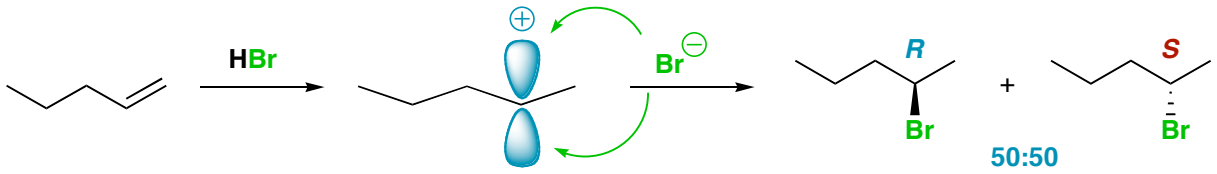
Chapter 9 - Stereochemistry

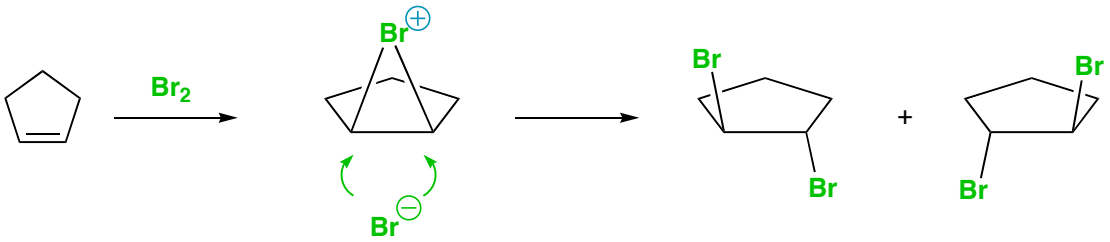
Stereochemistry of reactions

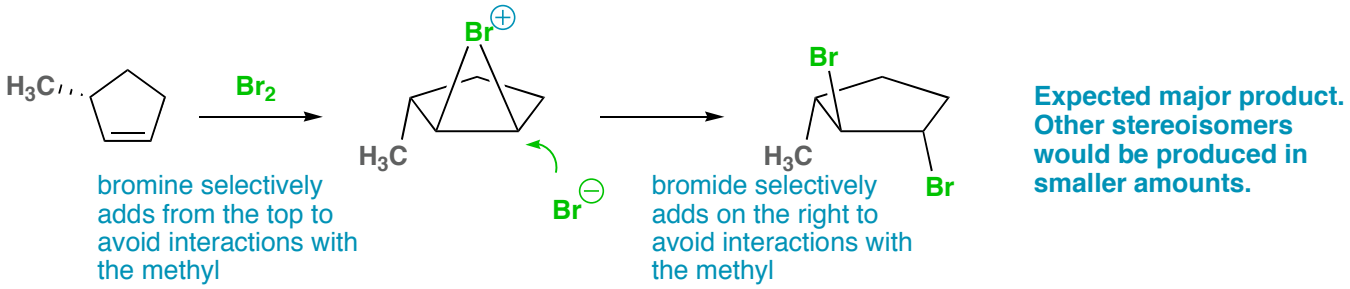
There are many reactions that produce a new stereogenic center. It is important to recognize that you will always get a racemic mixture of products in such a reaction unless there is something else chiral influencing the reaction.

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.



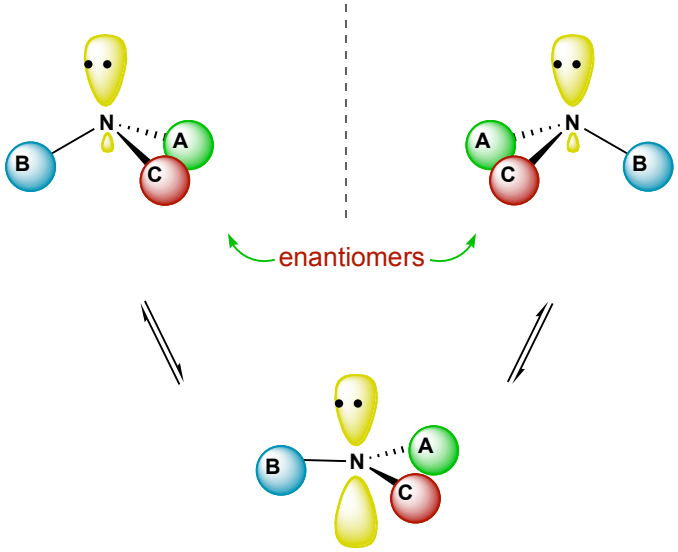
Another example is the electrophilic bromination of cyclopentene. Note that it is selective for giving the *trans*-product, however, they are obtained as a racemic mixture of enantiomers. If there is another stereocenter near the reaction site, it would have an influence on the reaction stereochemistry and it would not necessarily be an equal mixture of enantiomeric or diastereomeric products.





Stereochemistry of Other Atoms

Other atoms besides carbon have an asymmetric tetrahedral geometery. For example, when you consider the lone pair on nitrogen, and there are three different groups attached, the molecule will not be the same as its mirror image. However, Nitrogen compounds will invert very rapidly at room temperature and are thus always present as a racemic mixture. Therefore, they do not possess any properties of being chiral (eg. Rotate plane polarized ligt). Phosphine compounds invert much more slowly and can be isolated as chiral entities. They do not racemize unless heated.



Nitrogen compounds can undergo inversion similar to inverting an umbrella. In this way, the configuration is always racemized.