Mr Cole Science

Name: _____ Date: _____

AQA A-LEVEL CHEMISTRY

Stereoisomerism: Explaining E/Z Isomerism

Learn Pack

Guided notes, worked examples and practice questions to be completed alongside the lesson.

WATCH THE LESSON

Isomerism

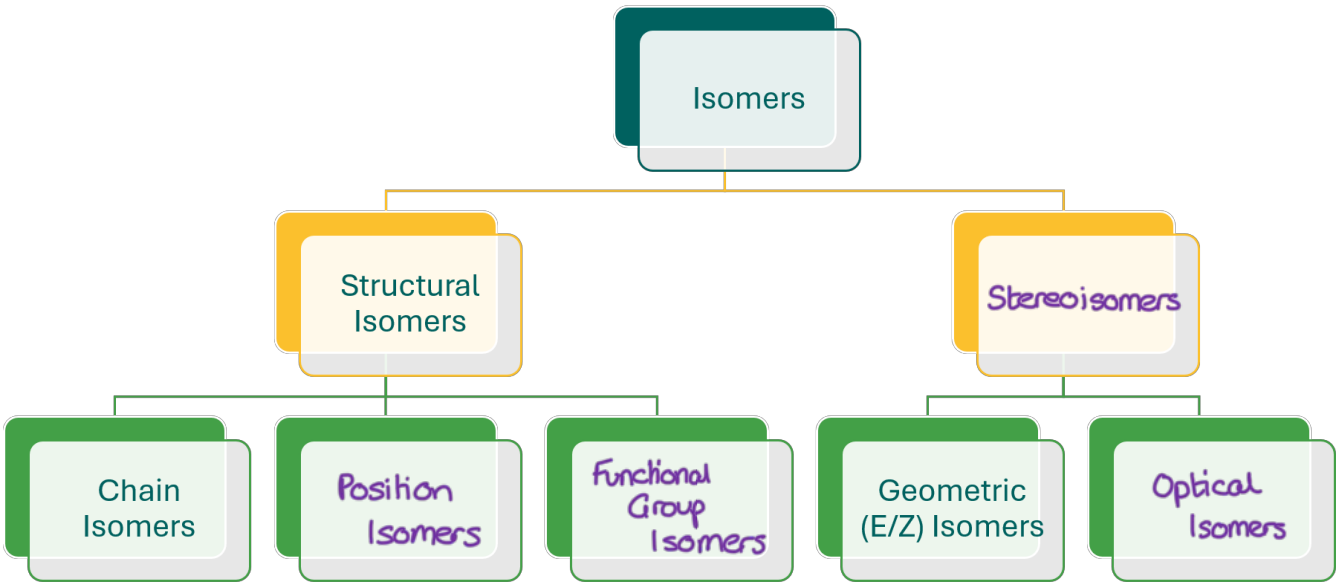
Lesson Objectives:

- Know what stereoisomers are.
- Know what geometric (E/Z) isomerism is.
- Understand why carbon–carbon double bonds can give rise to E/Z isomerism.
- Be able to draw structural formulae of E and Z isomers.

Isomers are molecules that have the same molecular formula but a different arrangement of atoms.

Structural isomers have the same molecular formula but different structural formulae.

Stereoisomers have the same molecular formula and the same structural formula but a different arrangement of atoms in space.



Geometric (E/Z) Isomerism

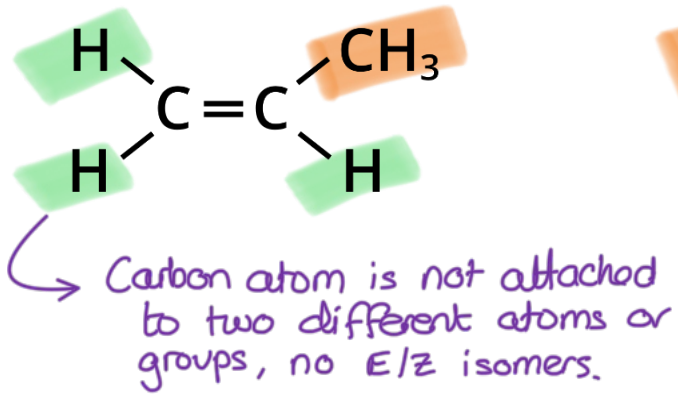
Geometric isomers are stereoisomers that differ because atoms or groups of atoms are arranged differently around carbon-carbon double bonds.

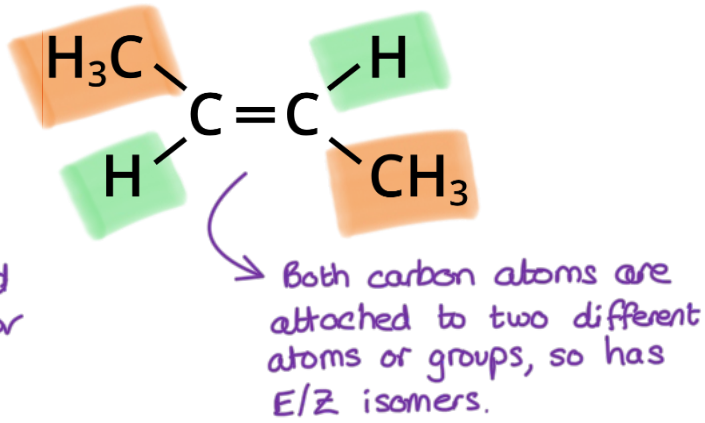
Explain what is meant by restricted rotation:

Atoms held together by double bonds cannot freely rotate about that bond, locking in the positions of atoms or groups of atoms attached to the atoms making the double bond.

For E/Z isomerism to exist, each carbon atom in the carbon-carbon double bond must be attached to two different groups.

Annotate the formulae below to explain whether they would demonstrate E/Z isomerism or not:



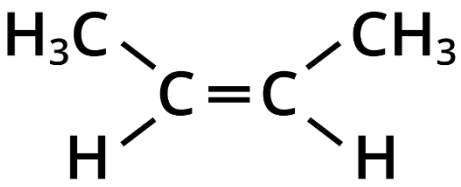


Naming E/Z Isomers:

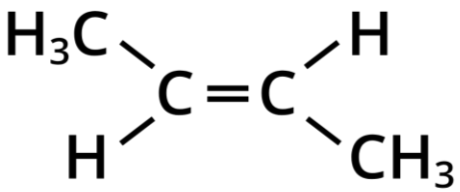
For IUPAC naming conventions scientists need a way to identify the two different isomers that can be formed by geometric isomerism, they use the prefixes E and Z to do this.

Prefix	German Word	Meaning
E	Entgegen	Opposite
Z	Zusammen	Together

Name the following E/Z isomers:



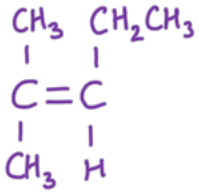
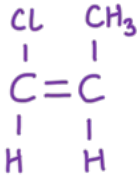
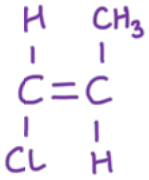
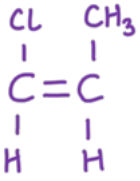
Z-but-2-ene



E-but-2-ene

Identifying E/Z Isomers

Determine whether the following molecules display E/Z isomerism or not, if they do draw both the E and Z isomer:

Chemical	Structural Formula	E/Z?	E-Isomer	Z-Isomer
2-methylpent-2-ene		N	N/A	N/A
1-chloropropene		Y		

Practise Questions – Fact Recall

1. What is a stereoisomer?

   Molecules with the same molecular and structural formula but with a different arrangement of atoms in space.

2. What is geometric (E/Z) isomerism?

   Where molecules differ because atoms or groups of atoms are arranged differently around carbon-carbon double bonds.

3. What is it about carbon-carbon double bonds that allows E/Z isomerism to occur?

   Restricted rotation about the carbon-carbon double bond.

4. What condition is required for E/Z isomerism?

   Each carbon atom in the carbon-carbon double bond must be attached to two different groups.

5. What is an E-isomer?

Where the priority groups on each carbon atom are on opposite sides of the double bond.

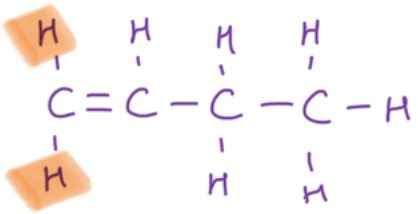
6. What is a Z-isomer?

Where the priority groups on each carbon atom are on the same side of the double bond.

Practise Questions – Application

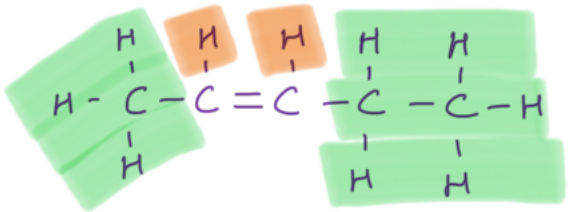
1. Determine whether the following molecules display E/Z isomerism:

a) But-1-ene



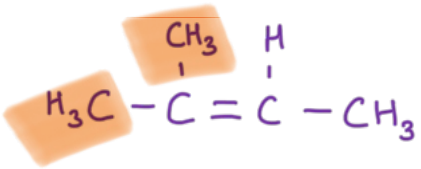
No

b) Pent-2-ene



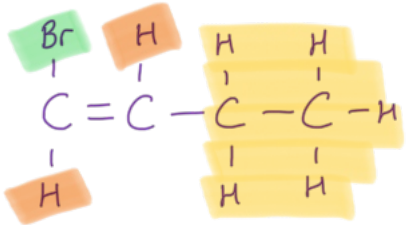
Yes

c) 2-methylbut-2-ene



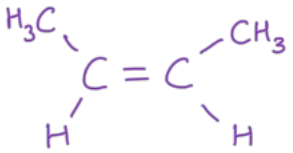
No

d) 1-bromobut-1-ene

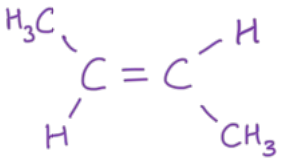


Yes

2. Draw both the E and Z isomer of but-2-ene.

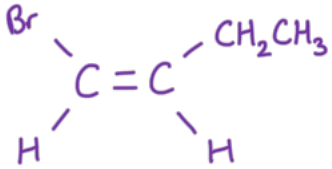


Z-but-2-ene

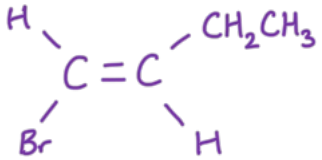


E-but-2-ene

3. Draw both the E and Z isomer of 1-bromobut-1-ene.



Z-1-bromobut-1-ene



E-1-bromobut-1-ene

4. Explain why propene does not display E/Z isomerism.

Because each carbon atom in the carbon-carbon double bond does not have two differerent groups attached to it.

5. A student says, "Every alkene shows E/Z isomerism.". Explain why this statement is incorrect.

In orde for E-Z isomerism to exist both carbon atoms in a carbon-carbon double bond need to have two different groups attached to them, this is not the case for all alkenes.