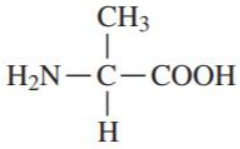
CHAPTER 25 NOMENCLATURE AND OPTICAL ISOMERISM

1 The amino acid *alanine* is shown below.

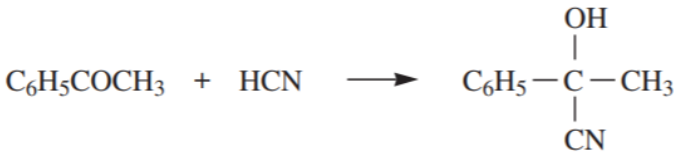


(a) Give the systematic name for alanine.

.....

(1 mark)

2 Phenylethanone, $C_6H_5COCH_3$, reacts with HCN according to the equation below.



(a) The product formed exists as a racemic mixture. State the meaning of the term *racemic mixture* and explain why such a mixture is formed in this reaction.

.....

.....

.....

.....

.....

(3 marks)

3 The reaction of but-2-ene with hydrogen chloride forms a racemic mixture of the stereoisomers of 2-chlorobutane.

(a) (i) Name the type of stereoisomerism shown by 2-chlorobutane

.....

(1 mark)

(ii) Give the meaning of the term *racemic mixture*.

.....

.....

(1 mark)

(iii) State how separate samples of the stereoisomers could be distinguished.

.....

.....

.....

(2 marks)

(b) By considering the shape of the reactive intermediate involved in the mechanism of this reaction, explain how a racemic mixture of the two stereoisomers of 2-chlorobutane is formed.

.....

.....

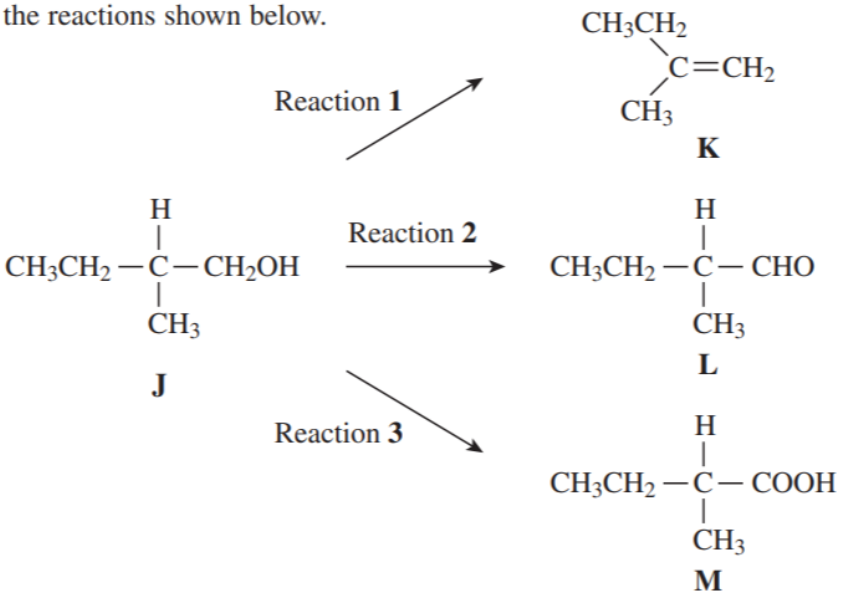
.....

.....

.....

(3 marks)

4 Consider the reactions shown below.



(a) Name compound **J**

.....

(1 mark)

(b) Compound **J** exists as a pair of stereoisomers. Name this type of stereoisomerism.

.....

(1 mark)

(c) Draw the structure of an isomer of **K** which shows stereoisomerism.

(1 mark)

5 (a) State the meaning of the term *stereoisomerism.*

.....

.....

(2 marks)

(b) Draw the structure of an isomer of C_5H_{10} which shows E-Z isomerism and explain how this type of isomerism arises. Name the structure you have drawn.

Explanation .....

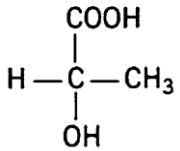
.....

.....

Name: .....

(3 marks)

(c) Name the structure below and state the type of isomerism it shows.



Name: .....

Type of isomerism: .....

(d) State how the different isomers of this structure can be distinguished from each other.

.....

.....

(2 marks)

6 (a) Define the term *stereoisomer*.

.....

.....

(1 mark)

(b) (i) Draw the displayed formula of but-2-ene.

(1 mark)

(ii) What type of isomerism is shown by but-2-ene?

.....

(1 mark)

(iii) What are the conditions necessary for this type of isomerism?

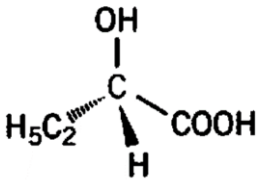
.....

.....

(2 marks)

7 Consider **molecule A** which is optically active.

molecule A



(a) Define the term *optically active*.

.....

.....

(1 mark)

(b) Draw the optical isomer of **molecule A**.

(1 mark)

(c) (i) What is a *racemic mixture*?

.....

.....

(1 mark)

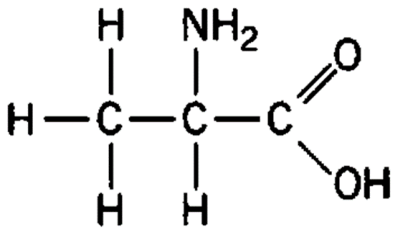
(ii) Why is a racemic mixture not optically active?

.....

.....

(1 mark)

8 The displayed formula of α-aminopropanoic acid is shown below.



(a) Circle the chiral centre.

(1 mark)

(b) Use the displayed formula above to explain why this molecule is optically active.

.....

.....

(1 mark)