$Cis-trans$ isomerism

A Level

Part A $Cis-trans$ isomers

Which formula could represent a compound which has *cis-trans* isomers?

- $C_2H_6O_2$
- $C_2H_2Cl_2$
- $C_2H_2O_4$
- C_2H_3Cl

Part B $E-Z$ or $cis-trans$

Which of the following exhibit *E-Z* isomerism but **not** *cis-trans* isomerism?

1. $CHCl{=}CHF$
2. $CClH{=}CHCl$
3. $CClBr{=}CHF$

- **1**, **2** and **3** are correct
- **1** and **2** only are correct
- **2** and **3** only are correct
- **1** only is correct
- **3** only is correct

Part A adapted with permission from UCLES, A-Level Chemistry, November 1996, Paper 4, Question 19;
Part B created for isaacphysics.org by R. Less

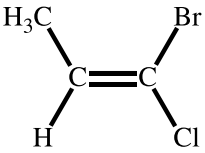
$E-Z$ isomerism

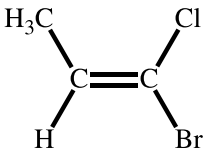
A Level

Part A Pairs of isomers

Which of the following pairs illustrate *E-Z* isomerism?

1





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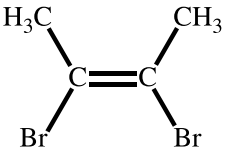

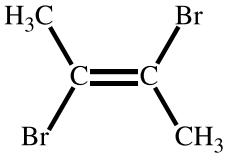

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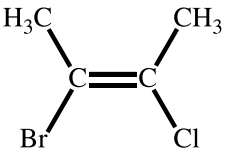


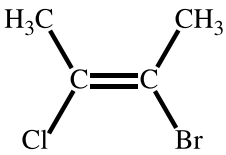


Figure 1: Pairs of stereoisomers

- **1**, **2** and **3** are correct
- **1** and **2** only are correct
- **2** and **3** only are correct
- **1** only is correct
- **3** only is correct

Part B Isomers of C_6H_{12}

Four isomers of C_6H_{12} are shown below.

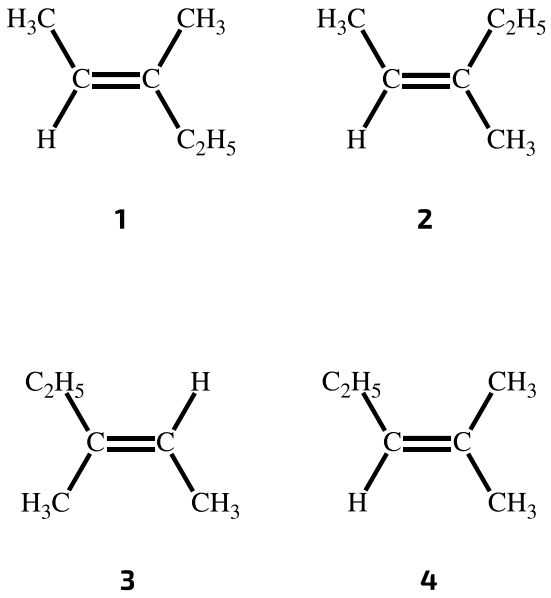


Figure 2: Four isomers of C_6H_{12}

Which of the following pairs consists of a pair of *cis-trans* isomers?

- **1** and **2**
- **1** and **3**
- **1** and **4**
- **2** and **4**
- **3** and **4**

Part A adapted with permission from UCLES, A-Level Chemistry, November 1992, Paper 4, Question 38;
Part B adapted with permission from UCLES, A-Level Chemistry, June 1992, Paper 4, Question 21

Isomerism in but-2-ene

A Level

Part A $CH_3CH{=}CHCH_3$

Draw a diagram of each stereoisomer which exists with the structure $CH_3CH{=}CHCH_3$ in this external structure editor.

When you have finished your structure click on the smiley face in the top left of the structure editor and copy and paste the string of letters (SMILES strings) into the box here.

Enter their structures as SMILES strings in the format "**A**, **B**" (space after comma).

Using the structure editor

Part B Feature of the molecule

What feature of the molecule enables these two isomers to exist as separate entities?

Part C Type of stereoisomerism

What is the name given to this type of stereoisomerism?

Adapted with permission from UCLES, Structured Science Scheme, June 1995, Unit C3: Essential Organic Chemistry, Question 4

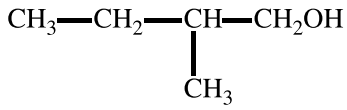
Isomers of alkenes

A Level

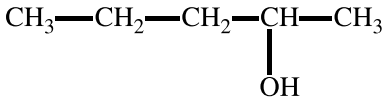
Part A $C_5H_{11}OH$ dehydration

Which of the following isomers of $C_5H_{11}OH$ gives, on dehydration, the greatest number of different alkenes?

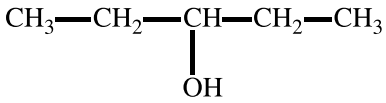
A



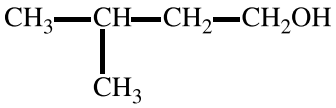
B



C



D



E

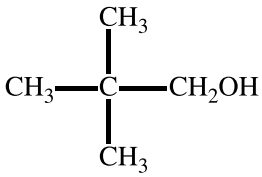
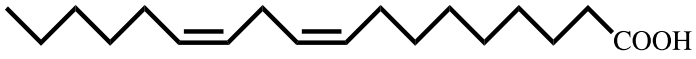


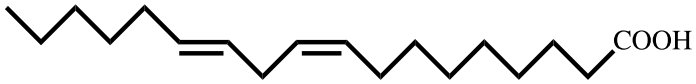
Figure 1: Isomers of $C_5H_{11}OH$

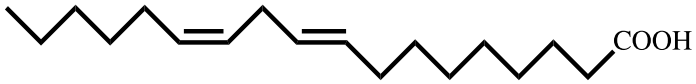
- A
- B
- C
- D
- E

Part B Linoleic acid

It is claimed that many polyunsaturated margarines contain esters derived from *cis-cis*-linoleic acid, $CH_3(CH_2)_4CH{=}CHCH_2CH{=}CH(CH_2)_7COOH$. Which simplified formula of linoleic acid contains the *cis-cis* arrangement?

A 

B 

C 

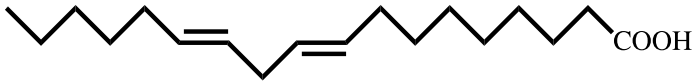
D 

Figure 2: Structures of linoleic acid

- A
- B
- C
- D

Part A adapted with permission from UCLES, A-Level Chemistry, June 1993, Paper 4, Question 26;
Part B adapted with permission from UCLES, A-Level Chemistry, June 1996, Paper 3, Question 19

Isomers of butanol

A Level

Alcohols can be classified as *primary*, *secondary* or *tertiary*.

Part A Primary alcohols of formula $C_4H_{10}O$

Use the structure editor to draw all the isomers of the *primary* alcohols of formula $C_4H_{10}O$.

Give your answer as SMILES strings in the format "**A**, **B**, *etc*" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Part B Secondary alcohols of formula $C_4H_{10}O$

Use the structure editor to draw all the isomers of the *secondary* alcohols of formula $C_4H_{10}O$.

Give your answer as SMILES strings in the format "**A**, **B**, *etc*" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Part C Tertiary alcohols of formula $C_4H_{10}O$

Use the structure editor to draw all the isomers of the *tertiary* alcohols of formula $C_4H_{10}O$.

Give your answer as SMILES strings in the format "**A**, **B**, *etc*" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Part A adapted with permission from UCLES, Modular Science, November 1996, Chains and Rings, Question 6

Isomers of C_4H_8O

A Level

Part A Test with Tollens' reagent

How many structural isomers with the molecular formula C_4H_8O can reduce a solution containing $Ag(NH_3)_2^+$ ions (Tollens' reagent) to form a silver mirror?

- 1
- 2
- 3
- 4
- 5

Part B Containing $C=O$ group

How many structural isomers with the molecular formula C_4H_8O contain the $C=O$ group?

- 1
- 2
- 3
- 4
- 5

Part A adapted with permission from UCLES, A-Level Chemistry, November 1996, Paper 4, Question 275;
Part B created for isaacphysics.org by R. Less

Isomers of $C_5H_{10}O$

A Level

The various structural isomers of $C_5H_{10}O$ can contain different functional groups.

Part A Aldehydes

How many isomers of $C_5H_{10}O$ are **aldehydes**?

Part B Ketones

Use the structure editor to draw all **ketones** of formula $C_5H_{10}O$.

Give your answer as SMILES strings in the format "**A**, **B**, *etc.*" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Created for isaacphysics.org by R. Less

Isomers of hydrocarbons

A Level

Part A Isomers of C_4H_{10}

Use the structure editor to draw all structural isomers of C_4H_{10}.

Give your answer as SMILES strings in the format "**A**, **B**, *etc.*" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Part B Isomers of C_5H_{12}

Use the structure editor to draw all structural isomers of C_5H_{12}.

Give your answer as SMILES strings in the format "**A**, **B**, *etc.*" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Part C Isomers of C_6H_{14}

How many structural isomers of C_6H_{14} are there?

Part D Isomers of C_4H_8

How many structural isomers of C_4H_8 are there?

Oxygen-inserting bacteria

A Level

Bacteria have been suggested as a possible means of cleaning up oil spillages. Some bacteria contain enzymes that can insert one or more oxygen atoms into any carbon-hydrogen bond in an alkane. This converts a water-insoluble alkane into a water-soluble alcohol, e.g. $CH_3CH_3 \longrightarrow CH_3CH_2OH$.

Which of the following alcohols could be obtained by this process from $(CH_3)_2CHCH_2CH_3$?

1 $(CH_3)_2C(OH)CH(OH)CH_3$
2 $CH_3CH(OH)CH(CH_3)_2$
3 $CH_3CH_2CH(CH_2OH)_2$

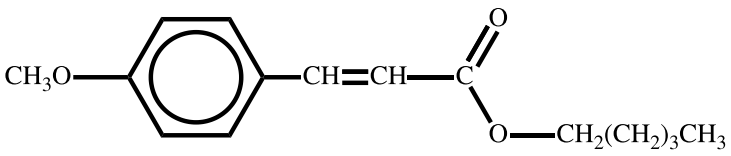
- **1**, **2** and **3** are correct
- **1** and **2** only are correct
- **2** and **3** only are correct
- **1** only is correct
- **3** only is correct

Adapted with permission from UCLES, A-Level Chemistry, November 1995, Paper 4, Question 39

Suntan cream

A Level

Pentyl 4-methoxycinnamate, **A**, is used in various suntan creams to absorb excessive ultra violet radiation and stop the skin burning.



A

Figure 1: Structure of pentyl 4-methoxycinnamate, **A**

Part A Isomers

The formula above represents two isomers. State the type of stereoisomerism **A** displays.

Part B Structures of A

Use the structure editor to draw the two isomers and give their SMILES strings below in the format "**X**, **Y**" (space after comma).

In the editor, after drawing your structure, click on the round, yellow smiley face to generate a SMILES string. Copy the SMILES string and paste it in the answer box.

Using the structure editor

Adapted with permission from UCLES, A-Level Chemistry, November 1991, Paper 3, Question 8