

Chemistry 111

General Principles Regarding Stereochemistry

1. A chirality center is almost always an sp^3 hybridized carbon that has **4 different substituents on its 4 sigma bonds**.
2. If a molecule possesses n chirality centers, then there are 2^n maximum stereoisomers possible for this molecule.
3. A molecule is **chiral** if it has a ***non-congruent (non-superimposable) mirror image***. This chiral molecule is “handed.” (It rotates plane polarized light, thus it is optically active.)
4. Enantiomers are chemically and spectroscopically indistinguishable. They differ only in their optical activity (equal but opposite specific rotations), and biologically, of course.
5. Diastereomers are stereoisomers, but they can be chemically and spectroscopically different.
6. If a molecule possesses *only one chirality center*, it is chiral. If it possesses no chirality centers, *usually* it is achiral.
7. If a molecule has a plane of symmetry it is achiral!! (Even if it possesses chiral centers, a molecule with a plane of symmetry is achiral – it has a congruent mirror image.)
8. An achiral molecule with chirality centers can have stereoisomers, diastereomers, however.