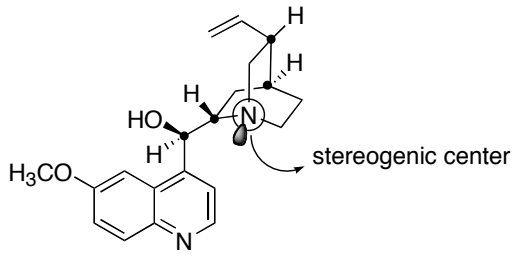
Chiral Centres:



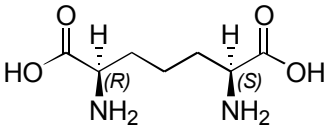
quinine - anti-malarial drug
from the bark of the tree
Cinchona officinalis

malaria is cause by *Plasmodium* species
transmitted by *Anopheles* mosquito

non-nitrogen centres shown with dot

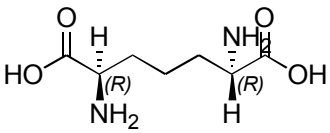
Meso compounds: have stereogenic centres but are achiral. The one below has an internal plane of symmetry.

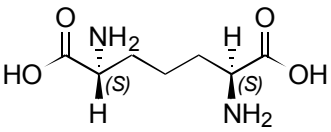
- EG. Of a Meso Compound:



All compounds with internal plane of symmetry are achiral (not chiral).

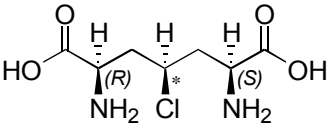
- However if one of the chiral centers were switched:





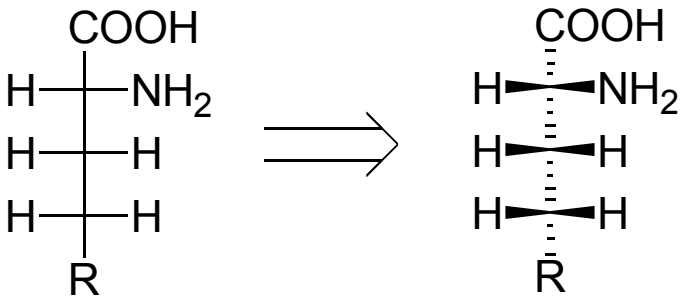
- a set of enantiomers is generated – each of these is a diastereomer of the meso isomer

- What if there was a chiral center in the middle?



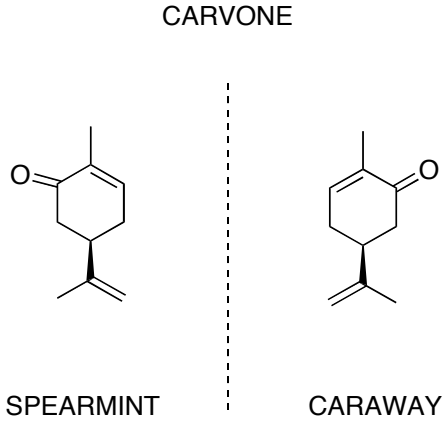
This is an achiral molecule. However, the carbon with * is still a stereogenic centre. Why? Even though the same atoms are attached on either side, their configurations are different, not both R or both S.

Fischer projection – a convention for drawing organic molecules in which horizontal groups are understood to point toward you, and vertical groups backward.
eg.



Physical properties of enantiomers

- Same physical properties in achiral agents or techniques
    - Melting point, boiling point, solubility in achiral solvents
- Enantiomers behave differently with chiral agents
    - Example: L & D-carvone have different smells (spearmint and caraway, respectively)



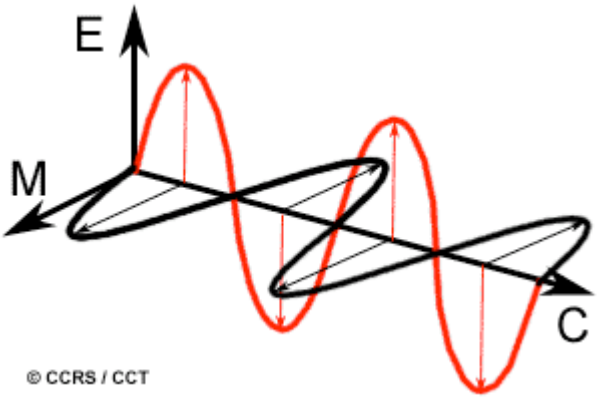
Optical Rotation

- rotation of plane of polarized light
    - dextrorotatory (right) (+)
    - levorotatory (left) (-)
- pure enantiomers show equal but opposite rotation

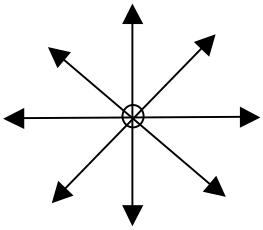
Light: Electromagnetic radiation

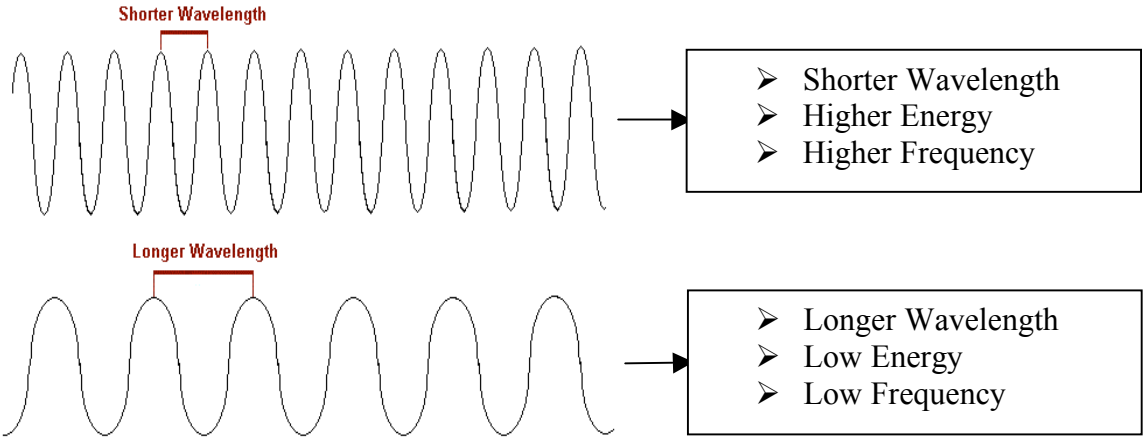
Light → $E = h\upsilon = \frac{hc}{\lambda}$

υ = frequency E = energy h = Planck's constant λ = wavelength
c = speed of light



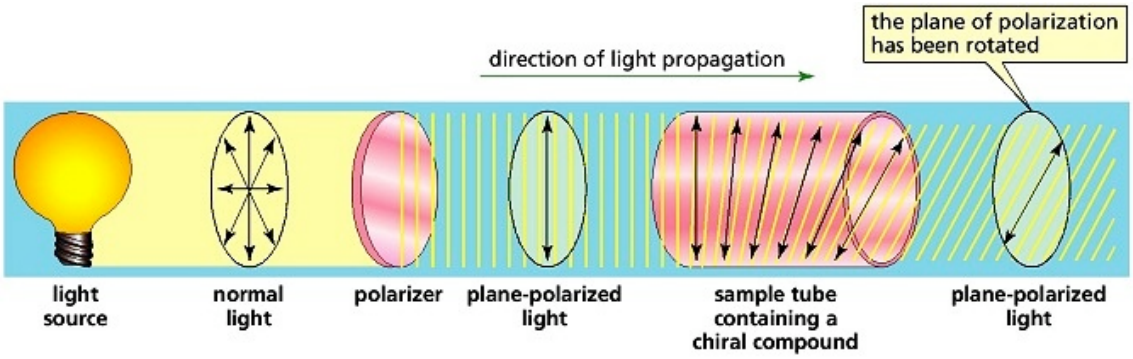
Light has oscillating Electric field (red) combined with magnetic field (black)


End on view of vector components of normal light



- Shorter Wavelength
- Higher Energy
- Higher Frequency

- Longer Wavelength
- Low Energy
- Low Frequency



$$[\alpha]_D = \frac{\alpha}{c \bullet l}$$

α = measured rotation c = concentration (mol/L) l = path length (cm)
D = D-line of sodium light $[\alpha]$ = absolute rotation

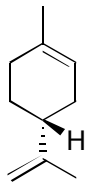
Degrees (^{o}) + - Clockwise
– - Anticlockwise

Optical Rotation

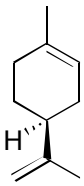
$[\alpha]_D$ = Absolute Rotation ; D stands for D line of sodium l = 5890 Å or 589 nanometers

Absolute Rotation is a physical property of a pure enantiomer

Pure enantiomers rotate in equal but opposite direction, example Limonene:



(+) Limonene
$[\alpha]_D$= + 123



(-) Limonene
$[\alpha]_D$= – 123