**Chirality** [Daley & Daley ch 11]

*This presentation of the material covered within a topic or chapter is meant to give students a clear vision of the central concepts or big picture concepts that all other information expands upon, relates to or serves.
Super concepts are the big picture, central concepts that should be completely obvious to you as we begin to cover them and when you reflect on the topic once we’ve covered it. Everyone who takes the course should be able to remember or recognize the super concepts years after having taken the course.*

*Each concept is an important “chunk” of a super concept. Each concept is a large enough idea to stand on its own. Good (B) students will remember and understand these concepts after taking the course.*

*The details are ideas, methods, or facts that you need to understand to solve problems and actually do chemistry. It’s likely that only the best (A) students will be able to remember and use the details years after taking the course.*

**Superconcepts:**

1. Chiral molecules are asymmetrical.
2. Chiral carbons are bonded to four different substituents.

**Concepts:**

1. Symmetrical objects are superimposable.
2. Enantiomers are chiral molecules: mirror image pairs of molecules (stereoisomers or configurational isomers) that contain chiral carbons and are non-superimposable.
3. Cahn-Ingold-Prelog allows us to label enantiomers R or S. The substituents of chiral carbons are prioritized by atomic mass: highest mass is highest priority. With the lowest priority group facing away from you, determine whether high to low priority requires clockwise (R ) or counterclockwise (S) rotation.
4. Fisher projections show 3D structure on a 2D page. Groups on the horizontal axis come forward (out of the page) while groups shown on the vertical axis recede backwards (into the page).
5. Meso isomers have two chiral carbons (of opposite rotation) with an internal plane of symmetry and are thus achiral; they don't rotate light.
6. Non-carbon atoms can also be chiral centers: Si, N, P, S.

 **Details:**

1. Molecules with an internal plane of symmetry are achiral even if they have chiral carbons.
2. A center (or point) of symmetry connects two identical groups in a symmetrical molecule.
3. When prioritizing substituents for CIP go atom by atom. So, a COOH group has a higher priority than a CH2OH group.
4. Enantiomeric pairs have identical physical & chemical properties, with two exceptions: 1) they rotate plane-polarized light in opposite directions, though to the same degree; 2) their biological properties will differ since most biological molecules that entantiomers interact with are also chiral.
5. Flipping Fisher projections by 180 degrees doesn't change them, but flipping them 90 degrees does change them.
6. Racemic mixtures of enantiomers appear not to rotate plane-polarized light, since each enantiomer rotates light in opposite directions.
7. Dextrorotary (D) enantiomers rotate light to the right, while levorotary (L) enantiomers rotate light to the left. D & L don’t correspond to R & S in any systematic way.
8. Biological synthesis produces only one an enantiomer while chemical synthesis produces both.
9. Enantiomers can be ‘resolved’ or separated by attaching each to the same molecule, separating the joined molecules by their (now) different physical and chemical properties, and then reversing the join.