

20.3 Stereoisomerism

Question Paper

Course	DIPB Chemistry
Section	20. Organic Chemistry (HL only)
Topic	20.3 Stereoisomerism
Difficulty	Easy

Time allowed: 40
Score: /28
Percentage: /100

Question 1a

a)

Define the term *stereoisomers*.

[1]

[1 mark]

Question 1b

b)

State the conditions needed for a compound to show cis-trans isomerism.

[2]

[2 marks]

Question 1c

c)

Draw the structural formulae for the *E* and *Z* stereoisomers of pent-2-ene.

[2]

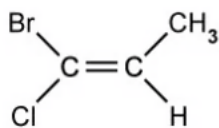
[2 marks]

Question 1d

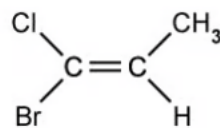
d)

2-bromo-1-chloropropene is a colourless, odourless liquid.

A student drew the two stereoisomers of 2-bromo-1-chloropropene below.



E-2-bromo-1-chloropropene



Z-2-bromo-1-chloropropene

State what is incorrect with their diagrams of these two stereoisomers.

[2]

[2 marks]

Question 2a

a)

Draw the *E* and *Z* stereoisomers for 2,3-dichlorobut-2-ene.

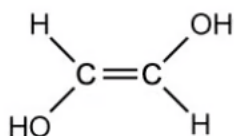
[2]

[2 marks]

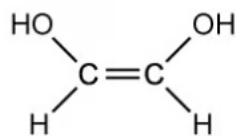
Question 2b

b)

Name compounds **C** and **D** using the *E/Z* naming system.



Compound C



Compound D

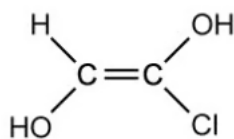
[2]

[2 marks]

Question 2c

c)

Compound **E** is a derivative of compound **C**.



Compound E

Suggest why the cis/trans naming system fails with compound **E**.

[1]

[1 mark]

Question 2d

d)

Describe the difference between conformational and configurational stereoisomers.

[2]

[2 marks]

Question 3a

a)

The chemical and physical properties of optical isomers are identical. However, there are some other differences that can be used to distinguish isomers from each other.

In terms of properties, state one difference between optical isomers.

[1]

[1 mark]

Question 3b

b)

Describe how you can detect optical activity in a sample.

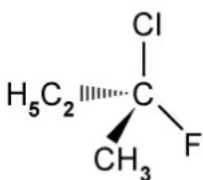
[2]

[2 marks]

Question 3c

c)

The structure of one optical isomer of a chlorofluorocarbon is shown below.



Draw the structure of the other enantiomer.

[1]

[1 mark]

Question 4a

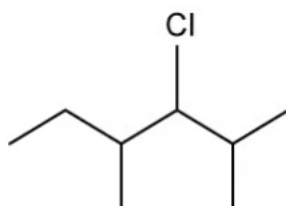
a)
State what is meant by the term a chiral carbon.

[1]

[1 mark]

Question 4b

b)
The skeletal structure of an organic compound is shown below.



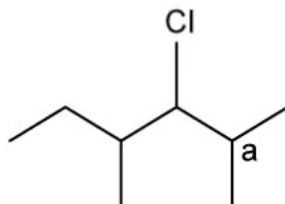
Identify the chiral carbons.

[2]

[2 marks]

Question 4c

c)
Explain why carbon **a** cannot be a chiral carbon.



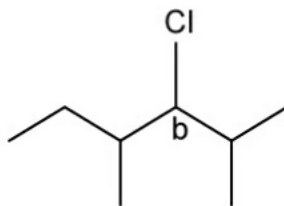
[1]

[1 mark]

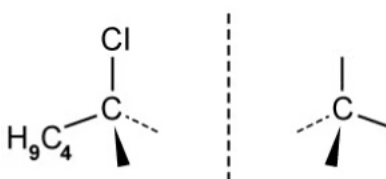
Question 4d

d)

The figure below identifies a different carbon, **b**, in the organic compounds structure.



Complete the figure below to show the 3D representations of the optical isomers formed at carbon **b**.



[2]

[2 marks]

Question 5a

a)

Define the term racemic mixture.

[1]

[1 mark]

Question 5b

b)

Describe the composition of enantiomers when a reaction mixture is optically active.

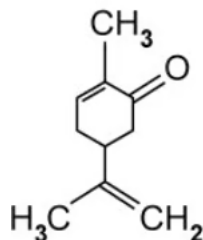
[1]

[1 mark]

Question 5c

c)

Carvone is an optically active molecule which is found widely in plants, mostly in caraway seeds and spearmint leaves. The structure is shown below.



Mark on the diagram using an asterisk (*) the chiral carbon which causes this structure to exhibit optical isomerism.

[1]

[1 mark]

Question 5d

d)

Draw the structure of the other optical isomer formed by carvone shown in part (c).

[1]

[1 mark]