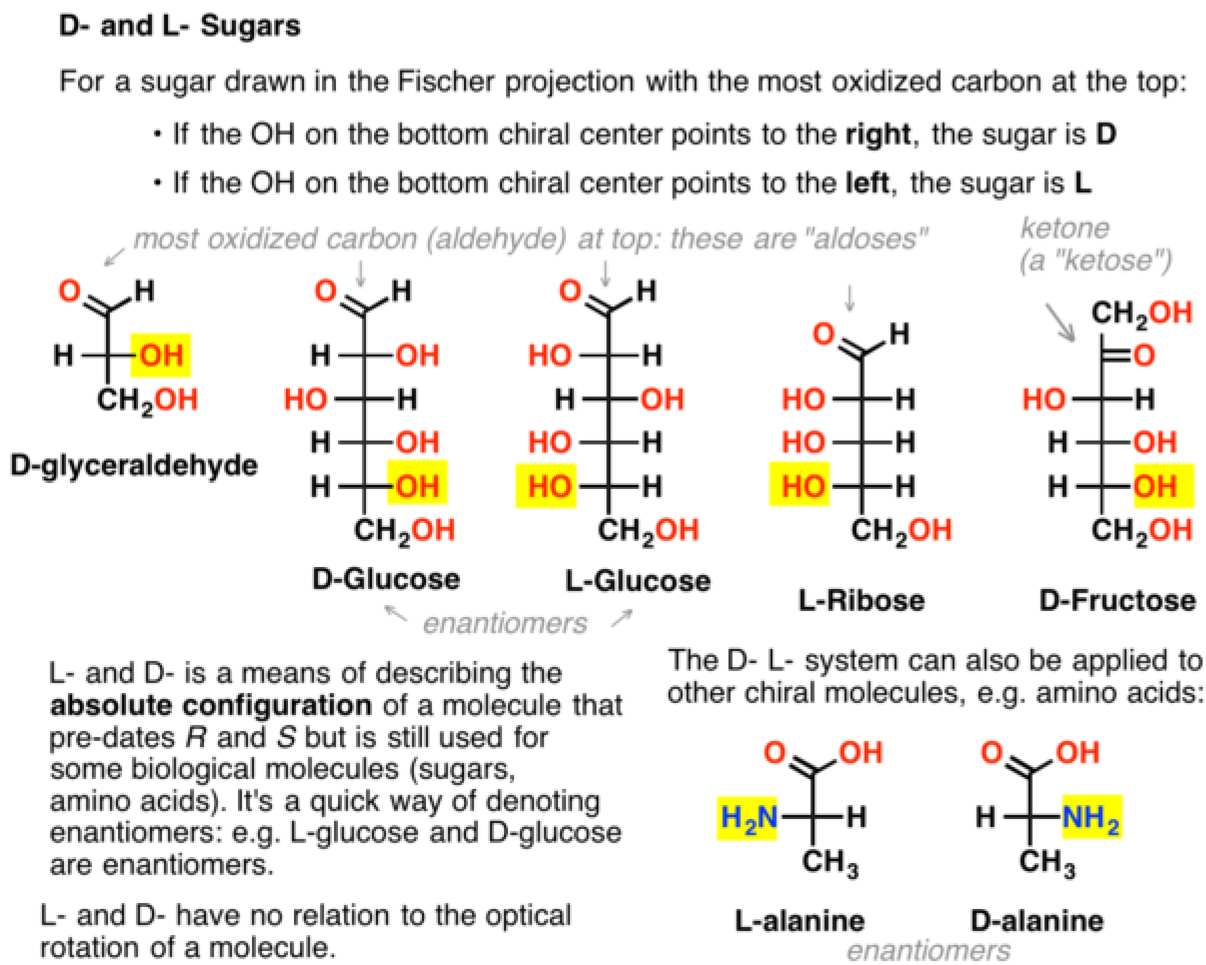
**Monosaccharide**

D AND L ISOMERS

For a sugar drawn in the Fischer projection with the most oxidized carbon at the top:

- if the OH on the bottom chiral centre points to the right, it is referred to as **D-**
- if the OH on the bottom chiral centre points to the left, it is referred to as **L-** .



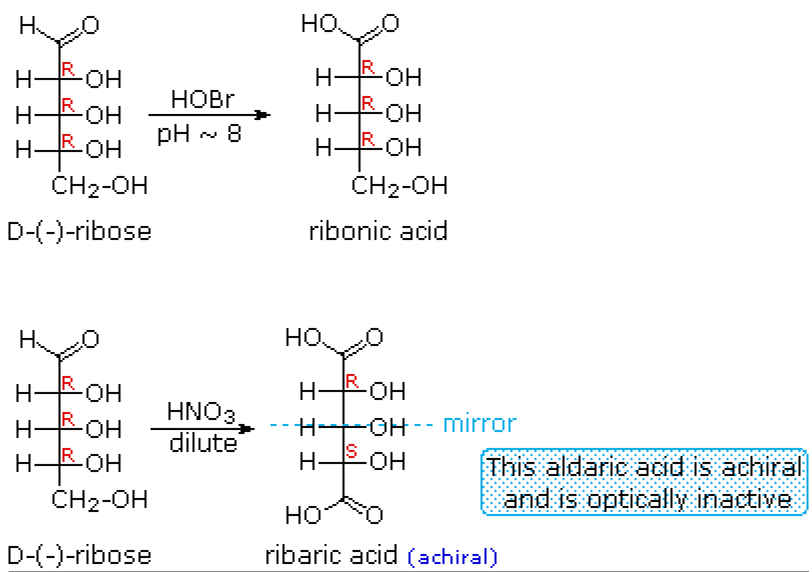

**<u>Optical activity of sugars</u>**

**Optical activity of carbohydrates**

Carbohydrates solutions have the property to rotate the plane-polarized light to the right or left. This property is called optical activity of the carbohydrates. This property is due to the presence of the asymmetric carbon atoms in their structures. The sugars rotating the plane-polarized light to left are termed as levorotatory while those which rotate the plane-polarized light to right are termed as dextrorotatory. The levorotation is represented by l or (–) sign while the dextrorotation is represented by d or (+) sign. There is no relation between D and L and (–) and (+) signs. A sugar may be a D sugar and levorotatory e.g. D-fructose. In the solution, glucose is dextrorotatory and sometimes glucose is called dextrose. Trend of use of "l" and "d" has become deleted. Now a days (–) and (+) signs are used for optical activity.

There are some conditions in which the plane-polarized will neither be rotated to right nor to left. Those are

1. If the compound does not possess an asymmetric carbon atom in its structure.
2. If equal quantities of the dextrorotatory and levorotatory isomers are present. Such mixtures are termed as racemic mixtures.
3. If a compound is a meso compound. Such compounds contain asymmetric carbon atoms but do not rotate the light. This is due to the fact that such compounds have two halves, one rotating the light to the right and the other to the left. This phenomenon is called as internal compensation e.g. meso tartaric acid.



# ENANTIOMERS AND EPIMERS

Stereoisomers are molecules that have the same molecular formula but different spatial arrangements. Enantiomers and epimers are optical isomers. Optical isomers are a subclass of stereoisomers. They are able to rotate the plane polarized light. In order to become stereoisomers, there should be at least one chiral carbon in molecules. In other words, a molecule with a chiral carbon can have stereoisomers due to different spatial arrangements of other groups attached to the chiral carbon. One molecule can have more than one chiral carbon. The main difference between enantiomers and epimers is that enantiomers are mirror images of each other whereas epimers are not mirror images of each other.

**Definition**

1. Enantiomers: Enantiomers are optical isomers that are non-superimposable mirror images of each other.
2. Epimers: Epimers are stereoisomers that contain more than one chiral carbon but differ from each other in the configuration at only one chiral carbon.

**Chiral Carbons**

1. Enantiomers: Enantiomers are different from each other at every chiral carbon.
2. Epimers: Epimers are different from each other at only one (or few) chiral carbons, but not all.

**Mirror Images**

1. Enantiomers: Enantiomers are non-superimposable mirror images of each other.
2. Epimers: Epimers are not mirror images of each other.

**Properties**

1. Enantiomers: The physical and chemical properties of enantiomers are the same except for the rotation of plane polarized light.
2. Epimers: The physical and chemical properties of epimers are different from each other.

# ENANTIOMERS
VERSUS
# EPIMERS

| ENANTIOMERS | EPIMERS |
| --- | --- |
| Enantiomers are optical isomers that are non-superimposable mirror images of each other | Epimers are stereoisomers that contain more than one chiral carbon but differ from each other in the configuration at only one chiral carbon |
| Different from each other at every chiral carbon | Different from each other at only one (or few) chiral carbons, but not all |
| Non-superimposable mirror images of each other | Not mirror images of each other |
| Physical and chemical properties are the same except for the rotation of plane polarized light | Physical and chemical properties are different from each other |