Optical isomerism

OCR A H432 · A level

Answer on your own paper. Show your working where needed.

1. Spot a chiral carbon

In each alcohol, examine the carbon bonded to OH. Decide whether it is chiral. A is $CH_3CH(OH)CH_3$. B is $CH_3CH(OH)CH_2CH_3$. Give the groups that make the distinction.

2. Connectivity and arrangement

A student calls two non-superimposable mirror images structural isomers because their diagrams look different. Correct the student by comparing the connectivity and three-dimensional arrangements.

3. Draw both mirror images

Draw the two enantiomers of butan-2-ol, $CH_3CH(OH)CH_2CH_3$, using a solid wedge and a dashed wedge in each diagram. Show the four groups bonded to the chiral carbon.

4. Change the branching

Compare optical isomerism in 2-methylbutane, $CH_3CH(CH_3)CH_2CH_3$, and 3-methylhexane, $CH_3CH_2CH(CH_3)CH_2CH_2CH_3$. Focus on the carbon at the branch point.

5. Compare two wedge drawings

At a chiral carbon, a student swaps the positions of H and OH. They also swap the other two groups, methyl and ethyl. Do the two drawings show different enantiomers? Explain.

6. Compare two reduction products

Reduction changes each C=O into CH(OH). Compare the products from $CH_3COCH_2CH_2CH_3$ and $CH_3CH_2COCH_2CH_3$. Which product has a chiral centre? Justify both decisions.

7. Inspect each carbon

Number the chain of $HOOCCH(OH)CH(OH)CH_3$ starting at COOH as carbon 1. Identify all its chiral carbons and justify the choice.

8. Find the change that removes chirality

The OH-bearing carbon in $CH_3CH(OH)CH_2CH_2Br$ is chiral. What happens to that centre when the alcohol group is oxidised with acidified dichromate? Explain in terms of the organic structure.

9. Extra challenge · Track chiral centres through a reaction

Number $HOCH_2CH(Br)CH(CH_3)CH(OH)CH_3$ from the CH_2OH end. Identify every chiral carbon and give the four groups at C3.

In a proposed reaction, only the secondary alcohol is oxidised to a ketone. Write the product structure and identify every chiral carbon that remains.

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