

**O Level Combined Chemistry Structured**

**Organic Chemistry Test 1.0**

Q1

- (a) Table 8.1 shows information about some organic compounds. Complete the table below with the name, structural formula and process used to manufacture each of the compound.

Table 8.1

name of compound	structural formula of compound	process used to manufacture the compound
ethene		catalytic _____ of long hydrocarbon chain hydrocarbon
	$\left( \begin{array}{cc} \text{H} & \text{H} \\   &   \\ \text{---C} & \text{---C---} \\   &   \\ \text{H} & \text{H} \end{array} \right)_n$	_____ of ethene
ethanoic acid		_____ of ethanol

[3]

- (b) Ethene will undergo complete combustion if there is sufficient oxygen.

(i) Write the chemical reaction for this reaction.

..... [1]

(ii) When ethene undergoes incomplete combustion, it will form an air pollutant. Name the air pollutant and state its effect on human health.

name of air pollutant .....

effect of air pollutant .....

..... [2]

Q2

The table shows some information about the homologous series of organic compounds called esters. Esters are formed when a carboxylic acid reacts with an alcohol.



The table shows the different esters produced when different carboxylic acids react with an alcohol (ethanol).

carboxylic acid	alcohol	name of ester formed	molecular formula of ester formed
methanoic acid HCOOH	ethanol C <sub>2</sub> H <sub>5</sub> OH	ethyl methanoate	HCOOC <sub>2</sub> H <sub>5</sub>
ethanoic acid CH <sub>3</sub> COOH	ethanol C <sub>2</sub> H <sub>5</sub> OH		
propanoic acid C <sub>2</sub> H <sub>5</sub> COOH	ethanol C <sub>2</sub> H <sub>5</sub> OH	ethyl propanoate	C <sub>2</sub> H <sub>5</sub> COOC <sub>2</sub> H <sub>5</sub>
butanoic acid C <sub>3</sub> H <sub>7</sub> COOH	ethanol C <sub>2</sub> H <sub>5</sub> OH	ethyl butanoate	C <sub>3</sub> H <sub>7</sub> COOC <sub>2</sub> H <sub>5</sub>

- (a) Complete the table to show the name and molecular formula of the ester formed when ethanoic acid reacts with ethanol.

[2]

- (b) (i) Explain using the formulae given in the table to show that esters are an example of a homologous series.

.....  
[1]

- (ii) Suggest one difference, in terms of their physical property, between ethyl methanoate and ethyl butanoate.

.....  
[1]

Q3

(a) E is a hydrocarbon with the formula  $C_2H_6$  and F is a hydrocarbon with the formula  $C_2H_4$ .

(i) Draw the structural formulae of E and F.

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[2]

(ii) Compare and contrast the chemical properties of E and F with reference to aqueous bromine and complete combustion reactions. Write chemical equations for all the reactions that you have mentioned.

.....  
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.....  
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.....  
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.....  
.....

[5]

(b) Ethanol is a very important substance because it is used as a fuel in many countries. One of the productions of ethanol is by the process of fermentation.

(i) Starting from cane sugar, describe briefly how it is converted into ethanol during this process.

.....  
.....  
.....  
.....

[2]

(ii) Write an equation to represent this process.

.....

[1]

Q4

Fig. 4.1 shows the structural formula of a molecule of drug called LSD.  
(Lysergic acid diethylamide)

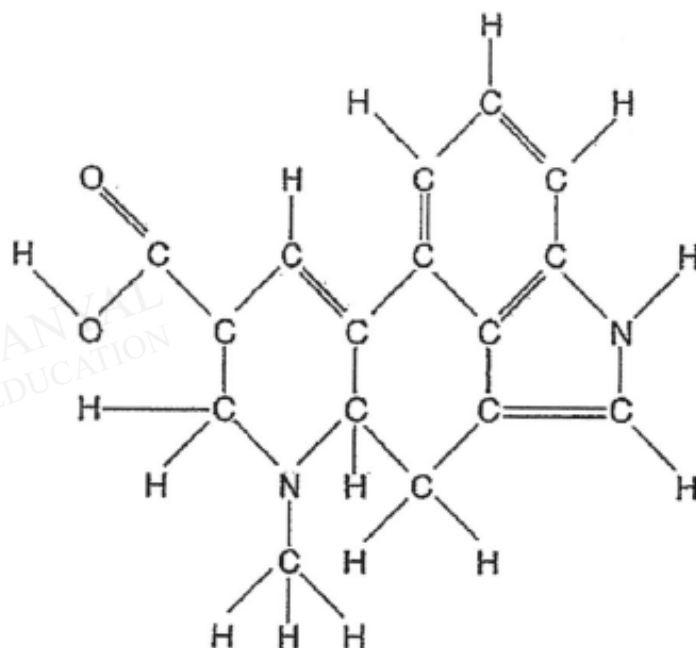


Fig. 4.1

- (a) Write down the molecular formula of LSD.  
.....[1]
- (b) LSD is an unsaturated molecule. Describe a chemical test to prove that LSD is an unsaturated molecule.  
Test .....
- Observation .....
- .....[1]
- (c) LSD dissolve in water to produce a weakly acidic solution with pH 4.
- (i) Explain why LSD produces a weakly acidic solution.  
.....  
.....[1]
- (ii) On Fig. 4.1, circle the functional group present in the LSD molecule which is responsible for the acidic nature.  
[1]

Q5

9 Fig. 9.1 describes some of the reactions of an organic compound E.

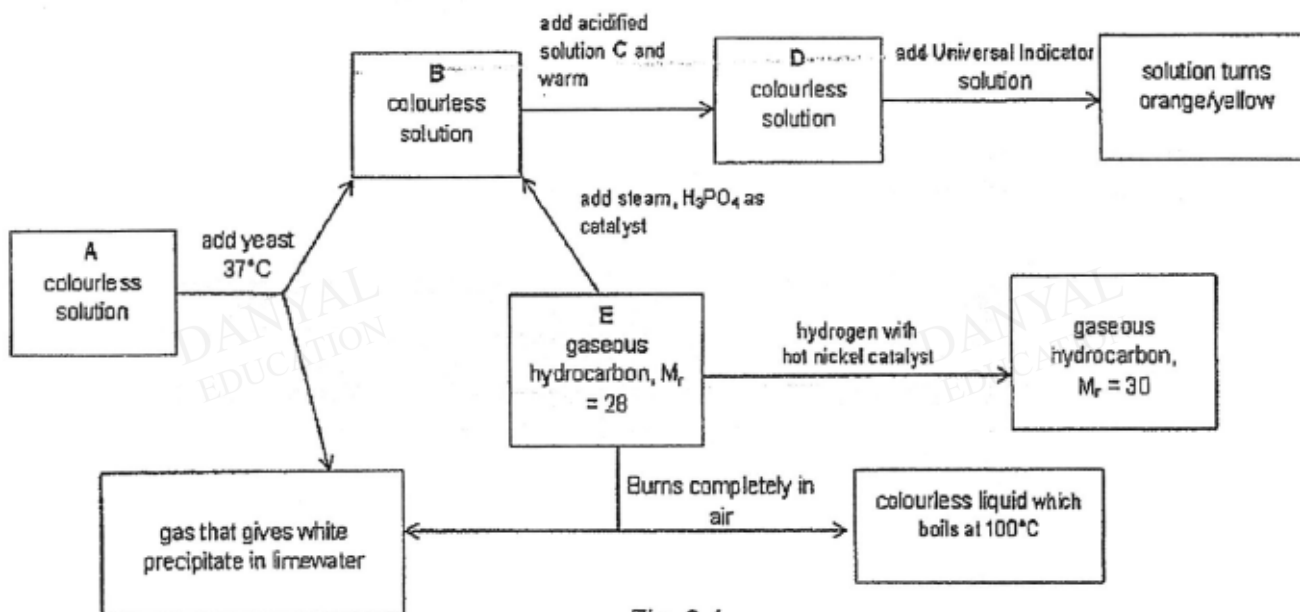


Fig. 9.1

(a) Identify

(i) A,

.....

(ii) B,

.....

(iii) C,

.....

(iv) D,

.....

(v) E,

.....

[5]

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(b) Write the balanced chemical equation to represent the reaction between hydrocarbon E with hydrogen.

.....[1]

(c) Hydrocarbon E undergoes further reaction under high heat and pressure; with a catalyst, to form a polymer.

(i) State the name of the polymer formed.

..... [1]

(ii) Draw the structure of one repeat unit of this polymer.

[1]

(iii) State one disadvantage of using the polymer.

.....  
.....[1]

**Answers**

**Organic Chemistry Test 1.0**

Q1

(a)	name of compound	structural formula of compound	process used to manufacture the compound	½ mark for each answer
	ethene	$  \begin{array}{c}  \text{H} \quad \quad \text{H} \\  \diagdown \quad \diagup \\  \text{C} = \text{C} \\  \diagup \quad \diagdown \\  \text{H} \quad \quad \text{H}  \end{array}  $	Catalytic <u>cracking</u> of long hydrocarbon chain hydrocarbon	
	<u>Poly(ethane)</u>	$  \left( \begin{array}{cc}  \text{H} & \text{H} \\    &   \\  -\text{C} & - \text{C}- \\    &   \\  \text{H} & \text{H}  \end{array} \right)_n  $	<u>Polymerisation</u> of ethene	

	ethanoic acid	$  \begin{array}{c}  \text{H} \\    \\  \text{H} - \text{C} - \text{C} = \text{O} \\    \quad \quad \quad \diagdown \\  \text{H} \quad \quad \quad \text{O} - \text{H}  \end{array}  $	<u>oxidation</u> of ethanol	
(b)	$\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{CO}_2 + 2\text{H}_2\text{O}$ ½ mark : correct fomula ½ mark : correct balancing			[1]
(c)	carbon monoxide			[1]
	Reduces ability of haemoglobin to carry oxygen to different parts of the body. ½ mark : difficulty in breathing			[1]

Q2

8a	Ethyl ethanoate $\text{CH}_3\text{COOC}_2\text{H}_5$
bi	Each member differs from the next by a $-\text{CH}_2-$ group Molecular formula of ethyl propanoate $\text{C}_2\text{H}_5\text{COOC}_2\text{H}_5$ differs from ethyl butanoate $\text{C}_3\text{H}_7\text{COOC}_2\text{H}_5$ by a $-\text{CH}_2-$ group
ii	Ethyl butanoate has a higher melting point/boiling point/density /viscosity than ethyl methanoate.

Q3

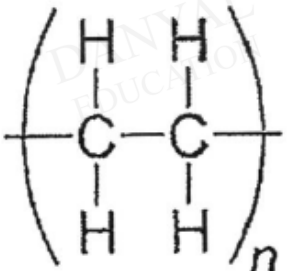
11ai	$  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H}-\text{C}-\text{C}-\text{H} \\    \quad   \\  \text{H} \quad \text{H} \\  \text{E}  \end{array}  \qquad  \begin{array}{c}  \text{H} \quad \text{H} \\    \quad   \\  \text{H}-\text{C}=\text{C}-\text{H} \\  \text{F}  \end{array}  $										
ii	<table border="1"> <thead> <tr> <th></th> <th>E</th> <th>F</th> </tr> </thead> <tbody> <tr> <td>bromine</td> <td>Reacts with bromine in the presence of ultra violet light to form bromoethane and hydrogen bromide. <math>\text{C}_2\text{H}_6 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_5\text{Br} + \text{HBr}</math></td> <td>Reacts with bromine water to form <u>dibromoethane</u>. <math>\text{C}_2\text{H}_4 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_4\text{Br}_2</math></td> </tr> <tr> <td>complete combustion</td> <td colspan="2">Both react with oxygen to form carbon dioxide and water. F burns with a smokier flame. <math>2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 4\text{CO}_2</math> <math>\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{CO}_2</math></td> </tr> </tbody> </table>			E	F	bromine	Reacts with bromine in the presence of ultra violet light to form bromoethane and hydrogen bromide. $\text{C}_2\text{H}_6 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_5\text{Br} + \text{HBr}$	Reacts with bromine water to form <u>dibromoethane</u> . $\text{C}_2\text{H}_4 + \text{Br}_2 \rightarrow \text{C}_2\text{H}_4\text{Br}_2$	complete combustion	Both react with oxygen to form carbon dioxide and water. F burns with a smokier flame. $2\text{C}_2\text{H}_6 + 7\text{O}_2 \rightarrow 6\text{H}_2\text{O} + 4\text{CO}_2$ $\text{C}_2\text{H}_4 + 3\text{O}_2 \rightarrow 2\text{H}_2\text{O} + 2\text{CO}_2$	
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bi	Cane sugar (glucose) solution is mixed with yeast and the mixture is kept at about $37^\circ\text{C}$ in the absence of oxygen. Sugar is converted to ethanol and carbon dioxide.										
ii	$\text{C}_6\text{H}_{12}\text{O}_6 \rightarrow 2\text{C}_2\text{H}_5\text{OH} + 2\text{CO}_2$										



Q4

(a) $C_{16}H_{15}O_2N_2$	1m
(b) Test: <u>Add LSD to aqueous bromine / a solution of bromine</u> Observation: <u>Reddish brown bromine is quickly decolourised/turns colourless</u>	Both correct = 1m
(c)(i) When dissolved in water, LSD molecule <u>dissociate partially</u> , producing a <u>low concentration of <math>H^+</math> ion</u> , resulting in a weakly acidic solution.	1m
(c)(ii) Circle $-COOH$ functional group	1m

Q5

(a) (i) A, <u>glucose solution</u>	1m
(ii) B, <u>ethanol</u>	1m
(iii) C, <u>acidified potassium manganate (VII)</u>	1m
(iv) D, <u>ethanoic acid</u>	1m
(v) E, ethene	1m
(b) $C_2H_4 + H_2 \rightarrow C_2H_6$	1m
(c)(i) poly(ethene)	
(ii) 	1m
(iii) Poly(ethene) is non-biodegradable and will cause land pollution, as it will be difficult to dispose.	1m