6.2: Background

During the lecture portion of your organic chemistry course, you learned about how when four different groups are bound to a tetrahedral carbon there are 2 different configurations. As shown in Figure 1, two absolute configurations are possible, labeled R or S. Determining the absolute configuration of a chiral center is vital when you are trying to elucidate the relationship between two different stereoisomers (enantiomers, diastereomers, or meso compounds).

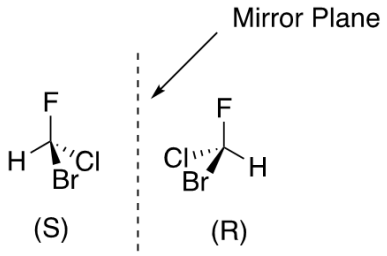

Figure 1. The S and R configurations of bromochlorofluoromethane.

As shown in Figure 2a, if two molecules with the same connectivity (molecular connections) have one or more stereocenters they will be enantiomers if all the stereocenters are of opposite configuration. If the stereocenters in two molecules are of the same configuration the molecules will be the same (Figure 2B). Two molecules with the same connectivity and two or more stereocenters will be diastereomers if some of the stereocenters are different. Enantiomers have the same chemical and physical properties such as their melting point, spectra, and reactivity. They differ, however, in their ability to rotate plane polarized light. Unlike a set of enantiomers, a set of diastereomers will have differing chemical and physical properties.

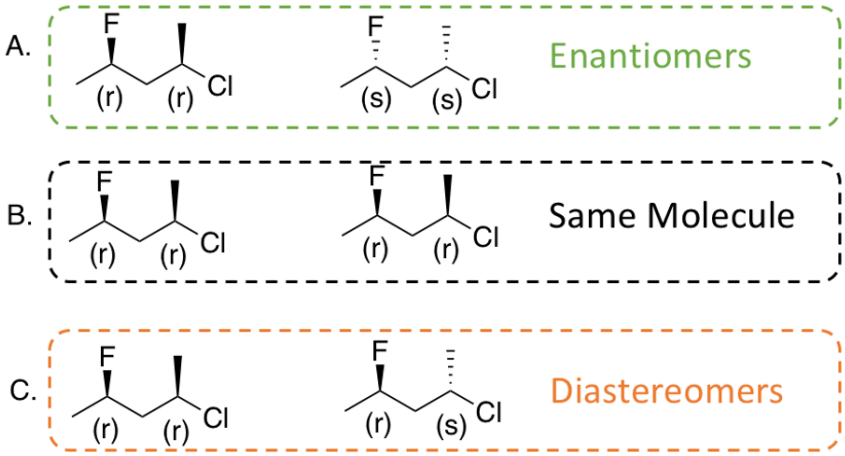

Figure 2. A. Two molecules with the same connectivity where all the chiral centers are inverted are enantiomers of each other. **B.** Two molecules with the same connectivity where all the chiral centers are the same are identical. **C.** Two molecules with the same connectivity but only some of the chiral centers are inverted.