CHEMISTRY ONLINE
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CHEMISTRY

ORGANIC CHEMISTRY II

Level & Board	AQA (A-LEVEL)
TOPIC:	OPTICAL ISOMERISM
PAPER TYPE:	QUESTION PAPER - 2
TOTAL QUESTIONS	10
TOTAL MARKS	/37

Optical Isomerism - 2

1. Why is the $CH_3CH(OH)CN$ molecule is chiral?

(3)

2. How many stereoisomers of 3-bromo-2-butanol, $CH_3CH(OH)CHBrCH_3$, exist?

A. 3
B. 1
C. 2
D. 4

(1)

3. P, Q and R have the molecular formula C_6H_{12}

All three are branched-chain molecules and none is cyclic.
P can represent a pair of optical isomers.
Q can represent a pair of geometrical isomers.
R can represent another pair of geometrical isomers different from Q.

Draw one possible structure for one of the isomers of each of P, Q and R.

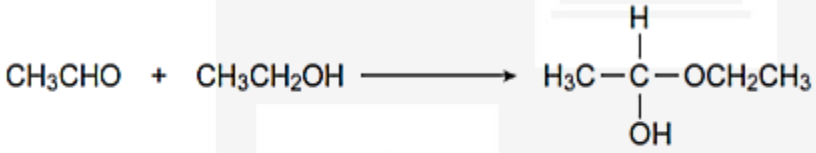
(3)

4. Which compound forms optically active compounds on reduction?

A. $CH_3CH_2C(CH_3)=CHCH_3$
B. $CH_3CH_2C(CH_3)=CH_2$
C. CH_3COCH_3
D. $CH_3CH_2COCH_3$

(1)

5. Hemiacetals and acetals are compounds formed by the reaction of aldehydes with alcohols, such as the reaction of ethanal with ethanol.



a hemiacetal

(a)

i. Use your knowledge of carbonyl mechanisms to suggest the name of the mechanism of this reaction.

(1)

ii. Outline how an ethanol molecule reacts with an ethanal molecule in the first step of this mechanism.

Include two curly arrows to show the movement of electron pairs.

(2)

(b) The reaction produces a racemic mixture of chiral molecules.

i. Explain the meaning of the term racemic mixture.

(1)

ii. State the relationship between two chiral molecules with the same structural formula.

(1)

6. Which compound does not show stereoisomerism?

A. 1,2-dichloropropene
B. 1,2-dichloropropane
C. 1,3-dichloropropene
D. 1,3-dichloropropane

(1)

7. Butan-2-ol reacts with concentrated sulfuric acid to produce three isomeric alkenes.

Name and outline a mechanism to show how any one of the alkenes is formed.

Explain how this reaction can lead to the formation of each of these three alkenes.

(6)

8. This question is about isomerism.

(a) How many isomers are represented by the formula C_5H_{12}?

(1)

(b) Name the type of structural isomerism shown by the isomers of C_5H_{12}

(1)

(c) 2-Hydroxypropanenitrile displays optical isomerism.

Draw three-dimensional representations of the two enantiomers of 2-hydroxypropanenitrile, showing how the two structures are related to each other.

(2)

(d) Describe how separate samples of each of these enantiomers could be distinguished.

(2)

9. The aldehyde $CH_3CH_2CH_2CH_2CHO$ reacts with KCN followed by dilute acid to form a racemic mixture of the two stereoisomers of

$$CH_3CH_2CH_2CH_2CH(OH)CN$$

(a) Give the IUPAC name of $CH_3CH_2CH_2CH_2CH(OH)CN$

(1)

(b) Describe how you would distinguish between separate samples of the two stereoisomers of $CH_3CH_2CH_2CH_2CH(OH)CN$

(2)

(c) Explain why the reaction produces a racemic mixture.

(3)

(d) An isomer of $CH_3CH_2CH_2CH_2CHO$ reacts with KCN followed by dilute acid to form a compound that does not show stereoisomerism.

Draw the structure of the compound formed and justify why it does not show stereoisomerism.

I am Sorry !!!!!

(2)

10. This question is about isomers with the molecular formula $C_5H_{10}O$

(a) Draw the skeletal formula of a branched chain aldehyde with molecular formula $C_5H_{10}O$ that is optically active.

(1)

(b) Describe how you distinguish between separate samples of the two enantiomers of the branched chain aldehyde $C_5H_{10}O$

(2)

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