

## OPTICAL ISOMERS

Optical isomerism is a form of stereoisomerism.

- same molecular and structural formula (connectivity between atoms is the same)
- different spatial arrangements of the atoms
- have non-superimposable mirror images / one cannot be superimposed on the other
- are described as chiral
- possess a chiral C atom / C atom bonded to 4 different atoms/groups

Each non-superimposable mirror image structure is called an enantiomer.

**KEY IDEA: There must be 4 different atoms/groups.**

Optical isomers rotate the plane of plane-polarised light, one enantiomer rotates the plane anticlockwise while the other enantiomer rotates the plane clockwise (by the same number of degrees). A racemic mixture is a mixture containing equal amounts of the enantiomers and it is not optically active – it will not rotate the plane-polarised light.

Which of the following could exist as enantiomers / optical isomers? Highlight any chiral centre(s).

<p>A.</p> $\begin{array}{c} \text{H} & & \text{H} \\ & \backslash & / \\ & \text{C} = \text{C} \\ & / & \backslash \\ \text{H} & & \text{Cl} \end{array}$	<p>B.</p> $\begin{array}{c} \text{H} \\   \\ \text{H} - \text{C} - \text{Br} \\   \\ \text{H} \end{array}$	<p>C.</p> $\begin{array}{c} \text{Br} \\   \\ \text{Cl} - \text{C} - \text{O} - \text{H} \\   \\ \text{H} \end{array}$
<p>D.</p> $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\   &   &   &   \\ \text{H} - \text{C} - & \text{C} - & \text{C} - & \text{C} - \text{H} \\   &   &   &   \\ \text{H} & \text{N} & \text{H} & \text{H} \\ & / \ \backslash & & \\ & \text{H} \ \ \text{H} & & \end{array}$	<p>E.</p> $\begin{array}{c} \text{H} & & \text{O} \\   & & // \\ \text{H} - \text{C} - & \text{C} \\   & \backslash \\ \text{H} & \text{C} - \text{H} \\ & / \ \backslash \\ & \text{H} \ \ \text{C} - \text{Cl} \\ & // \\ \text{H} - \text{C} - & \text{C} - \text{H} \\   & \backslash \\ \text{H} & \text{H} \end{array}$	
<p>F.</p> $\begin{array}{ccc} \text{H} & \text{H} & \text{O} \\   &   & // \\ \text{H} - \text{C} - & \text{C} - & \text{C} \\   &   & \backslash \\ \text{H} & \text{N} & \text{O} - \text{H} \\ & / \ \backslash & \\ & \text{H} \ \ \text{H} & \end{array}$	<p>G.</p> $\begin{array}{cc} \text{H} & \text{H} \\   &   \\ \text{H} - \text{C} - & \text{C} - \text{Cl} \\   &   \\ \text{H} & \text{O} \\ &   \\ & \text{H} \end{array}$	
<p>H.</p> $\begin{array}{cccc} \text{H} & \text{H} & \text{H} & \text{H} \\   &   &   &   \\ \text{H} - \text{C} - & \text{C} - & \text{C} - & \text{C} - \text{H} \\   &   &   &   \\ \text{H} & \text{O} & \text{H} & \text{H} \\ &   & & \\ & \text{H} & & \end{array}$		

Answers:

<p>A.</p> $  \begin{array}{c}  \text{H} \quad \text{H} \\  \diagdown \quad / \\  \text{C} = \text{C} \\  / \quad \diagdown \\  \text{H} \quad \text{Cl}  \end{array}  $	<p>B.</p> $  \begin{array}{c}  \text{H} \\    \\  \text{H} - \text{C} - \text{Br} \\    \\  \text{H}  \end{array}  $	<p>C.</p> $  \begin{array}{c}  \text{Br} \\    \\  \text{Cl} - \text{C} - \text{O} - \text{H} \\    \\  \text{H}  \end{array}  $
<p>D.</p> $  \begin{array}{cccc}  & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   \\  \text{H} - & \text{C} - & \text{C} - & \text{C} - & \text{H} \\  &   &   &   & \\  & \text{H} & \text{N} & \text{H} & \\  & & / \quad \backslash & & \\  & & \text{H} \quad \text{H} & &   \end{array}  $	<p>E.</p> $  \begin{array}{c}  \text{H} \quad \text{O} \\    \quad // \\  \text{H} - \text{C} - \text{C} \\    \quad \backslash \\  \text{H} \quad \text{H} \\  \quad \quad \backslash \\  \quad \quad \quad \text{C} - \text{H} \\  \quad \quad \quad / \quad \backslash \\  \quad \quad \quad \text{H} \quad \text{C} - \text{Cl} \\  \quad \quad \quad // \\  \quad \quad \quad \text{C} - \text{H} \\  \quad \quad \quad   \\  \quad \quad \quad \text{H} - \text{C} - \text{H} \\  \quad \quad \quad   \\  \quad \quad \quad \text{H}  \end{array}  $	
<p>F.</p> $  \begin{array}{ccc}  \text{H} \quad \text{H} \quad \text{O} \\    \quad   \quad // \\  \text{H} - \text{C} - \text{C} - \text{C} \\    \quad   \quad \backslash \\  \text{H} \quad \text{N} \quad \text{O} \\  \quad \quad / \quad \backslash \\  \quad \quad \text{H} \quad \text{H}  \end{array}  $	<p>G.</p> $  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H} - \text{C} - \text{C} - \text{Cl} \\    \quad   \\  \text{H} \quad \text{O} \\  \quad \quad   \\  \quad \quad \text{H}  \end{array}  $	
<p>H.</p> $  \begin{array}{cccc}  & \text{H} & \text{H} & \text{H} & \text{H} \\  &   &   &   &   \\  \text{H} - & \text{C} - & \text{C} - & \text{C} - & \text{H} \\  &   &   &   & \\  & \text{H} & \text{O} & \text{H} & \\  & &   & & \\  & & \text{H} & &   \end{array}  $		