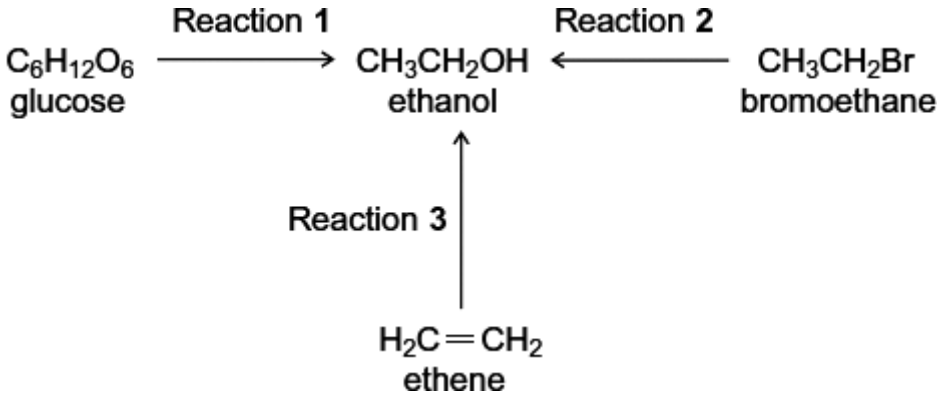
Name of the Student:_____
Max. Marks : 25 Marks **Time : 25 Minutes**

Q1.

Three different ways of producing ethanol are shown below.



(a) Reaction **1** produces a 15% aqueous solution of ethanol.
It is claimed that the ethanol produced in this way is a carbon-neutral biofuel.

Write an equation for Reaction **1** and name the process.

Write an equation for the complete combustion of ethanol.

Explain why the ethanol produced by this process may **not** be a *carbon-neutral* biofuel.

_____

_____

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_____

(5)

(b) Give a reagent and conditions for Reaction **2**.

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CH_3CH_2Br —Reaction 2→ CH_3CH_2OH

Name and outline a mechanism for Reaction **2**.

Suggest **one** reason, other than safety, why this method is **not** used in industry to make ethanol.

(6)

(c) Reaction **3** is used in industry.

$H_2C=CH_2$ —Reaction 3→ CH_3CH_2OH

Identify a suitable catalyst for Reaction **3**.

Identify the type of reaction.

Give **two** conditions, in addition to the presence of a catalyst, necessary for Reaction **3** to produce a high yield of ethanol.

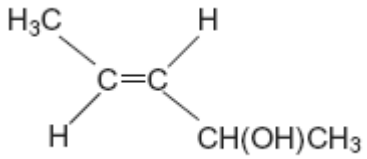
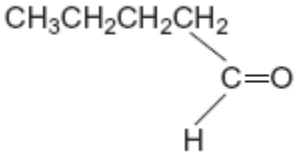
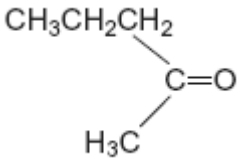
(4)

(Total 15 marks)

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Q2.

The table below shows the structures of three isomers with the molecular formula $C_5H_{10}O$

Isomer **1** 	(*E*)-pent-3-en-2-ol
Isomer **2** 	pentanal
Isomer **3** 	

(a) Complete the table by naming Isomer **3**.

(1)

(b) State the type of structural isomerism shown by these three isomers.

_____

(1)

(c) The compound (*Z*)-pent-3-en-2-ol is a stereoisomer of (*E*)-pent-3-en-2-ol.

(i) Draw the structure of (*Z*)-pent-3-en-2-ol.

(1)

(ii) Identify the feature of the double bond in (*E*)-pent-3-en-2-ol and that in (*Z*)-pent-3-en-2-ol that causes these two compounds to be stereoisomers.

_____

(1)

(d) A chemical test can be used to distinguish between separate samples of Isomer **2** and Isomer **3**.
Identify a suitable reagent for the test.
State what you would observe with Isomer **2** and with Isomer **3**.

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Test reagent _____

Observation with Isomer **2** _____

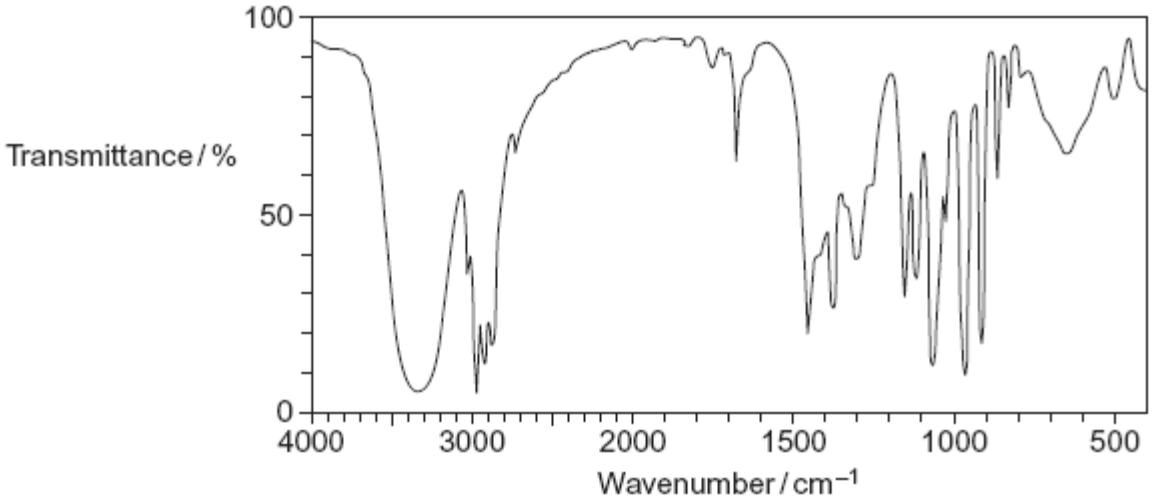
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Observation with Isomer **3** _____

_____

(3)

(e) The following is the infrared spectrum of one of the isomers **1**, **2** or **3**.



(i) Deduce which of the isomers (**1**, **2** or **3**) would give this infrared spectrum. You may find it helpful to refer to **Table 1** on the Data Sheet.

_____

(1)

(ii) Identify two features of the infrared spectrum that support your deduction.
In each case, identify the functional group responsible.

Feature 1 and functional group _____

_____

_____

_____

Feature 2 and functional group _____

_____

_____

_____

(2)

(Total 10 marks)

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