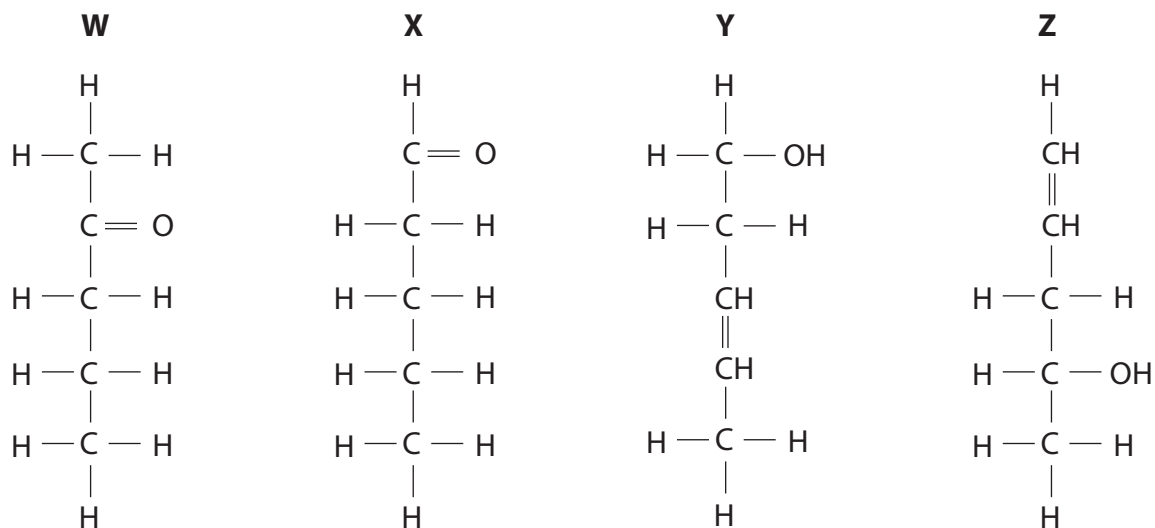


1 The following molecules are structural isomers with molecular formula $C_5H_{10}O$.



(a) Which of the molecules would exhibit optical isomerism?

(1)

- A** W
- B** X
- C** Y
- D** Z

(b) Which of the molecules would exhibit geometric isomerism?

(1)

- A** W
- B** X
- C** Y
- D** Z

(c) Which of the molecules would produce iodoform when reacting with iodine in alkaline solution?

(1)

- A** W only
- B** W and X
- C** W and Y
- D** W and Z

(d) Which of the molecules would be oxidized to a carboxylic acid using acidified sodium dichromate(VI)?

(1)

- A X only
- B Z only
- C X and Y
- D X, Y and Z

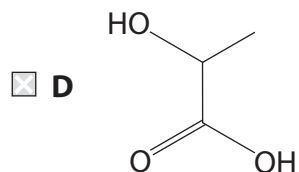
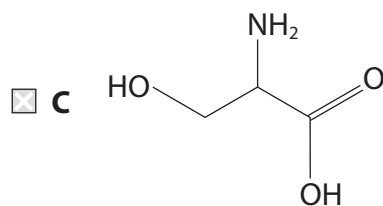
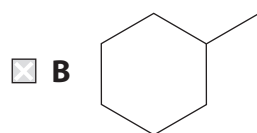
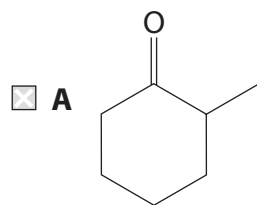
(e) Which of the molecules would form a crystalline product with 2,4-dinitrophenylhydrazine?

(1)

- A W only
- B W and X
- C W, X and Z
- D X only

(Total for Question = 5 marks)

2 Which of the following compounds is **not** chiral?



(Total for Question = 1 mark)

3 When one optically active isomer of 3-chloro-3-methylhexane reacts with hydroxide ions to form 3-methylhexan-3-ol, a racemic mixture forms because

- A** 3-chloro-3-methylhexane forms a carbocation intermediate.
- B** the reaction is a nucleophilic substitution.
- C** 3-chloro-3-methylhexane forms a five-bonded transition state.
- D** 3-methylhexan-3-ol contains a chiral carbon.

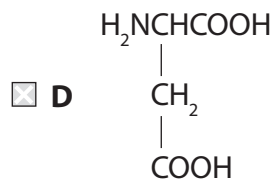
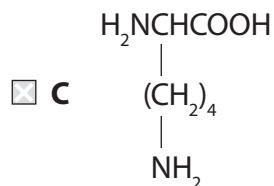
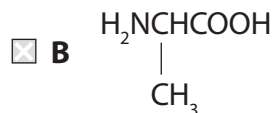
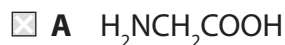
(Total for Question = 1 mark)

4 Select the word that best describes the effect of a chiral molecule on the plane of plane-polarized light. The plane of polarization of light is

- A reflected.
- B refracted.
- C resolved.
- D rotated.

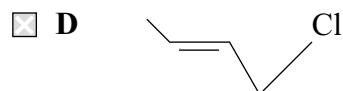
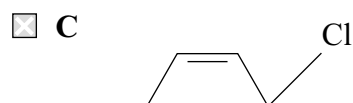
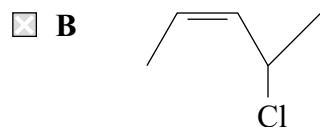
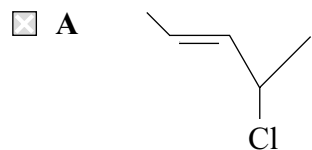
(Total for Question = 1 mark)

5 Which of the following amino acids is optically active and produces an approximately neutral solution when dissolved in water?



(Total for Question = 1 mark)

6 Which of the following compounds is a *Z* isomer **and** contains a chiral carbon atom?



(Total for Question 1 mark)

7 Which of these compounds, whose formulae are shown below, **cannot** exist as a racemic mixture?

- A** $\text{CH}_2\text{ClCHClCOOH}$
- B** HOOCCHClCOOH
- C** $\text{CH}_3\text{CHClCOOH}$
- D** $\text{CH}_3\text{CH}(\text{OH})\text{COOH}$

(Total for Question 1 mark)

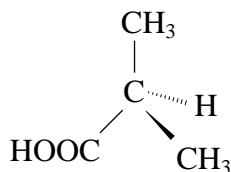
8 Which of the following compounds has both optical and *E-Z* isomers?

- A $\text{CH}_3\text{CH}=\text{CHCH}_2\text{CH}_3$
- B $\text{CH}_3\text{CHClCH}=\text{C}(\text{CH}_3)_2$
- C $\text{CH}_3\text{CCl}=\text{CClCH}_3$
- D $\text{CH}_3\text{CHBrCH}=\text{CHCl}$

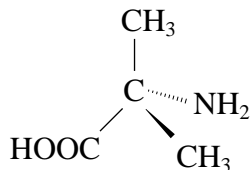
(Total for Question = 1 mark)

9 A white organic compound, **X**, is optically active and reacts with ninhydrin to give a coloured product. The structural formula of **X** could be

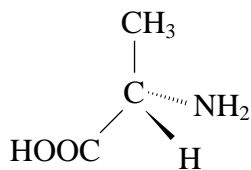
A



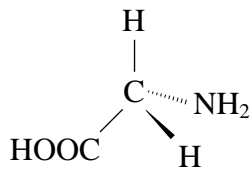
B



C



D



(Total for Question = 1 mark)

10 Ketones react with hydrogen cyanide, HCN, in the presence of cyanide ions, CN^- .

(a) Which of these ketones does **not** form a racemic mixture in this reaction?

(1)

- A $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_3$
- B $\text{CH}_3\text{CH}_2\text{COCH}_2\text{CH}_3$
- C $\text{CH}_3\text{CH}_2\text{CH}_2\text{CH}_2\text{COCH}_3$
- D $\text{CH}_3\text{CH}_2\text{CH}_2\text{COCH}_2\text{CH}_3$

(b) This type of reaction is classified as

(1)

- A nucleophilic substitution.
- B nucleophilic addition.
- C electrophilic addition.
- D electrophilic substitution.

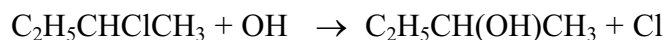
(Total for Question 2 marks)

11 Which of the following has both optical and E-Z isomers?

- A $\text{ClCH}_2\text{CHClCH}=\text{CH}_2\text{CH}_2$
- B $\text{CH}_2=\text{CClCH}_2\text{CH}_2\text{Cl}$
- C $\text{ClCH}_2\text{CH}=\text{CHCH}_2\text{Cl}$
- D $\text{CHCl}=\text{CHCHClCH}_3$

(Total for Question 1 mark)

12 One optically active isomer of 2-chlorobutane reacts with hydroxide ions to form butan-2-ol.



The organic product is a **mixture** of enantiomers because

- A butan-2-ol contains a chiral carbon atom.
- B the reaction is a nucleophilic substitution.
- C 2-chlorobutane forms a carbocation intermediate.
- D 2-chlorobutane forms a five-bonded transition state.

(Total for Question 1 mark)

13 Which of these four amino acids could **not** rotate the plane of plane-polarised light?

- A $\text{H}_2\text{NCH}(\text{CH}_3)\text{COOH}$
- B $\text{H}_2\text{NCH}(\text{CH}_2\text{COOH})\text{COOH}$
- C $\text{H}_2\text{NCH}_2\text{COOH}$
- D $\text{H}_2\text{NCH}(\text{CH}_2\text{SH})\text{COOH}$

(Total for Question 1 mark)