

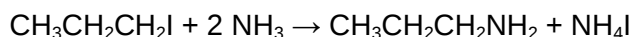
Name of the Student: _____

Max. Marks : 24 Marks

Time : 24 Minutes

Q1.

This question is about the synthesis of propylamine ($\text{CH}_3\text{CH}_2\text{CH}_2\text{NH}_2$) by the reaction of 1-iodopropane ($\text{CH}_3\text{CH}_2\text{CH}_2\text{I}$) with an excess of ammonia.



- (a) Name and outline the mechanism for this reaction.

Name of mechanism _____

Outline of mechanism

(5)

- (b) 1-iodopropane is a liquid at room temperature.

Calculate the number of molecules in 5.0 cm^3 of 1-iodopropane ($M_r = 169.9$). Give your answer in standard form.

For 1-iodopropane, density = 1.75 g cm^{-3}

The Avogadro constant, $L = 6.022 \times 10^{23} \text{ mol}^{-1}$

Number of molecules _____

(2)

- (c) In an experiment, 10.3 g of 1-iodopropane ($M_r = 169.9$) are reacted with an excess of ammonia. 2.3 g of propylamine ($M_r = 59.0$) are produced.

Calculate the percentage yield in this experiment.

Percentage yield _____

(2)

(Total 9 marks)

Q2.

Under suitable conditions, 2-bromobutane reacts with sodium hydroxide to produce a mixture of five products, **A**, **B**, **C**, **D** and **E**.

Products **A**, **B** and **C** are alkenes.

A is a structural isomer of **B** and **C**.

A does not exhibit stereoisomerism.

B and **C** are a pair of stereoisomers.

Products **D** and **E** are alcohols.

D and **E** are a pair of enantiomers.

- (a) Give the names of the **two** concurrent mechanisms responsible for the formation of the alkenes and the alcohols.

Mechanism to form alkenes _____

Mechanism to form alcohols _____

(2)

- (b) Define the term stereoisomers.

(2)

- (c) Deduce the name of isomer **A**.

Explain why **A** does **not** exhibit stereoisomerism.

Name _____

Explanation _____

(2)

- (d) Outline the mechanism for the reaction of 2-bromobutane with sodium hydroxide to form alkene **A**.

(3)

- (e) Deduce the name of isomer **B** and the name of isomer **C**.

Explain the origin of the stereoisomerism in **B** and **C**.

Name _____

Explanation _____

(2)

- (f) Draw 3D representations of enantiomers **D** and **E** to show how their structures are related.

(2)

- (g) A student compares the rates of hydrolysis of 1-chlorobutane, 1-bromobutane and 1-iodobutane.

The suggested method is:

- add equal volumes of the three halogenoalkanes to separate test tubes
- add equal volumes of aqueous silver nitrate to each test tube
- record the time taken for a precipitate to appear in each test tube.

State and explain the order in which precipitates appear.

Order in which precipitates appear _____

Explanation _____
