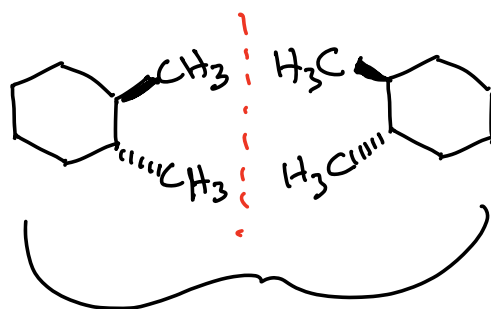
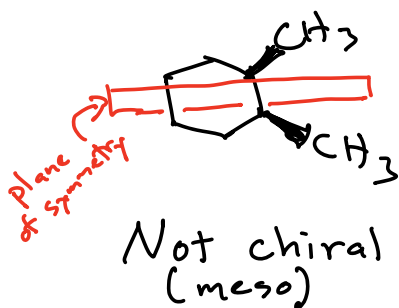


# Exam Preview → 22 questions

Lewis Structures and Contributing Structures	57 pts
Molecular Dipole	18 pts
Bonding theory	68 pts
Nomenclature	34 pts
Chirality	88 pts
Conformations	44 pts
MCAT Question	22 pts

Pro tip → Use flat cyclohexanes to look for planes of symmetry

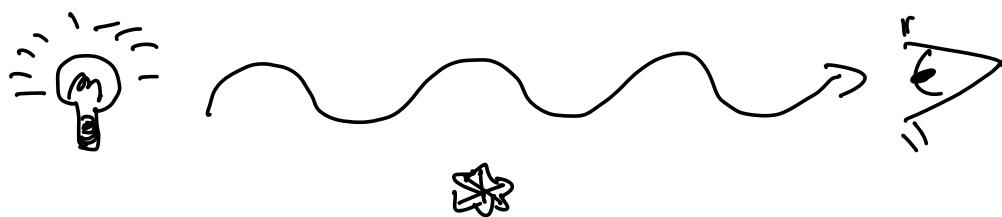


enantiomers → no plane of symmetry

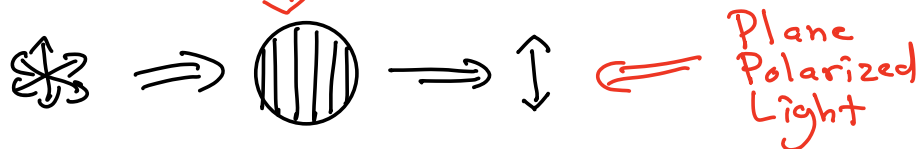
Enantiomers → identical physical properties  
m.p., b.p., density...

Diastereomers → DIFFERENT physical properties  
m.p., b.p., density...

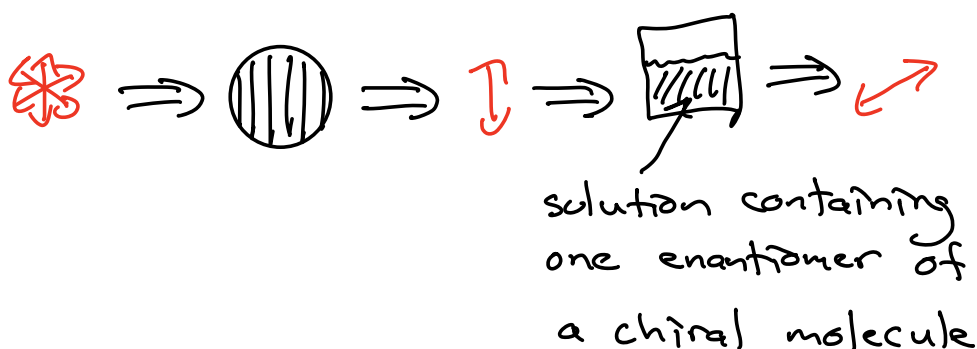
→ Can be distinguished if measured  
in a chiral way!



Polarizing filter → makes it so only light in a single plane gets through



A sample of a chiral molecule will rotate the plane of plane polarized light an amount and direction that is characteristic for that molecule → Its enantiomer will rotate the plane of plane polarized light by the same amount but in the OPPOSITE direction!

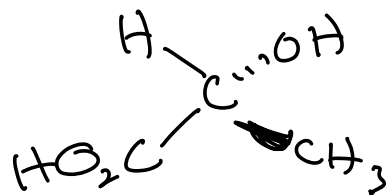


Clockwise rotation → "+"

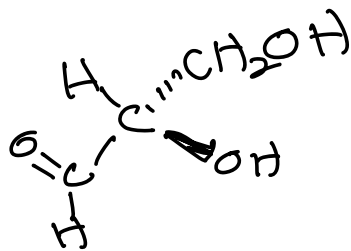
Counterclockwise rotation "-"



There is no direct connection between R and S and "+" and "-". Sometimes R is "+" and sometimes S is "+". Sometimes R is "-" and sometimes S is "-".



R-(-)-lactic acid



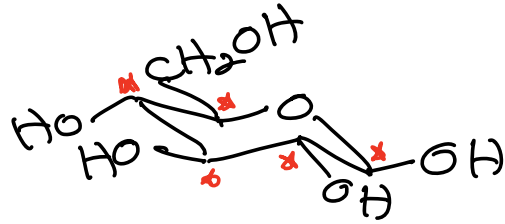
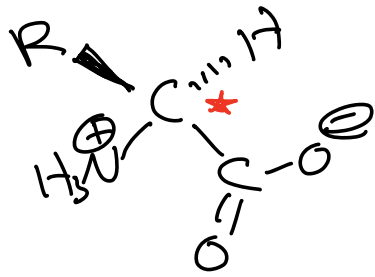
S-(-)-glyceraldehyde

New definition  $\rightarrow$  Racemic Mixture

1:1 mixture of two enantiomers

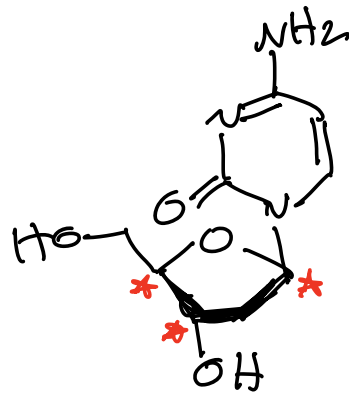
Does not rotate the plane of plane polarized light  $\Rightarrow$  the directions cancel

A meso compound does not rotate  
 $\Downarrow$  the plane of plane polarized light  
Not Chiral



R = 20 different things

Amino Acids

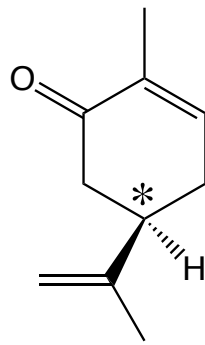


These are our molecular building blocks → they are present as single enantiomers in living things → We and all life on this planet is chiral!

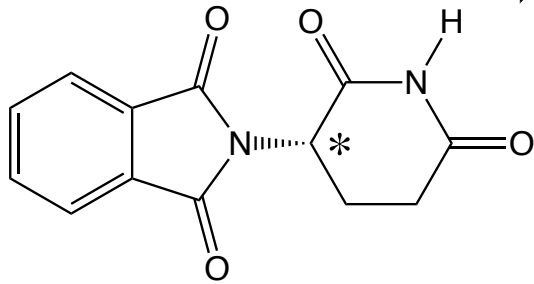
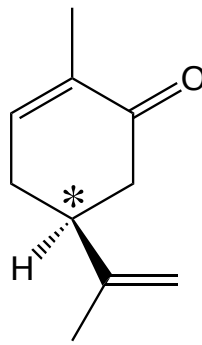
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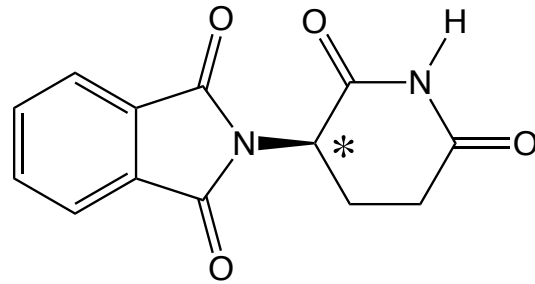
*R*-Carvone  
Spearmint



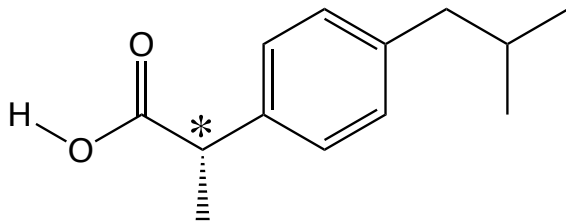
*S*-Carvone  
Major component  
of caraway seeds



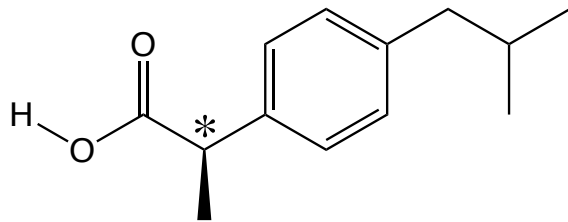
*S*-Thalidomide (Relieves morning sickness)



*R*-Thalidomide (Causes birth defects)

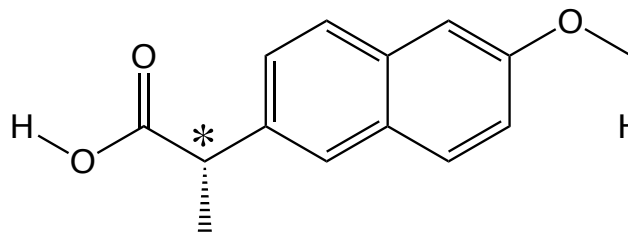


*S*-Ibuprofen (Advil, Motrin)

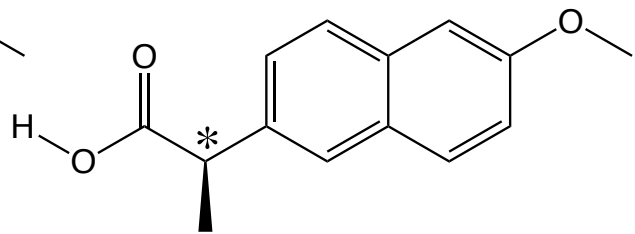


*R*-Ibuprofen (Inactive and relatively harmless)

Sold as a racemic mixture



*S*-Naproxen (Aleve)



*R*-Naproxen (liver toxin)

Sold as a  
single enantiomer

**Organic Chemistry is the study of carbon-containing molecules.**

**This class has two points.**

***The first point of the class is to understand the organic chemistry of living systems. We will teach you how to think about and understand the most amazing things on the planet!!***

Water is essential for life, you will learn why water has such special properties. 8/25/2022

You will learn the secret structural reason proteins, the most important molecular machines in our bodies, can support the chemistry of life. 9/6/22

You will learn why when you take Advil for pain, exactly half of what you take works, and the other half does nothing. 9/20/22

You will learn how toothpaste works.

You will learn how a single chlorofluorocarbon refrigerant molecule released into the atmosphere can destroy many, many ozone molecules, leading to an enlargement of the ozone hole.

You will learn how medicines like Benadryl, Seldane, and Lipitor work.

You will learn how Naloxone is an antidote for an opioid overdose.

You will learn why Magic Johnson is still alive, decades after contracting HIV.

You will learn how MRI scans work.

***The second point of organic chemistry is the synthesis of complex molecules from simpler ones by making and breaking specific bonds.***

You will learn how to understand movies of reaction mechanisms like alkene hydration.

You will learn reactions that once begun, will continue reacting such that each product molecule created starts a new reaction until all the starting material is used up.

You will learn reactions that can make antifreeze from vodka.

You will learn a reaction that can make nail polish remover from rubbing alcohol.

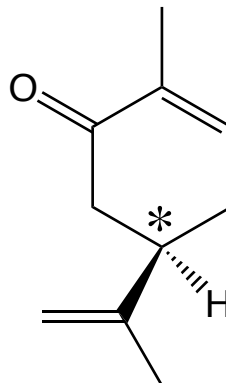
You will learn how to look at a molecule and accurately predict which atoms will react to make new bonds, and which bonds will break during reactions.

You will learn how to analyze a complex molecule's structure so that you can predict ways to make it via multiple reactions starting with less complex starting molecules.

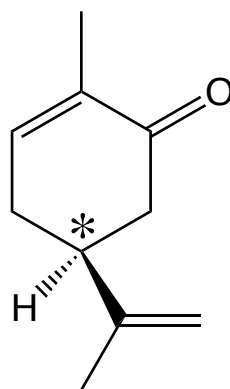




*R*-Carvone  
Spearmint

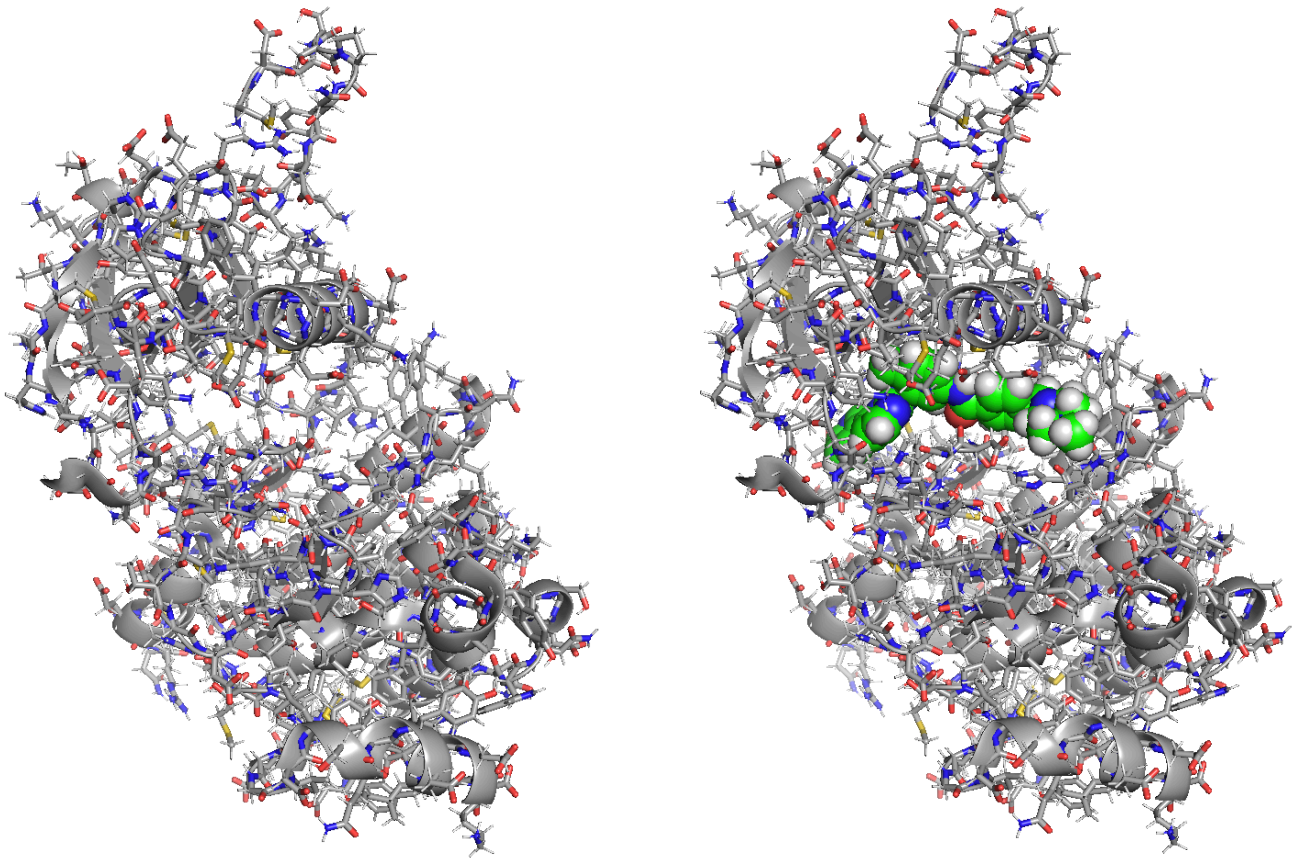


Enantiomers → but  
because we are chiral  
these smell and taste very  
different to us!

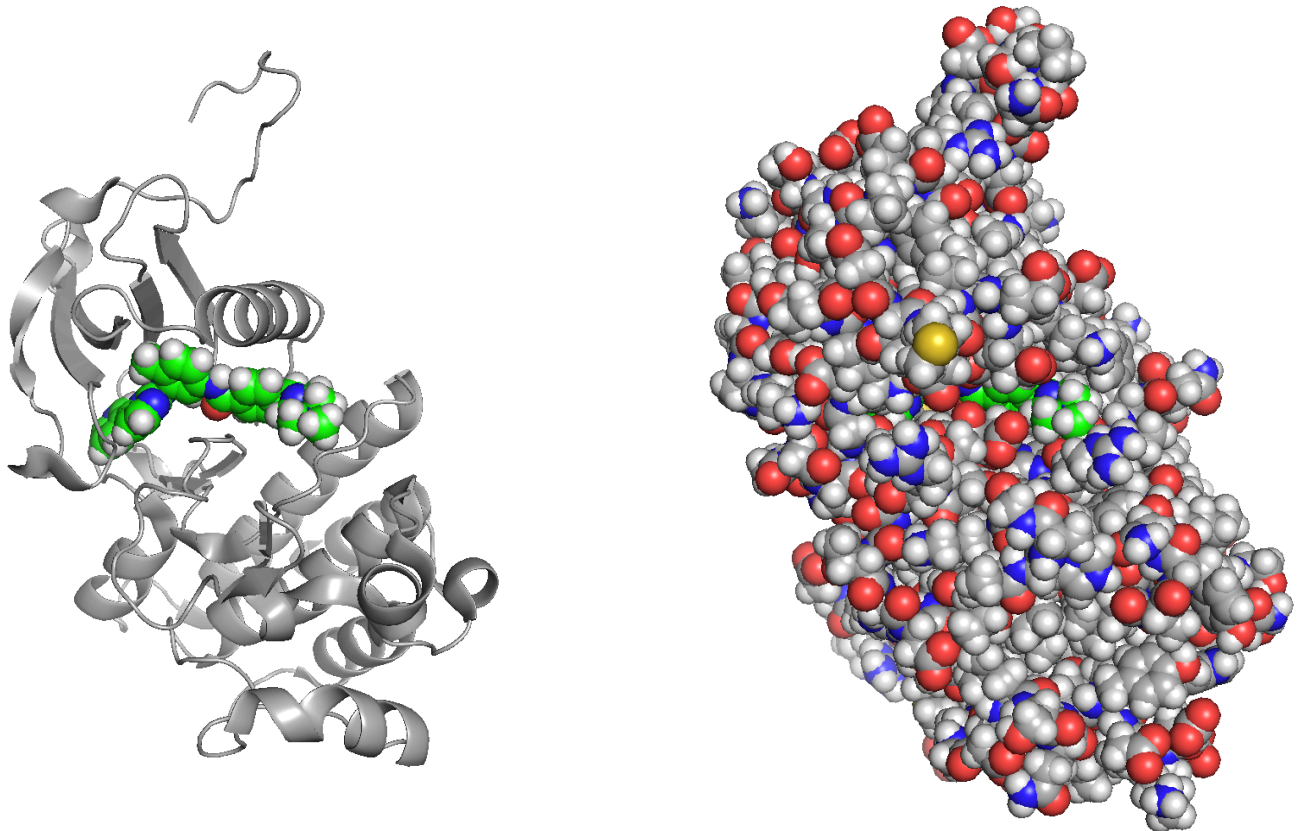


*S*-Carvone  
Major component  
of caraway seeds





The drug Gleevec (green) bound to its target protein, the ABL kinase.



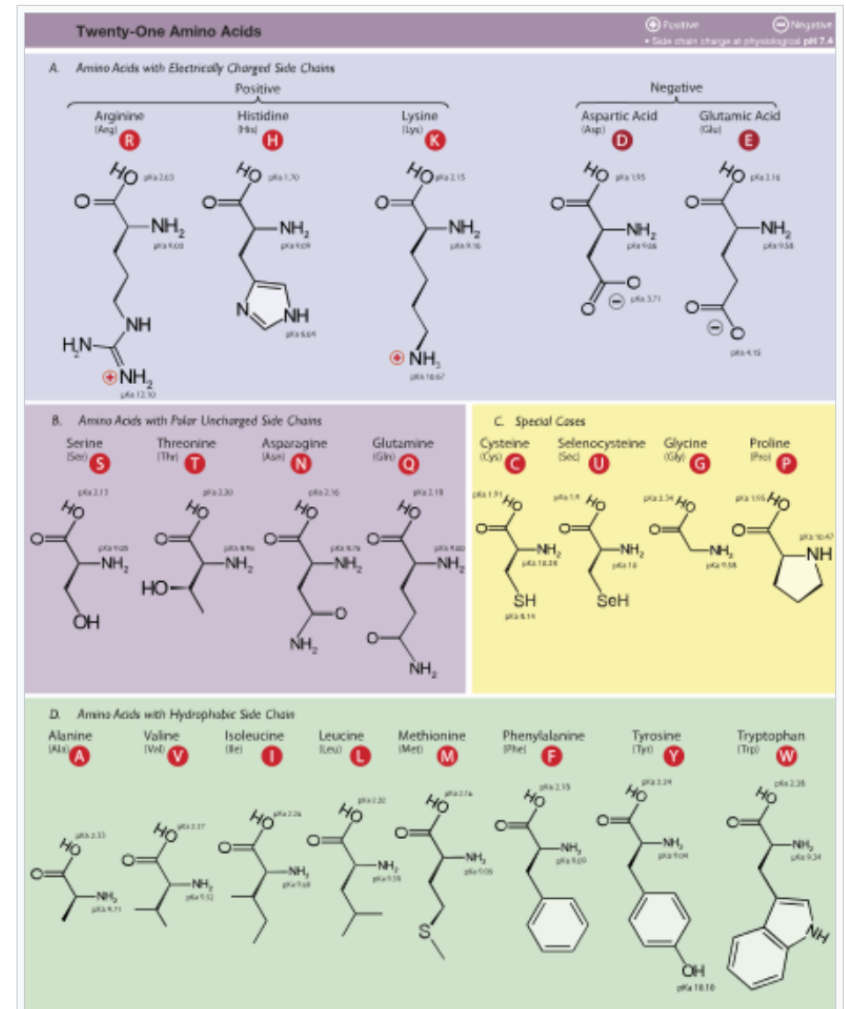
## General structure [\[ edit \]](#)

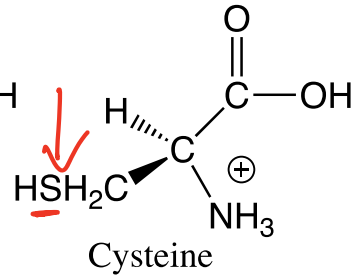
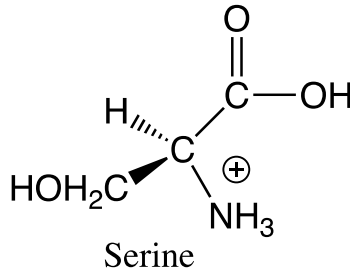
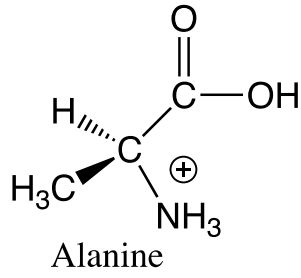
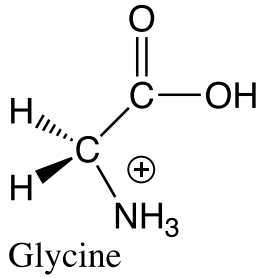
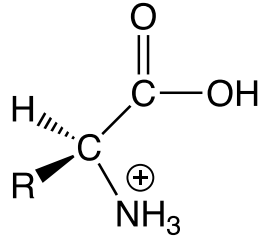
In the structure shown at the top of the page, **R** represents a [side chain](#) specific to each amino acid. The [carbon](#) atom next to the [carboxyl group](#) (which is therefore numbered 2 in the [carbon chain](#) starting from that functional group) is called the  $\alpha$ -carbon. Amino acids containing an [amino group](#) bonded directly to the alpha carbon are referred to as *alpha amino acids*.<sup>[34]</sup> These include amino acids such as [proline](#) which contain [secondary amines](#), which used to be often referred to as "imino acids".<sup>[35][36][37]</sup>

## Isomerism [\[ edit \]](#)

The alpha amino acids are the most common form found in nature, but only when occurring in the L-isomer. The alpha carbon is a [chiral](#) carbon atom, with the exception of [glycine](#) which has two indistinguishable hydrogen atoms on the alpha carbon.<sup>[38]</sup>

Therefore, all alpha amino acids but [glycine](#) can exist in either of two [enantiomers](#), called L or D amino acids, which are mirror images of each other (*see also* [Chirality](#)). While L-amino acids represent all of the amino acids found in [proteins](#) during translation in the ribosome, D-amino acids are found in some proteins produced by enzyme [posttranslational modifications](#) after [translation](#) and [translocation](#) to the [endoplasmic reticulum](#), as in exotic sea-dwelling organisms such as [cone snails](#).<sup>[39]</sup> They are also abundant components of the [peptidoglycan cell walls](#) of bacteria,<sup>[40]</sup> and D-serine may act as a [neurotransmitter](#) in the brain.<sup>[41]</sup> D-amino acids are used in [racemic crystallography](#) to create centrosymmetric crystals, which (depending on the protein) may allow for easier and more robust protein structure determination.<sup>[42]</sup>





X

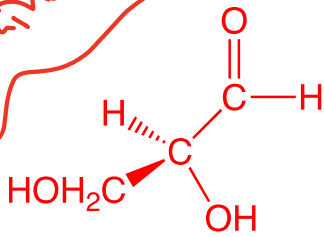
S

S

R

IUPAC

Can be used to synthesize all 19 chiral amino acids



(L)-(-)-Glyceraldehyde

Levorotary

Another word for "-"  
Rotates the plane of plane polarized light counter-clockwise



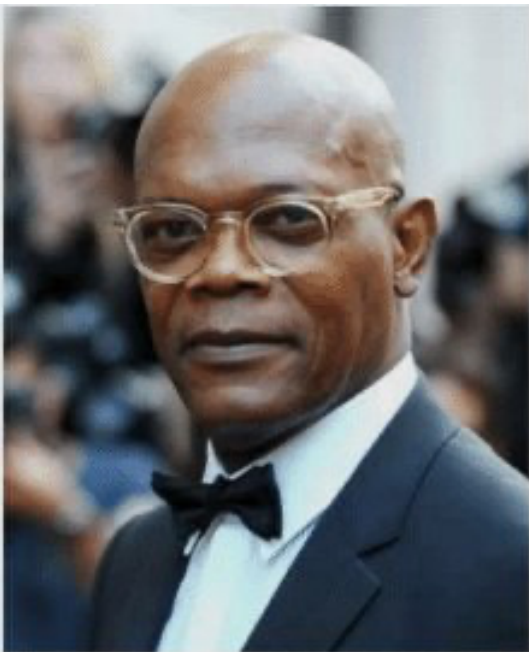
(D)-(+)-Glyceraldehyde

Dextrorotary

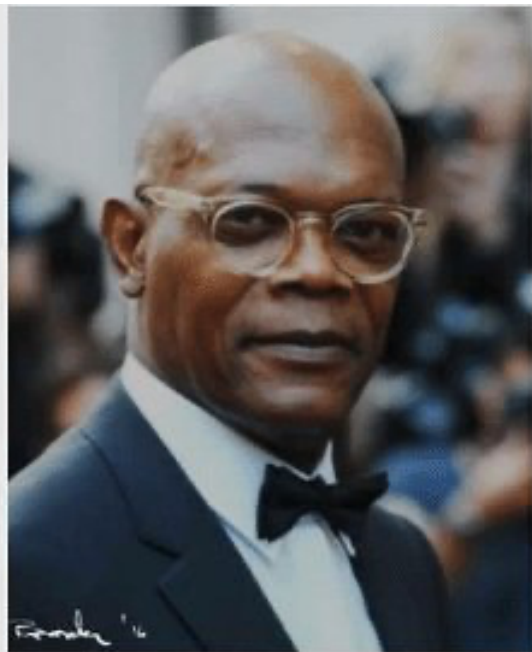
Another word for "+"  
Rotates the plane of plane polarized light clockwise

The 19 chiral common amino acids are all "L" amino acids (even cysteine!)

The "L" designation of amino acids is based on the structural relationship to (L)-(-)-glyceraldehyde



Samuel-L-Jackson



Samuel-D-Jackson

I hope this goes chiral

