A Fischer projection or Fischer projection formula is a convention used to depict a stereoformula in two dimension without destroying the stereochemical information, i.e., absolute configuration, at chiral centers.

eg: (\(R\))-Lactic acid

![Fischer projection of Lactic acid]

To convert this stereoformula into a Fischer projection use the following procedure:

**Step 1**: Hold the molecule so that

1. the chiral center is on the plane of the paper,
2. two bonds are coming out of the plane of the paper and are on a horizontal plane,
3. the two remaining bonds are going into the plane of the paper and are on a vertical plane
Step 2: Push the two bonds coming out of the plane of the paper onto the plane of the paper.

Step 3: Pull the two bonds going into the plane of the paper onto the plane of the paper.
Step 4: Omit the chiral atom symbol for convenience.

This is the Fischer Projection of (R)-Lactic acid.

To determine the absolute configuration of a chiral center in a Fisher projection, use the following two-step procedure.

Step 1:
Assign priority numbers to the four ligands on the chiral center (see R,S convention).

eg:

Step 2:
If the lowest priority ligand is on a vertical bond, meaning that it is pointing away from the viewer, trace the three highest-priority ligands starting at the highest-priority ligand (① → ② → ③);

<table>
<thead>
<tr>
<th>direction of ① → ② → ③</th>
<th>absolute configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>clockwise</td>
<td>R</td>
</tr>
<tr>
<td>counterclockwise</td>
<td>S</td>
</tr>
</tbody>
</table>

eg:

If the lowest-priority ligand is on a horizontal bond, meaning that it is pointing toward the viewer, trace the three highest-
priority ligands starting at the highest-priority ligand (① → ② → ③);

<table>
<thead>
<tr>
<th>direction</th>
<th>absolute configuration</th>
</tr>
</thead>
<tbody>
<tr>
<td>clockwise</td>
<td>S</td>
</tr>
<tr>
<td>counterclockwise</td>
<td>R</td>
</tr>
</tbody>
</table>

eg:

A Fischer projection restricts a three-dimensional molecule into two dimensions. Consequently, there are limitations as to the operations that can be performed on a Fischer projection without changing the absolute configuration at chiral centers. The operations that do not change the absolute configuration at a chiral center in a Fischer projection can be summarized as two rules.

Rule 1: Rotation of the Fischer projection by 180° in either direction without lifting it off the plane of the paper does not change the absolute configuration at the chiral center.

eg:

Rule 2: Rotation of three ligands on the chiral center in either direction, keeping the remaining ligand in place, does not change the absolute configuration at the chiral center.

eg:
The operations that do change the absolute configuration at a chiral center in a Fischer projection can be summarized as two rules.

Rule 1: Rotation of the Fischer projection by 90° in either direction changes the absolute configuration at the chiral center.

eg:

Rule 2: Interchanging any two ligands on the chiral center changes the absolute configuration at the chiral center.

eg:
The above rules assume that the Fischer projection under consideration contains only one chiral center. However, with care, they can be applied to Fischer projections containing any number of chiral centers.

see also D,L-convention.

Contributors

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