

Name of the Student: _____

Max. Marks : 29 Marks

Time : 29 Minutes

Q1.

This question is about pentan-2-ol and pent-1-ene.

- (a) The boiling point of pentan-2-ol is 119 °C
The boiling point of pent-1-ene is 30 °C

Explain why pentan-2-ol has a higher boiling point than pent-1-ene.

(3)

- (b) Pent-1-ene is formed by the elimination of water from pentan-2-ol.

State the reagent and condition for this reaction.

Outline the mechanism for this reaction.

Reagent _____

Condition _____

Outline of mechanism

(5)

(Total 8 marks)

Q2.

This question is about ethanedioic acid ($\text{H}_2\text{C}_2\text{O}_4$) which is a dicarboxylic acid.

- (a) Draw the skeletal formula of ethanedioic acid.

(1)

- (b) Ethanedioic acid is formed by the oxidation of ethane-1,2-diol ($\text{HOCH}_2\text{CH}_2\text{OH}$).

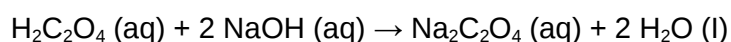
State suitable reagent(s) and a condition for this reaction.

Reagent(s) _____

Condition _____

(2)

- (c) Ethanedioic acid reacts with an excess of sodium hydroxide to form sodium ethanedioate.



A student mixes 10.0 cm^3 of $0.400 \text{ mol dm}^{-3}$ ethanedioic acid with 50.0 cm^3 of $0.200 \text{ mol dm}^{-3}$ sodium hydroxide.

Show that the sodium hydroxide is in excess.

Calculate the mass, in mg, of sodium ethanedioate that can be formed in this reaction.

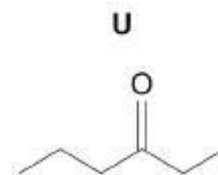
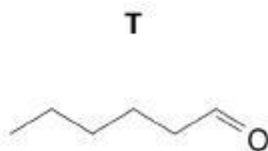
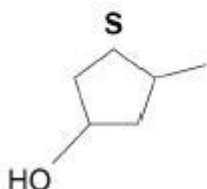
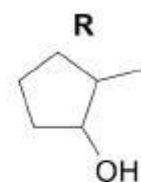
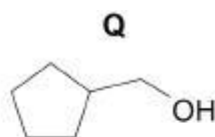
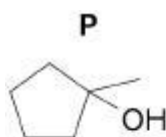
Mass of sodium ethanedioate _____ mg

(5)

(Total 8 marks)

Q3.

This question is about the structural isomers shown.



- (a) Identify the isomer(s) that would react when warmed with acidified potassium dichromate(VI).

State the expected observation when acidified potassium dichromate(VI) reacts.

Isomer(s) _____

Expected observation _____

(2)

- (b) Identify the isomer(s) that would react with Tollens' reagent.

State the expected observation when Tollens' reagent reacts.

Isomer(s) _____

Expected observation _____

(2)

- (c) Separate samples of each isomer are warmed with ethanoic acid and a few drops of concentrated sulfuric acid. In each case the mixture is then poured into a solution of sodium hydrogencarbonate.

Identify the isomer(s) that would react with ethanoic acid.

Suggest a simple way to detect if the ethanoic acid reacts with each isomer.

Give a reason why the mixture is poured into sodium hydrogencarbonate solution.

Isomer(s) _____

Suggestion _____

Reason _____

(3)

- (d) State the type of structural isomerism shown by isomers **P**, **Q**, **R** and **S**.

(1)

- (e) Describe fully how infrared spectra can be used to distinguish between isomers **R**, **S** and **T**. Use data from **Table A** in the Data Booklet in your answer.

(4)

- (f) State why mass spectrometry using electrospray ionisation is **not** a suitable method to distinguish between the isomers.

(1)

(Total 13 marks)