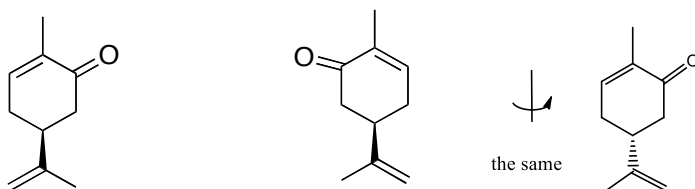


Optical Rotation:

- Optical rotation is a physical property
- Pure enantiomers rotate in equal but opposite directions



enantiomers

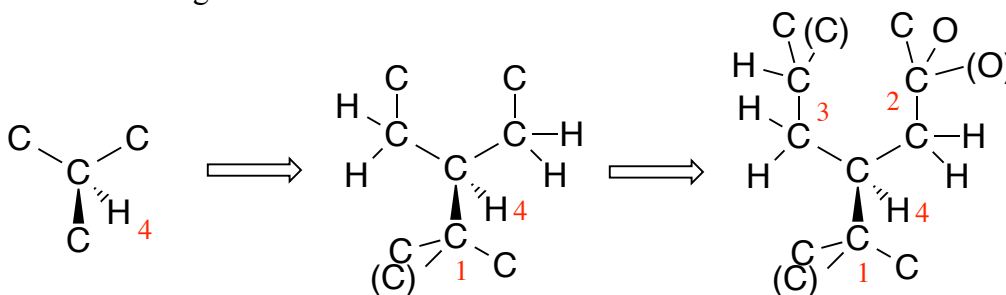
D-carvone

L-carvone

d = dextrorotatory (Clockwise)

l = levorotatory (Counter Clockwise)

Absolute configuration of D-carvone is S:



R/S is nomenclature (convention), while d and l optical activity is a physical property. They cannot be easily correlated theoretically (there is no way reliable method a priori to predict that a d or l compound would have certain R S stereogenic center).

Optical purity (experimental) = enantiomeric excess = e.e. (theoretical)

$[\alpha]_D$ = Absolute rotation of a compound.

Optical purity is the excess of one enantiomer over the other

Calculating Optical Purity

For this example for D and S-carvone, assume the pure S enantiomer has $+100^\circ$ rotation

For S isomer: $[\alpha]_D = +100^\circ$

For R isomer: $[\alpha]_D = -100^\circ$

Mix 1:1 R + S enantiomers $\alpha = \text{measured} = 0^\circ$

Racemate = racemic mixture = 50:50 mixture of enantiomers

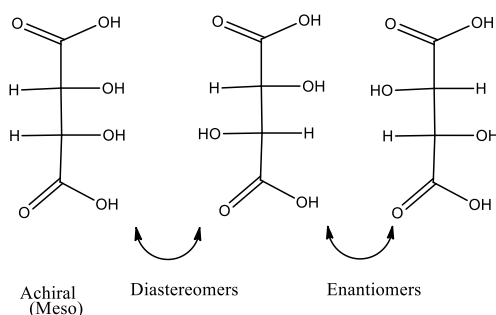
<u>R</u>	<u>S</u>	<u>Rotation (°)</u>	<u>Optical Purity (%)</u>
100 %	0 %	-100 °	100 %
0 %	100 %	+100 °	100 %
50 %	50 %	0 °	0 %
25 %	75 %	+50 °	50 %

Separation of Enantiomers:

Resolution: Separation of enantiomers.

- For resolution, a chiral agent is necessary
- Physical separation (crystallization of specific enantiomer)
- Conversion to diastereomers, which can be separated
 - o e.g. Make salts by acid-base reaction

Tartaric acid:



The enantiomers of tartaric acid can be separated by forming diastereomeric salts with a chiral amine, such as morphine

