

**Q1.** (a) One of the isomers in part (a) is resistant to oxidation by acidified potassium dichromate(VI).

(i) Identify this isomer.

.....

(ii) This isomer can be dehydrated. Give a suitable dehydrating agent and write an equation for this dehydration reaction.

*Dehydrating agent*.....

*Equation* .....

**(3)**

(b) (i) Identify the isomer in part (a) which can be oxidised to a ketone. Give the structure of the ketone formed.

*Isomer* .....

*Structure of the ketone*

(ii) Identify **one** of the isomers in part (a) which can be oxidised to an aldehyde. Give the structure of the aldehyde formed.

*Isomer* .....

*Structure of the aldehyde*

(iii) Give a reagent that can be used in a test to distinguish between a ketone and an aldehyde. State what you would observe in the test.

Reagent .....

Observation with ketone .....

Observation with aldehyde .....

(7)

- (c) Butan-1-ol can be oxidised to form a carboxylic acid. Using [O] to represent the oxidising agent, write an equation for this reaction and name the product.

Equation .....

Name of product .....

(2)

(Total 12 marks)

- Q2.** (a) Ethanol can be manufactured by the direct hydration of ethene and by the fermentation of sugars.

- (i) State what is meant by the term *hydration*.

.....

- (ii) Give **one** advantage and **one** disadvantage of manufacturing ethanol by fermentation rather than by hydration.

Do **not** include energy consumption or cost.

Advantage .....

.....

Disadvantage .....

.....

(3)

(b) Ethanol can be oxidised to an aldehyde and to a carboxylic acid.

(i) Draw the structure of this aldehyde and of this carboxylic acid.

*Structure of aldehyde*

*Structure of carboxylic acid*

(ii) Give a suitable reagent and reaction conditions for the oxidation of ethanol to form the carboxylic acid as the major product.

*Reagent* .....

*Conditions* .....

.....

(5)

(c) (i) Draw the structure of an alcohol containing four carbon atoms which is resistant to oxidation.

- (ii) Draw the structure of an alcohol containing four carbon atoms which can be oxidised to a ketone.

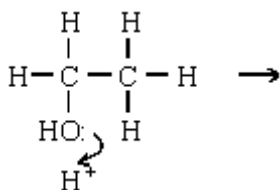
(2)

- (d) In the presence of a catalyst, ethanol can be dehydrated to ethene.

- (i) Give a suitable catalyst for use in this reaction.

.....

- (ii) Complete the mechanism for this dehydration reaction.



(5)  
(Total 15 marks)

Q3. Which one of the following **cannot** be produced by oxidation of propan-1-ol?

- A carbon dioxide
- B propanone
- C propanal
- D propanoic acid

(Total 1 mark)

- Q4.** (a) An alcohol containing carbon, hydrogen and oxygen only has 64.9% carbon and 13.5% hydrogen by mass. Using these data, show that the empirical formula of the alcohol is  $C_4H_{10}O$

.....

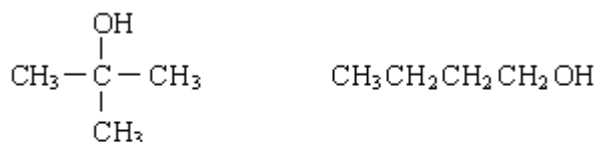
.....

.....

.....

(3)

- (b) The structural formulae of two of the four possible alcohols of molecular formula  $C_4H_{10}O$  are shown below.



*Isomer 1*

*Isomer 2*

- (i) What type of alcohol is Isomer 1? Suggest a reason why this type of alcohol is not easily oxidised.

*Type of alcohol* .....

*Reason* .....

- (ii) Draw the structural formulae of the two remaining alcohols of molecular formula  $C_4H_{10}O$

Isomer 3

Isomer 4

(4)

(c) Isomer 2 was oxidised by adding it dropwise to acidified potassium dichromate(VI) solution and immediately distilling off the product. When this product was treated with Fehling's solution, a red precipitate was formed.

(i) State the type of product distilled off during the oxidation by acidified potassium dichromate(VI) solution.

.....

(ii) Write an equation for the oxidation by potassium dichromate(VI), showing clearly the structure of the organic product. Use [O] to represent the oxidising agent.

.....

(iii) Name and draw a structure for the organic product formed by the reaction with Fehling's solution.

Name .....

Structure .....

(5)

(d) State **one** advantage and **one** disadvantage of the production of ethanol by the hydration of ethene compared to the fermentation of glucose.

Advantage .....

Disadvantage .....

(2)

- (e) Outline a mechanism for the dehydration of ethanol to form ethene in the presence of an acid catalyst.

(4)  
(Total 18 marks)