

Name: _____

Date: _____

AQA A-LEVEL CHEMISTRY

Structural Isomerism: Chain, Position and Functional Group Isomers

Learn Pack

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



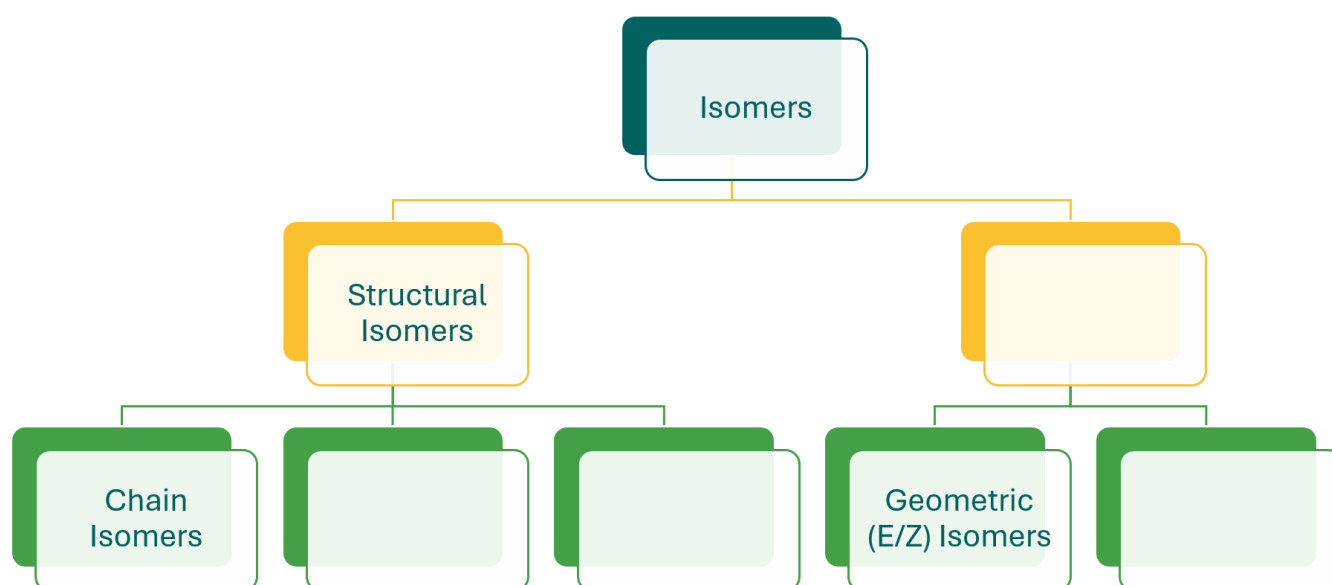
Isomerism

Isomers are molecules that have the same _____
but a different _____ of
atoms.

This definition can feel a little vague and so as a consequence scientists classify Isomers into different types depending upon what the differences between the molecules are:

Lesson Objectives:

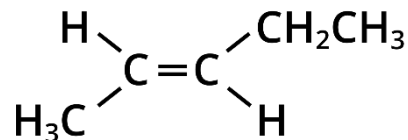
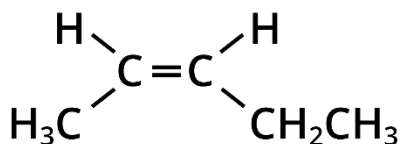
- Know what isomers are.
- Know what structural isomers are.
- Classify structural isomers as either chain, position or functional group isomers.
- Understand what bond free rotation is.



Structural Isomers

Structural isomers have the same _____ formula but a different
_____ formula.

Substance	$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{H} \quad \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \quad \text{H} \end{array} $
Molecular Formula		
Structural Formula		



Explain why these two substances are not structural isomers:

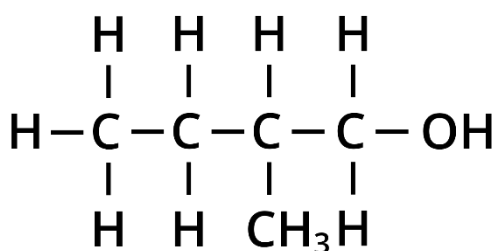
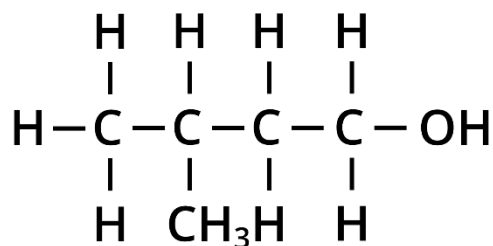
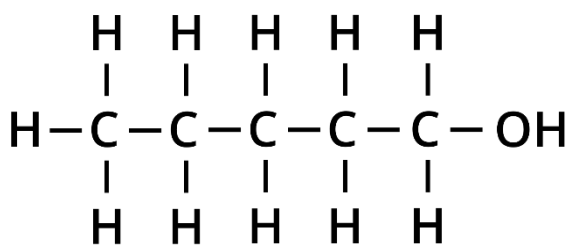
Chain Isomers

Chain isomers:

- Contain the same _____.
- Have different arrangements of the _____.

For each of the following substances:

1. Highlight the carbon skeleton.
2. Circle the functional group.



Position Isomers

Position isomers:

- Have the same _____.
- Have the same _____.
- Differ in the _____ of the functional group.

For the following pairs of molecules, decide whether they are position isomers or not:

Molecules		Position Isomers?
$ \begin{array}{cccc} \text{H} & \text{Br} & \text{H} & \text{H} \\ & & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $	$ \begin{array}{cccc} \text{Br} & \text{H} & \text{H} & \text{H} \\ & & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $	
$ \begin{array}{cccc} \text{H} & \text{H} & \text{Br} & \text{H} \\ & & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $	$ \begin{array}{cccc} \text{H} & \text{Br} & \text{H} & \text{H} \\ & & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & & \\ \text{H} & \text{H} & \text{H} & \text{H} \end{array} $	
$ \begin{array}{ccc} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{OH} \\ & & \\ \text{H} & \text{H} & \text{H} \end{array} $	$ \begin{array}{ccc} \text{H} & \text{H} & \text{H} \\ & & \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ & & \\ \text{H} & \text{OHH} & \end{array} $	

Functional Group Isomers

Functional group isomers have the same _____ arranged into different _____.

Common examples:

Homologous Series	Functional Group Isomer
Alkenes	
Alcohols	
Aldehydes	

Why are pentanal and pentan-2-one functional group isomers rather than position isomers?

Identifying Structural Isomers

Carbon-carbon single bonds allow: _____

This means that:

For the following pairs of molecules, decide whether they are structural isomers or not:

Molecules		Structural Isomers?
$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{OH} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{OH} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	
$ \begin{array}{c} \text{H} \quad \text{Cl} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{Cl} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	
$ \begin{array}{c} \text{Br} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \end{array} $	$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \\ \text{Br} \quad \text{H} \quad \text{H} \end{array} $	

If you're unsure whether two compounds are structural isomers, you can compare either their _____ or their _____.

Practise Questions – Fact Recall

1. What is an isomer?

2. What are structural isomers?

3. What are position isomers?

4. What are functional group isomers?

5. What are chain isomers?

Practise Questions – Application

1. Draw all the chain isomers of C_5H_{12} .

2. Draw a functional group isomer of propanal.

3. Draw a functional group isomer of pent-2-ene.

4. Draw a position isomer of pent-2-ene.

5. State what type of structural isomerism is shown by the following pairs of molecules.

Molecules	Type of Structural Isomerism
$ \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{C}-\text{O}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} \qquad \begin{array}{c} \text{H} \quad \text{H} \\ \quad \\ \text{H}-\text{C}-\text{O}-\text{C}-\text{H} \\ \quad \\ \text{H} \quad \text{H} \end{array} $	
$ \begin{array}{c} \text{Br} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} \qquad \begin{array}{c} \text{H} \quad \text{H} \quad \text{Br} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{H} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} $	
$ \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{C}-\text{OH} \\ \quad \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \end{array} \qquad \begin{array}{c} \text{H} \quad \text{H} \quad \text{H} \quad \text{H} \\ \quad \quad \quad \\ \text{H}-\text{C}-\text{C}-\text{C}-\text{C}-\text{OH} \\ \quad \quad \quad \\ \text{H} \quad \text{H} \quad \text{CH}_3 \quad \text{H} \end{array} $	