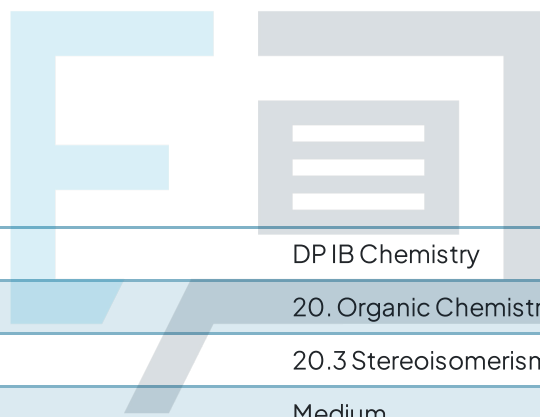




20.3 Stereoisomerism

Mark Schemes



Course	DP IB Chemistry
Section	20. Organic Chemistry (HL only)
Topic	20.3 Stereoisomerism
Difficulty	Medium

Exam Papers Practice

To be used by all students preparing for DP IB Chemistry HL
Students of other boards may also find this useful

1

The correct answer is **A** because:

- Cis and trans isomers differ by having two of the same groups on the same side or opposite side of the plane of double bond
- The identical groups are ethyl CH_3CH_2 which are the same side in X and on opposite sides in Z

B & C are incorrect as	Y is not an isomer of X or W (Y is short of an ethyl group)
D is incorrect as	W and Z are the same molecule. If you flip W by 180° you get Z

2

The correct answer is **C** because:

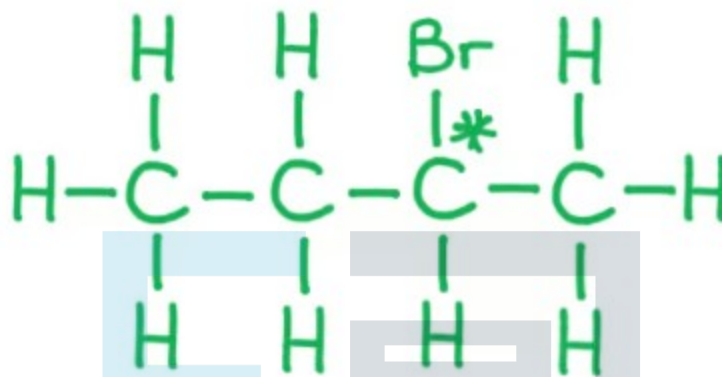
- Following the naming rules:
 - The carbon skeleton is a derivative of ethene
 - The lowest number combination for substituents is 1,1, 2
 - The halogens are named in alphabetical order
 - The CIP rule is that the two atoms with the highest atomic numbers on the same side of the double bond is the Z isomer, in this case Br and Cl

A & B are incorrect as	this does not give the lowest numbering combination
D is incorrect as	this is the right molecule, but the wrong E/Z isomer

3

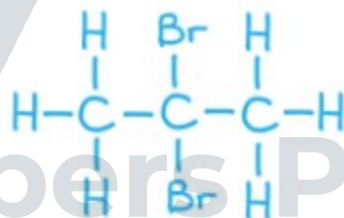
The correct answer is **A** because:

- The second carbon on the chain has four different groups on it so is an asymmetric carbon resulting in two optical isomers
- The best way to see this is to draw the molecule:



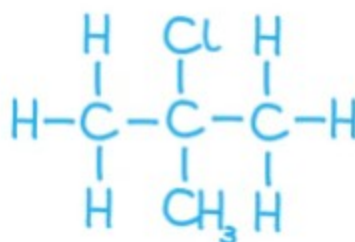
B is incorrect as

1,3-dibromopropane has no asymmetric carbons:



C is incorrect as

2-chloro-2-methylpropane has no asymmetric carbons:



<p>D is incorrect as</p>	<p>3-bromopentane has no asymmetric carbons:</p> $ \begin{array}{ccccccccc} & \text{H} & \text{H} & \text{Br} & \text{H} & \text{H} & & & \\ & & & & & & & & \\ \text{H} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{C} & -\text{H} & & \\ & & & & & & & & \\ & \text{H} & \text{H} & \text{H} & \text{H} & \text{H} & & & \end{array} $
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4

The correct answer is **C** because:

- Two methyl groups are on the same side of the double bond so this is a cis isomer
- The lowest number position for the double bond is 2, which makes the methyl group on the third carbon, so the molecule is *cis*-3-methyl-2-hexene
- It can also be named *cis*-3-methylhex-2-ene

<p>A is incorrect as</p>	<p>this is not the lowest numbering combination</p>
<p>B is incorrect as</p>	<p>this is not a trans isomer nor the lowest numbering combination</p>
<p>D is incorrect as</p>	<p>this is the right numbering but not the right isomer</p>



5

The correct answer is **B** because:

- The second carbon on the chain has four different groups (methyl, ethyl, hydroxyl and hydrogen) attached so it will have enantiomers



- Enantiomers are optical isomer pairs

A is incorrect as	the double bond has two hydrogens attached at one end so it cannot form <i>E/Z</i> isomers
C is incorrect as	cis-trans isomers have the double bond located on the same carbon. But-1-ene and but-2-ene are positional isomers
D is incorrect as	optical isomers have the same name with a prefix in front (+/-, d/l, D/L and R/S are used). Butan-1-ol and butan-2-ol are positional isomers

Exam Papers Practice