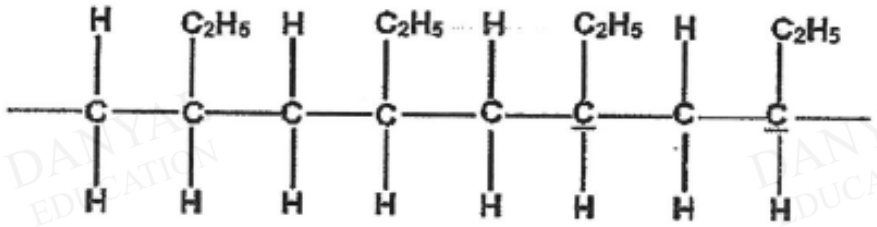
O Level Combined Chemistry Structured

Organic Chemistry Test 4.0

Q1

A monomer undergoes addition polymerisation to form a polymer.
Part of the structure of polymer is shown below.



(a) Draw the structure of the monomer from which the polymer is formed. [1]

(b) What change would you expect to see when a sample of the monomer is shaken with aqueous bromine? [1]

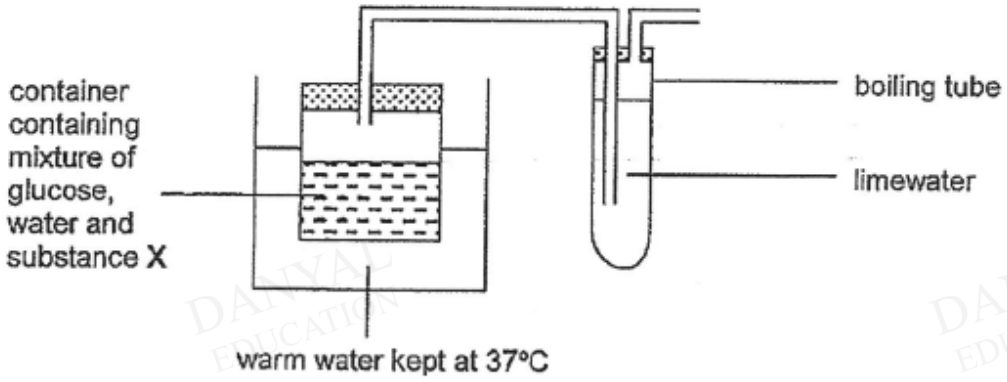
(c) The monomer can be made by cracking tetradecane, $C_{14}H_{30}$ in industry. One other product is formed at the same time.

(i) Write a chemical equation for the reaction. [1]

(ii) State the conditions necessary for the reaction to take place. [1]

Q2

Ethanol can be made from glucose, $C_6H_{12}O_6$, by fermentation. Using the apparatus shown below, a student conducted a fermentation experiment in the laboratory.



(a) Name the substance **X** that the student must add to the glucose solution in order to produce ethanol in the container. [1]

_____

(b) Explain why the temperature for the fermentation mixture must be kept below 40 °C. [1]

_____

(c) Describe and explain the changes that would occur in the boiling tube after 2 hours. [2]

_____

_____

(d) Ethanol can be used as a fuel when burnt in excess air.

(i) Write a balanced chemical equation for the reaction. [2]

_____

(ii) Suggest whether the reaction is exothermic or endothermic. Explain your answer. [1]

_____

(e) Ethanol is oxidised in air to form another organic compound.

(i) State the name and draw the structural formula of the organic compound formed. [2]

Name of organic compound: _____

Structural formula:

(ii) If a few drops of Universal Indicator are added to the organic compound formed, what would be the colour observed? [1]

_____

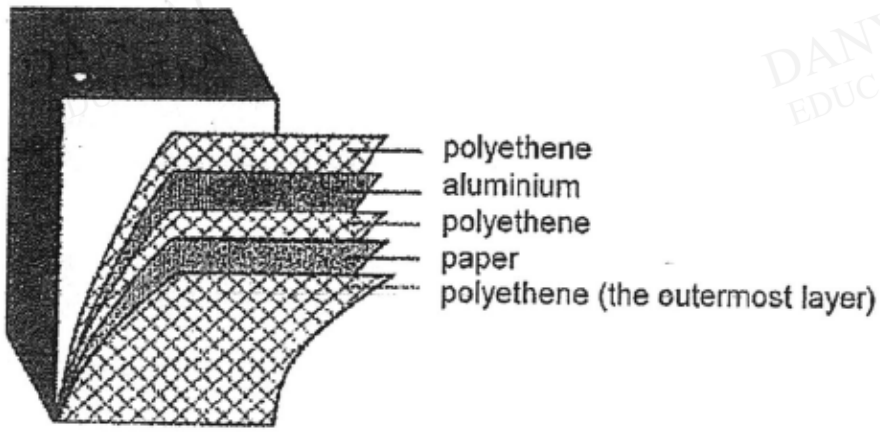
Q3

(a) Ethene is an unsaturated hydrocarbon.
Define the term *unsaturated*.

.....

..... [1]

(b) A polymer, polyethene can be used in the making of beverage boxes.
The diagram below shows the structure of a common beverage box consisting of paper, polyethene and aluminium.



(i) Draw the structure of polyethene, showing three repeating units.

[1]

(ii) Name the chemical reaction involved in the making of polyethene.

..... [1]

(iii) Explain the function of the polyethene layers of the beverage box.

.....

..... [1]

(iv) Oxygen can pass through the paper and polyethene.
Explain how the beverage box can prevent oxygen from coming in contact with the drink.

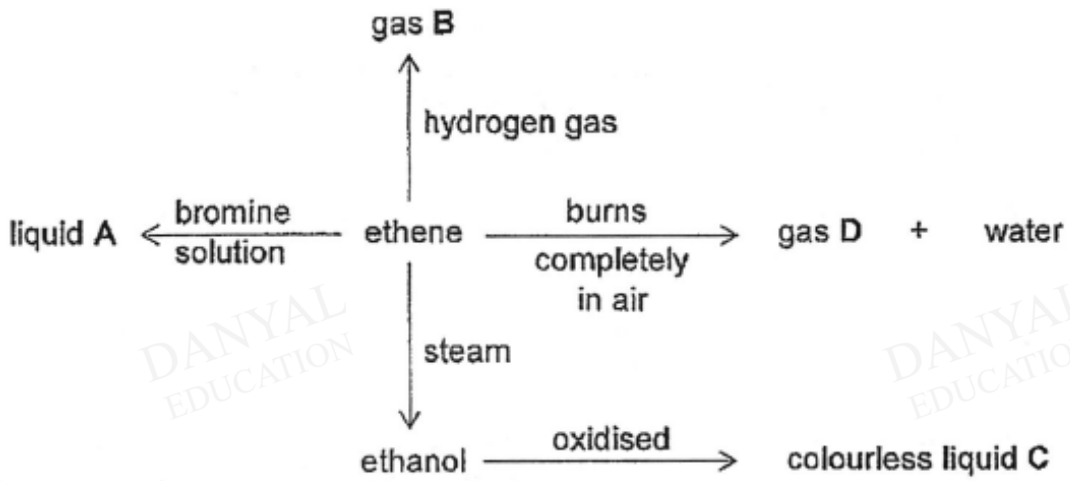
.....

.....

..... [2]

Q4

The flow diagram below shows some of the reactions of ethene.



(a) Draw the full structural formula for liquid **A**. [1]

(b) Name gas **B** and state the conditions for the formation. [2]

(c) Draw the dot and cross diagram for gas **D**, showing only the outermost shell electrons. [2]

(d) Name and draw the structural formula of colourless liquid **C**. [2]

(e) In the laboratory, ethanol can be oxidised to colourless liquid C by warming it with an oxidising agent.

(i) Name the oxidising agent. [1]

(ii) Write the chemical equation for formation of colourless liquid **C** from ethanol. Include state symbols [1]

(f) Ethene can be manufactured by the cracking of long chain hydrocarbon molecules such as $C_{22}H_{46}$.

Construct the equation to show the cracking of $C_{22}H_{46}$ to make ethene and another hydrocarbon as the only products. [1]

Q5

Figure **7.1** shows some of reaction involving unsaturated hydrocarbon V.

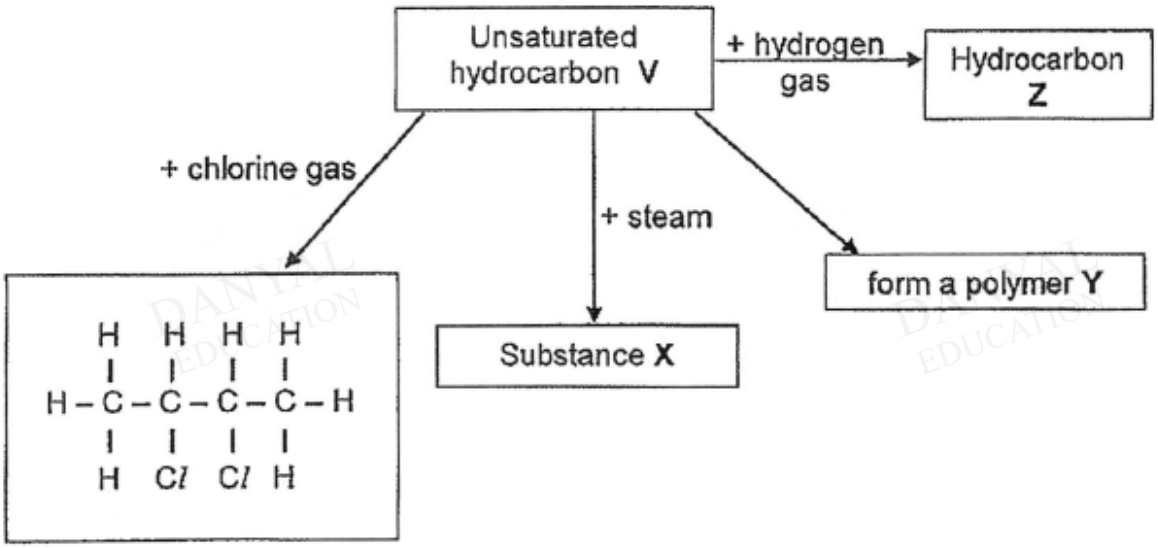


Figure 7.1

(a) Draw the structural formula of substance X and the repeating unit of polymer Y. [2]

Substance X

repeating unit of polymer Y

(b) Describe an experiment to differentiate V from Z. [3]

.....

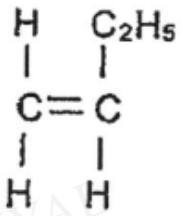
.....

.....

Answers

Organic Chemistry Test 4.0

Q1

(a)  [1]

(b) Aqueous bromine will decolourise rapidly in the monomer. [1]

(c) (i) $C_{14}H_{30} \rightarrow C_4H_8 + C_{10}H_{22}$ [1]

(ii) Condition: high temperature and with suitable catalyst [1]

Q2

(a) Yeast [1]

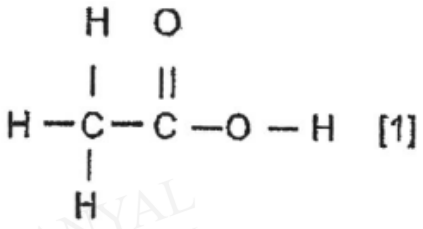
(b) At high temperature, the yeast will be denatured and the reaction stops. [1]

(c) White precipitate will be formed / effervescence observed [1]
due to the carbon dioxide produced. [1]

(d) (i) $C_2H_5OH + 3O_2 \rightarrow 2CO_2 + 3H_2O$ [formula:1, balancing:1]

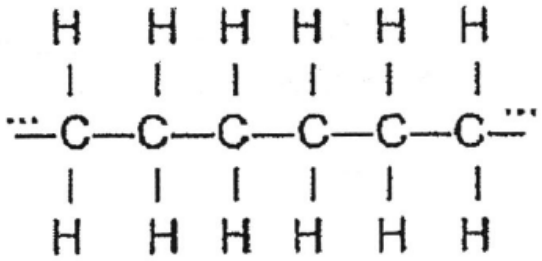
(ii) Exothermic because heat is given out during the reaction. [1]

(e) (i) Ethanoic acid [1]

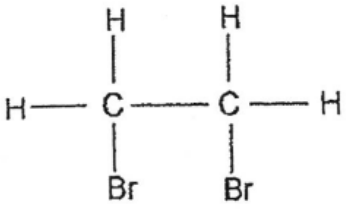
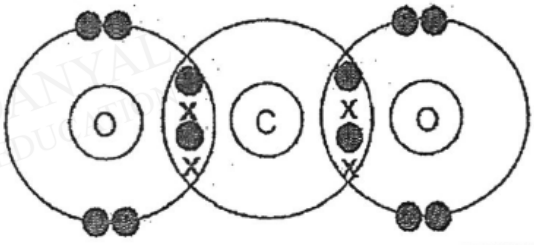
 [1]

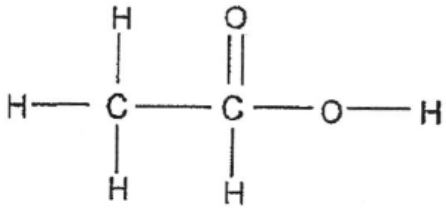
(ii) orange [1]

Q3

(a)		Hydrocarbons that contain carbon-carbon double bonds (-C=C-).	[1]
(b)	(i)		[1]
	(ii)	Addition polymerisation	[1]
	(iii)	Polyethene is waterproof, hence it will prevent the beverage from seeping through the box.	[1]
	(iv)	The layer of aluminum can react with oxygen in the air to prevent oxygen from entering the beverage box and thus prevents the spoilage of beverage.	[1] [1]

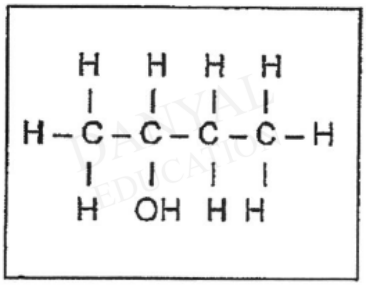
Q4

(a)		[1]
(b)	Gas B is ethane Conditions: 200 °C and nickel catalyst	[1] [1]
(c)		Correct atoms [1] Correct bonding [1]

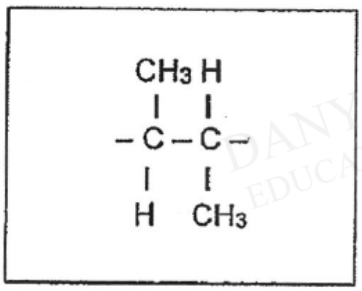
(d)	Liquid C is **ethanoic acid** *vinegar is not accepted (vinegar is a common name* 		[1] [1]
(e)	(i)	Oxidising agent: **acidified potassium manganate (VII)** Or *mixture of sulfuric acid and potassium manganate (VII) or potassium dichromate (VI)* **Not acceptable:** Oxygen and bacteria in the air (as the question says oxidation by oxidising agent in a laboratory)	[1]
	(ii)	$C_2H_5OH\ (aq) + 2[O] \longrightarrow CH_3COOH\ (aq) + H_2O\ (l)$	[1] If any state symbol is wrong = [0]
(f)	$C_{22}H_{46} \longrightarrow C_2H_4 + C_{20}H_{42}$		[1]

Q5

(a) Draw the structural formula of substance **X** and the repeating unit of polymer **Y**. [2]



Substance **X**



repeating unit of polymer Y

(b) Describe an experiment to differentiate V from Z. [3]

Add aqueous bromine [1]

With V, brown bromine decolourises [1]

With Z, there will be no visible change. [1]