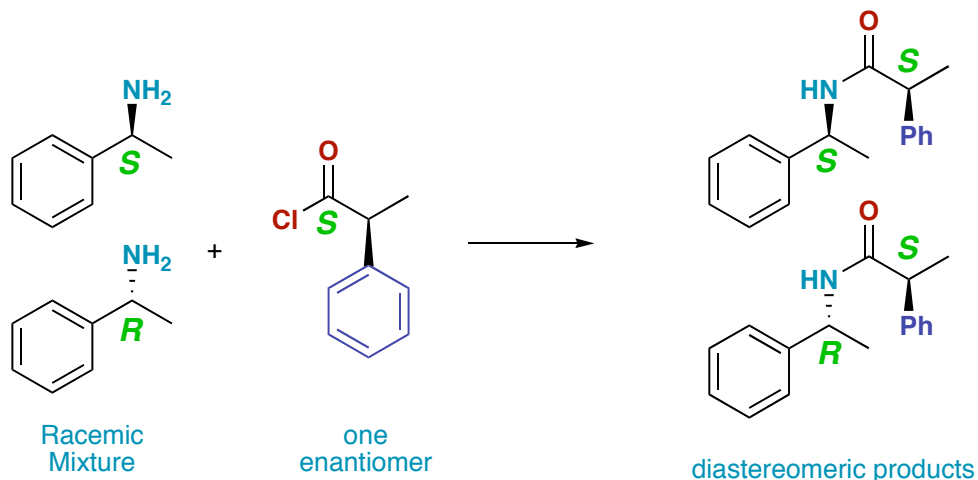
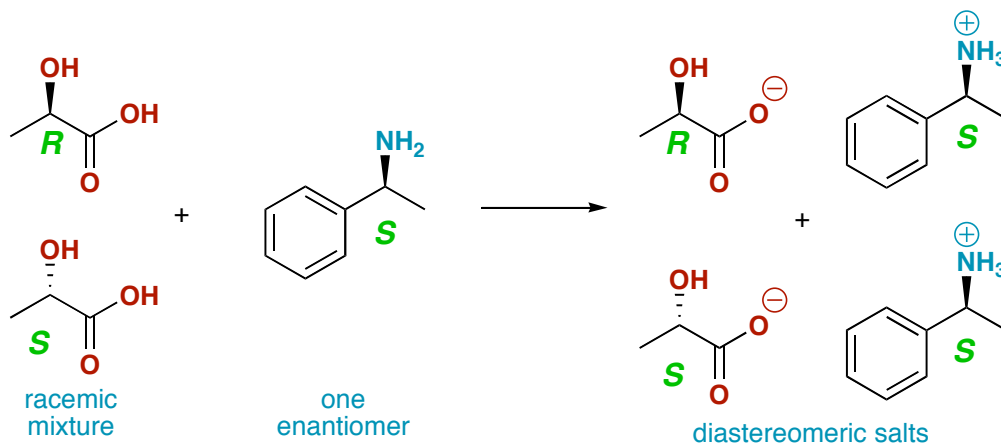


Resolution of Racemic Mixtures

While enantiomers have identical physical properties except for the direction of the rotation of plane polarized light, diastereomers have different physical properties.

molecule	config	optical rotation	mp	density
	(S,S)	+12°	168-170°C	1.7598
	(R,R)	-12°	168-170°C	1.7598
	(S,R) meso	0	146-148°C	1.6660

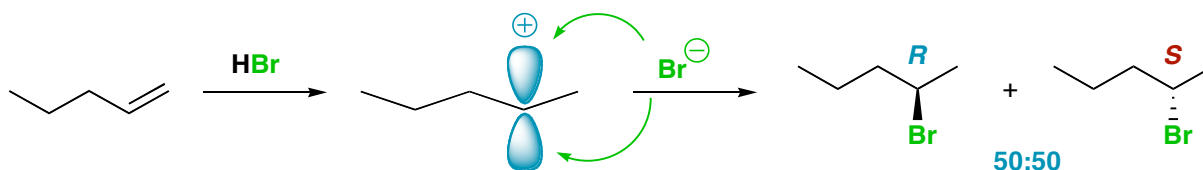
Unlike Pasteur's physical separation of enantiomers based on macroscopic properties of the crystal form (mirror images), the separation of enantiomers, or the **resolution** of enantiomers, is very difficult. In order to separate enantiomers, we must convert them to diastereomers with different physical properties (eg. solubility, boiling point, etc.). We can accomplish this by making ionic bonds (acid base reaction to make diastereomeric salts) or by making covalent bonds with a chiral molecule as a single enantiomer.



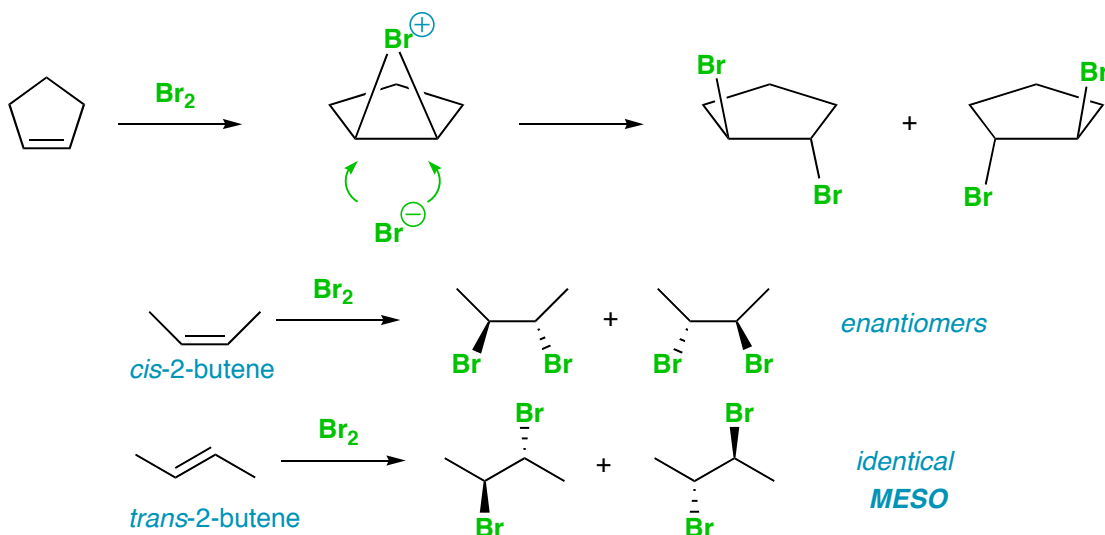
Stereochemistry of reactions

There are many reactions that produce a new stereogenic center. It is important to recognize that you will always get a racemic mixture of products in such a reaction unless there is something else chiral influencing the reaction.

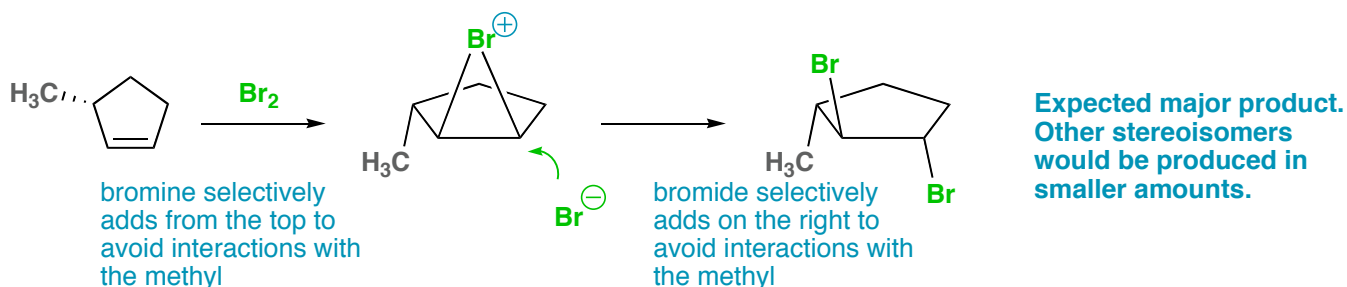
For example, electrophilic addition of HBr to 1-pentene will result in a 50:50 mixture of both enantiomers. The alkene and the carbocation intermediate are planar and the step that creates the asymmetric center could add the bromide from either face with equal energies.



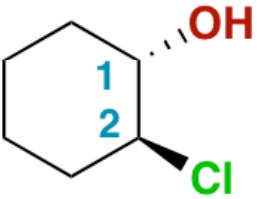
Another example is the electrophilic bromination of cyclopentene. Note that it is selective for giving the *trans*-product, however, they are obtained as a racemic mixture of enantiomers. Cis and trans alkenes will afford different diastereomeric products, but they will still be racemic.



If there is another stereocenter near the reaction site, it would have an influence on the reaction stereochemistry and it would not necessarily be an equal mixture of enantiomeric or diastereomeric products. The only way to influence the configuration of a new stereogenic carbon to favor one enantiomer over the other is to have some other chiral influence on the reaction.



Quiz of the day

<p>Q: What is the stereochemical configuration of the stereocenters in the following molecule?</p> 	<input type="checkbox"/> 1:	1R,2S
	<input type="checkbox"/> 2:	1R,2R
	<input type="checkbox"/> 3:	1S,2R
	<input checked="" type="checkbox"/> 4:	1S,2S