The stereochemistry of carbohydrates is generally described by using D/L notation, as opposed to the modern R/S (Cahn-Prelog-Ingold) method.

### Background of D/L notation

The d/l system (named after Latin dexter and laevus, right and left) names molecules by relating them to the molecule glyceraldehyde. Glyceraldehyde is chiral, and its two isomers are labeled d and l (typically typeset in small caps in published work). Certain chemical manipulations can be performed on glyceraldehyde without affecting its configuration, and its historical use for this purpose (possibly combined with its convenience as one of the smallest commonly used chiral molecules) has resulted in its use for nomenclature. In this system, compounds are named by analogy to glyceraldehyde, which, in general, produces unambiguous designations, but is easiest to see in the small biomolecules similar to glyceraldehyde. One example is the chiral amino acid alanine, which has two optical isomers, and they are labeled according to which isomer of glyceraldehyde they come from. On the other hand, glycine, the amino acid derived from glyceraldehyde, has no optical activity, as it is not chiral (achiral).

![Fischer projection of D and L glyceraldehyde](image)

The d/l labeling is unrelated to (+)/(-); it does not indicate which enantiomer is dextrorotatory and which is levorotatory. Rather, it says that the compound's stereochemistry is related to that of the dextrorotatory or levorotatory enantiomer of glyceraldehyde—the dextrorotatory isomer of glyceraldehyde is, in fact, the d-isomer. Nine of the nineteen l-amino acids commonly found in proteins are dextrorotatory (at a wavelength of 589 nm), and d-fructose is also referred to as levulose because it is levorotatory.

### Determining D/L notation in carbohydrates

A Fischer projection is used to differentiate between L- and D- carbohydrates. On a Fischer projection of a monosaccharide, the penultimate (“next-to-last”) carbon (alternatively, the last stereogenic carbon) of D sugars are depicted with hydrogen on the left and hydroxyl on the right. L sugars will be shown with the hydrogen on the right and the hydroxyl on the left. In a standard Haworth projection of the cyclohexane structures of hexoses, D-carbohydrates have the terminal carbon (typically -CH2OH) pointing up.

### Examples of D and L carbohydrates

The Fischer projections of D and L glyceraldehyde shown above illustrate the relationship between D and L and the
stereochemistry of the penultimate carbon.

Other examples:

Problems:

1) Assign R or S to each of the stereocenters in D-mannose

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