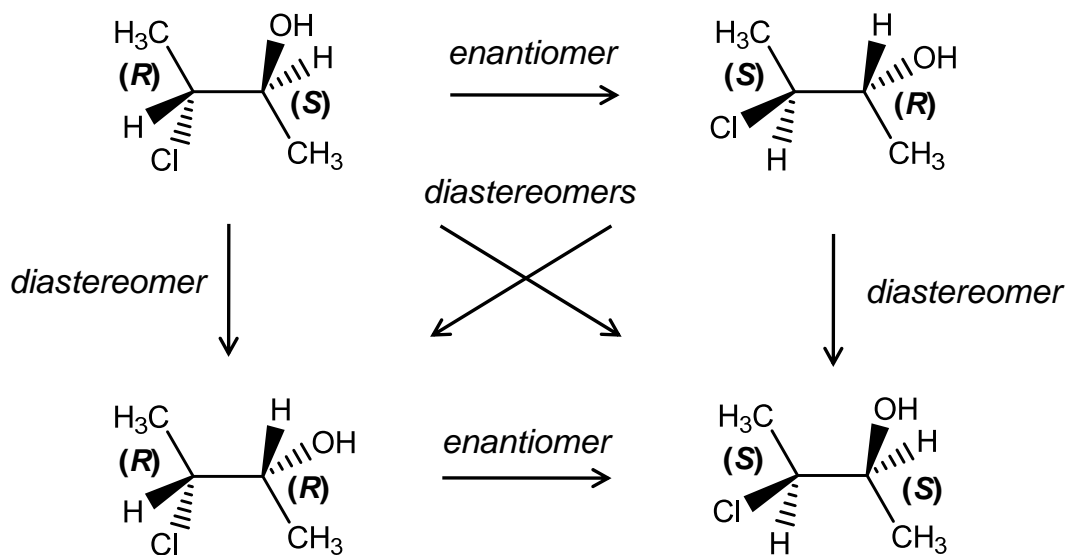


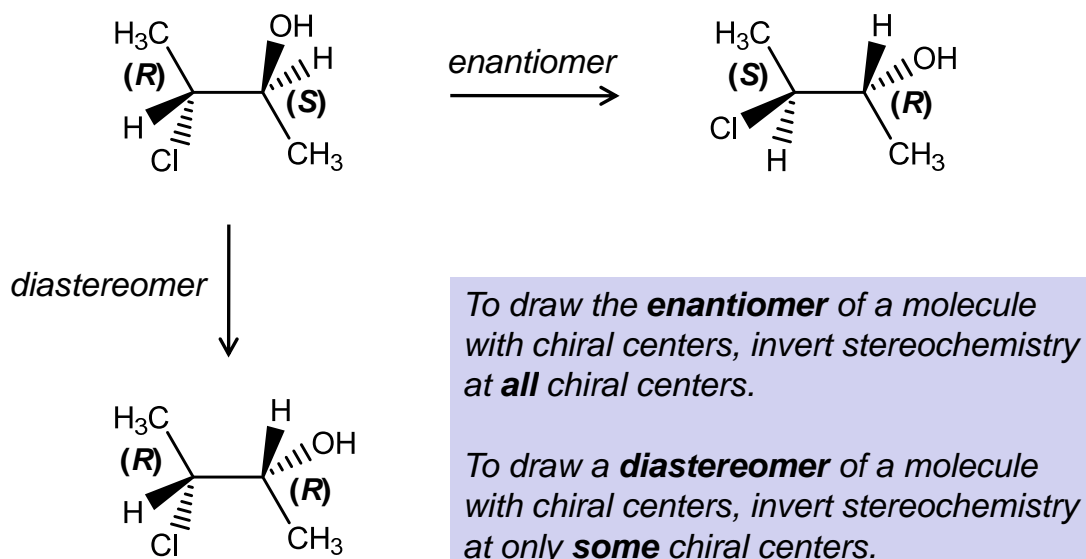
# Diastereomers

**Diastereomers:** Stereoisomers that are not mirror images.



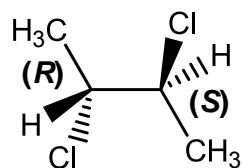
# Diastereomers

**Diastereomers:** Stereoisomers that are not mirror images.



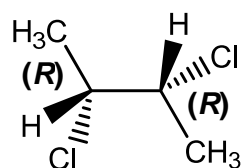
# Meso Compounds

**Meso:** A molecule that contains chiral centers, but is achiral.

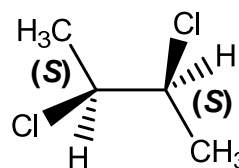


Are these molecules chiral?

(These are different from the molecules I just showed; they have 2 -Cl's, rather than 1 -Cl & 1 -OH.)



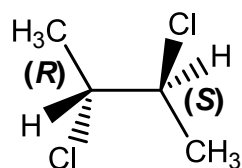
enantiomer



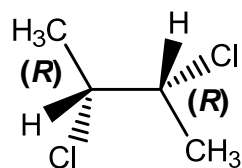
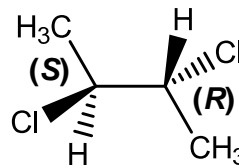
These molecules are **chiral** mirror images of one another. (R,R) and (S,S) are not the same.

# Meso Compounds

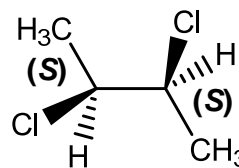
**Meso:** A molecule that contains chiral centers, but is achiral.



enantiomer ?  
no!  
same molecule!

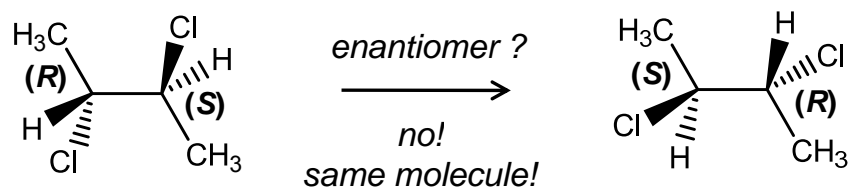


enantiomer



## Meso Compounds

**Meso:** A molecule that contains chiral centers, but is achiral.



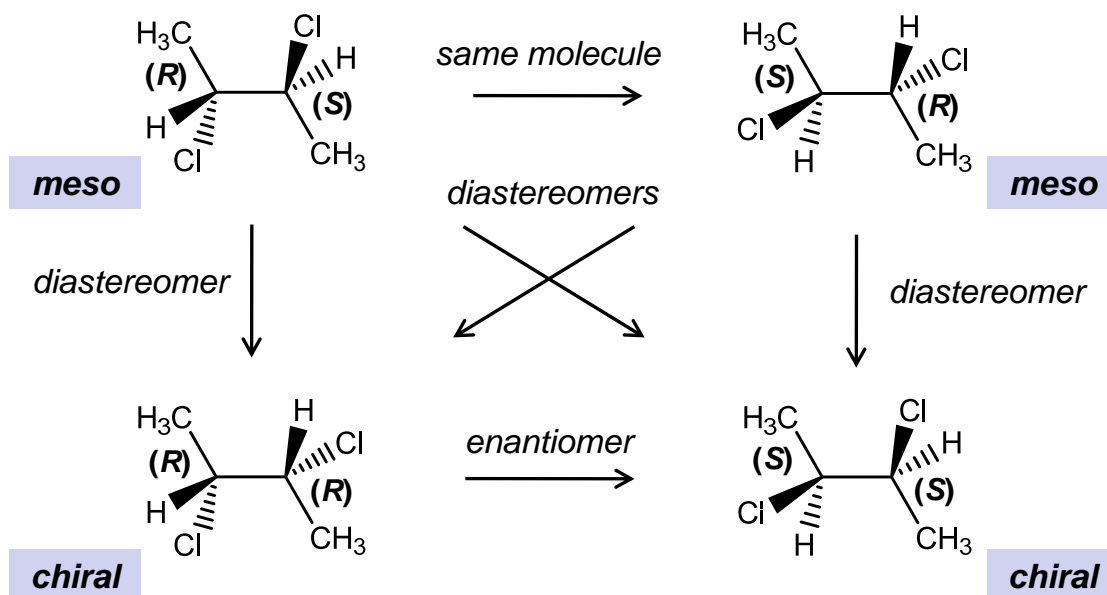
If a molecule

- contains the same number of (*R*) and (*S*) stereocenters, and
- those stereocenters have identical groups attached, then

the molecule is **achiral** and *meso*.

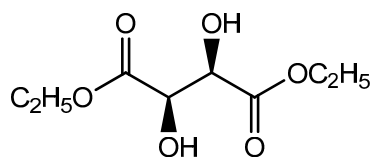
## Meso Compounds

**Meso:** A molecule that contains chiral centers, but is achiral.

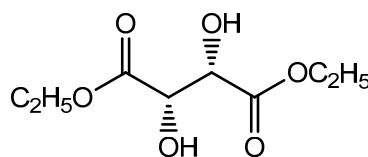


# Properties of Enantiomers

Most physical properties of enantiomers are identical.



diethyl-(*R,R*)-tartrate

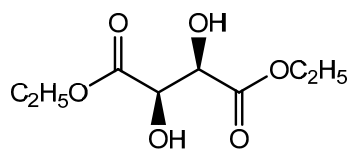
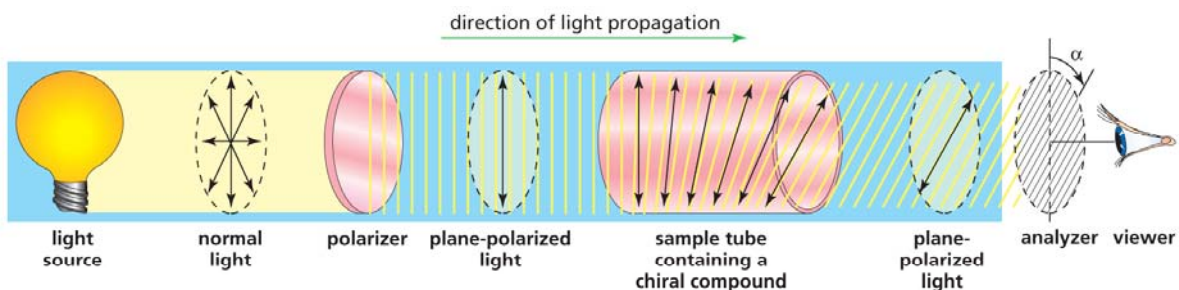


diethyl-(*S,S*)-tartrate

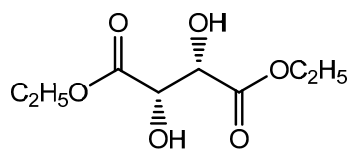
boiling point	280 °C	280 °C
melting point	19 °C	19 °C
density	1.204 g/mL	1.204 g/mL
refractive index	1.447	1.447

*i.e.*, chirality does not affect most physical properties.

## Chiral Molecules Rotate Plane-Polarized Light



diethyl-(*R,R*)-tartrate



diethyl-(*S,S*)-tartrate

specific rotation [ $\alpha$ ]

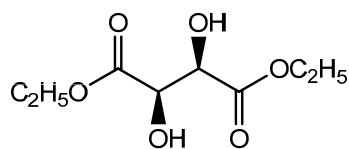
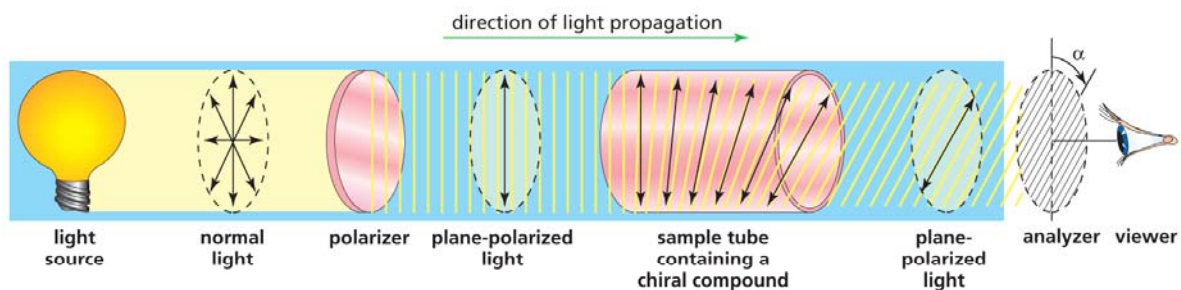
+8.5°

-8.5°

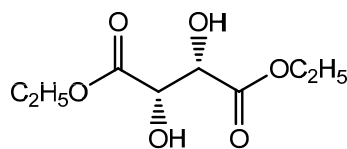
(rotation of light passed through 10 cm of substance; + is clockwise)

*enantiomers rotate light in opposite directions.*

# Chiral Molecules Rotate Plane-Polarized Light



diethyl-(*R,R*)-tartrate



diethyl-(*S,S*)-tartrate

specific rotation [ $\alpha$ ]

+8.5°

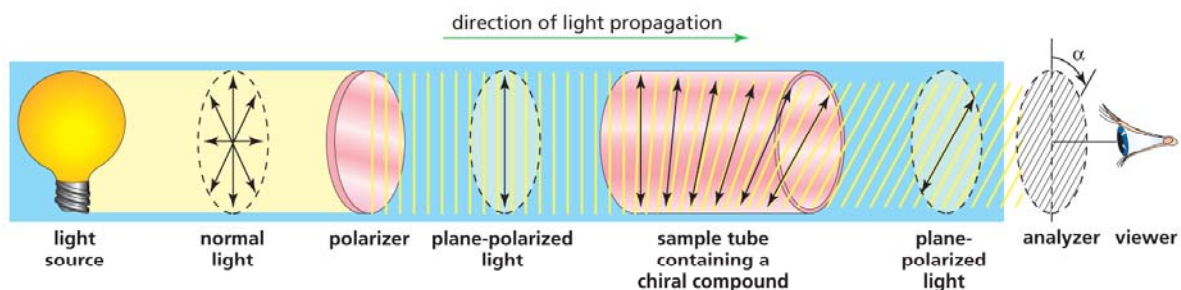
-8.5°

*molecules are sometimes named (+) or (-) after this property.*

(+)-diethyl tartrate

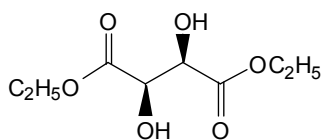
(-)-diethyl tartrate

# Chiral Molecules Rotate Plane-Polarized Light



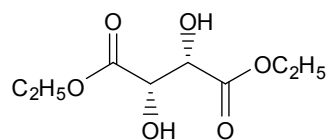
(rotation of light passed through 10 cm of substance; + is clockwise)

specific rotation [ $\alpha$ ]



diethyl-(*R,R*)-tartrate

+8.5°



diethyl-(*S,S*)-tartrate

-8.5°

*molecules are sometimes named (+) or (-) after this property.*

(+)-diethyl tartrate

(-)-diethyl tartrate

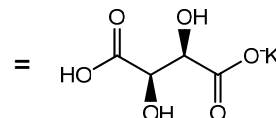
*enantiomers rotate light in opposite directions.*

# Racemic Mixtures

**Racemate**, or

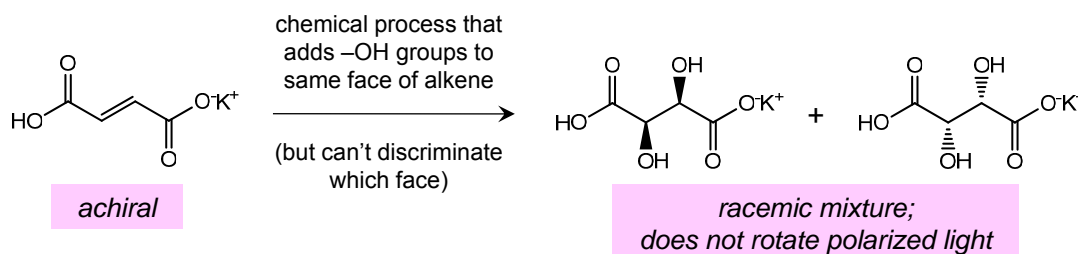
**Racemic mixture**: A perfect, 1:1 mixture of enantiomers.

- Biological processes normally produce enantiomerically pure materials (are *stereospecific*).

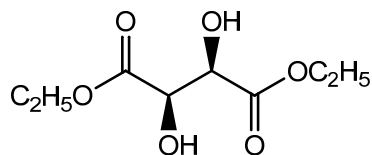


(+)-tartaric acid,  
potassium salt

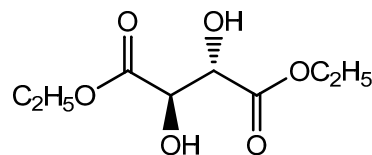
- Chemical processes usually produce racemates.



## Diastereomers Have Different Physical Properties



diethyl-(*R,R*)-tartrate



diethyl-(*R,S*)-tartrate

boiling point	280 °C	> 300 °C
melting point	19 °C	60 °C
density	1.204 g/mL	1.135 g/mL
refractive index	1.447	1.432
specific rotation [ $\alpha$ ]	+8.5°	0°

meso,  
achiral