

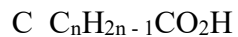
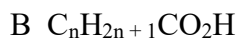
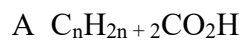
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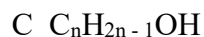
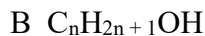
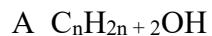
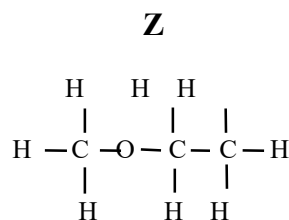
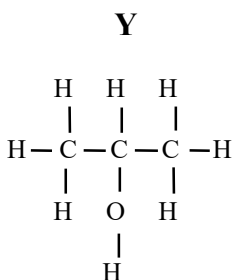
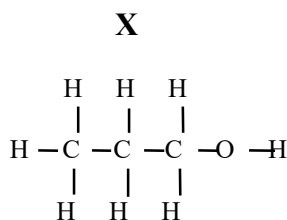
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Section A: Multiple Choice Questions

1 Which of the following is the general formula of an organic acid?

☐

2 Which of the following is the general formula of an alcohol?

☐3 The structural formulae of three compounds **X**, **Y** and **Z** are shown below.

Which compounds are isomers?

A **X** and **Y** onlyB **X** and **Z** onlyC **X**, **Y** and **Z**D **Y** and **Z** only☐

4 What is the same for ethanol, ethanoic acid and ethyl ethanoate?

A the elements in each compound

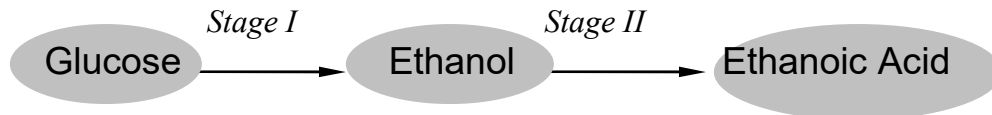
B the empirical formula of each compound

C the number of carbon atoms in one molecule of each compound

D the number of oxygen atoms in one molecule of each compound

☐

5 Ethanoic acid can be produced from glucose as follows.



Which terms are used to describe these two stages?

	<i>Stage I</i>	<i>Stage II</i>
A	cracking	oxidation
B	fermentation	oxidation
C	fermentation	addition
D	oxidation	fermentation

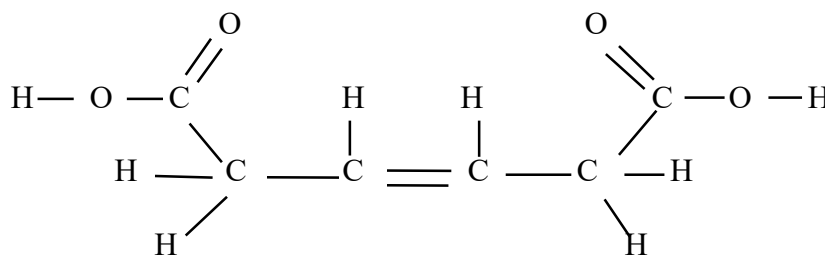
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6 What are the empirical and molecular formulas of ethanoic acid?

	<i>empirical formula</i>	<i>molecular formula</i>
A	CH ₂ O	C ₂ H ₄ O ₂
B	C ₂ H ₄ O	C ₂ H ₄ O
C	C ₂ H ₆ O	C ₂ H ₆ O
D	C ₂ H ₄ O ₂	CH ₂ O

☐

7 The diagram shows the structure of a compound **Q**.

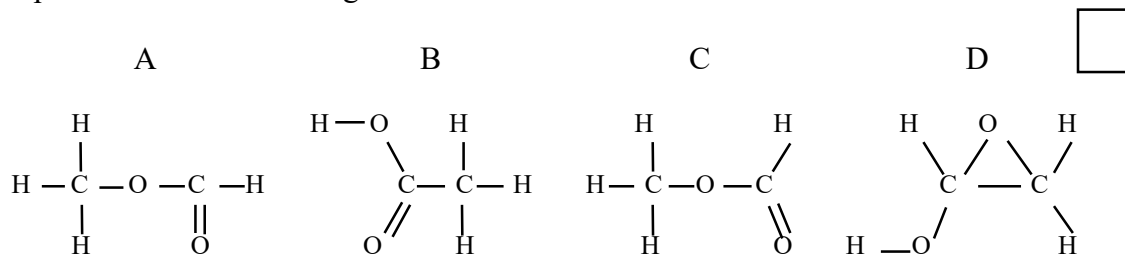


How can compound **Q** be classified?

- A as an acid and an alcohol
- B as an acid and as an alkene
- C as an alcohol and as an alkene
- D as an ester and as an alkene

☐

- 8 Four isomers of $C_2H_4O_2$ are shown below. Which one reacts with sodium carbonate to produce carbon dioxide gas?



- 9 Which two properties explain why ethanol is suitable for use in perfumes and deodorants?

- A It is flammable and is a good solvent.
- B It is colourless and is flammable.
- C It is a good solvent and has a low boiling point.
- D It is flammable and has a low boiling point.

☐

- 10 Ethanol is boiled with excess acidified potassium dichromate(VI). What is the organic product?

- | | |
|-------------------|-----------------|
| A ethane | B ethanoic acid |
| C ethyl ethanoate | D polyethene |

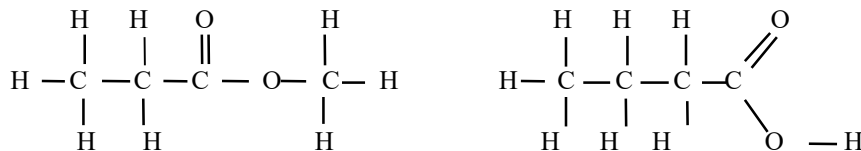
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- 11 Organic compound **X** reacts with sodium hydroxide to produce a compound with molecular formula $C_4H_9O_2Na$. What can **X** be?

- | | |
|-----------------|----------|
| A butanol | B butane |
| C butanoic acid | D butene |

☐

12 The structural formulas of two compounds are shown below.



What are the similarities and differences between these two compounds?

similarities

differences

- | | | |
|---|---------------------|---------------------------|
| A | molecular formulas | relative molecular masses |
| B | structural formulas | molecular formulas |
| C | molecular formulas | chemical reactions |
| D | structural formulas | relative molecular masses |



Section B: Structured Questions

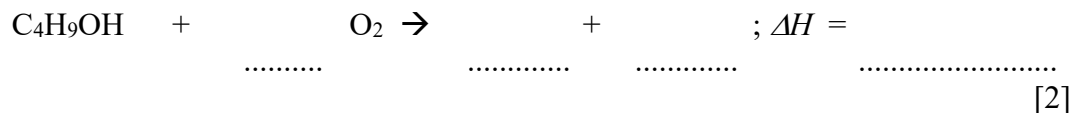
1 Some information about some alcohols is given in the table.

name	relative molecular mass, M_r	boiling point, °C	heat produced on completely burning one mole, kJ
methanol	32	65	720
ethanol		78	1370
	60	97	2010
butanol	74		2670
pentanol	88	138	

(a) Complete the table by

- adding the name of the other alcohol
- calculating the missing relative molecular mass
- estimating the boiling point of butanol
- estimating the heat produced on completely burning one mole of pentanol.

(b) Complete the equation for the complete combustion of butanol.



(c) Explain why the data for the heat produced in burning one mole *increases down the table*.

.....
 [1]

2 A list of formulas of several organic compounds is given below.

C₂H₅OH	C₅H₁₀	C₃H₇COOH	C₈H₁₈	C₃H₈
-------------------------------------	------------------------------------	---------------------------------------	------------------------------------	-----------------------------------

Choose from these formulas, the ones that fit the descriptions below.

(a) a compound that undergoes an addition reaction with steam

..... [1]

(b) a compound that has a pH less than 7 in water

..... [1]

(c) a compound that is oxidised by air to produce ethanoic acid

..... [1]

(d) one compound that is **not** a hydrocarbon

..... [1]

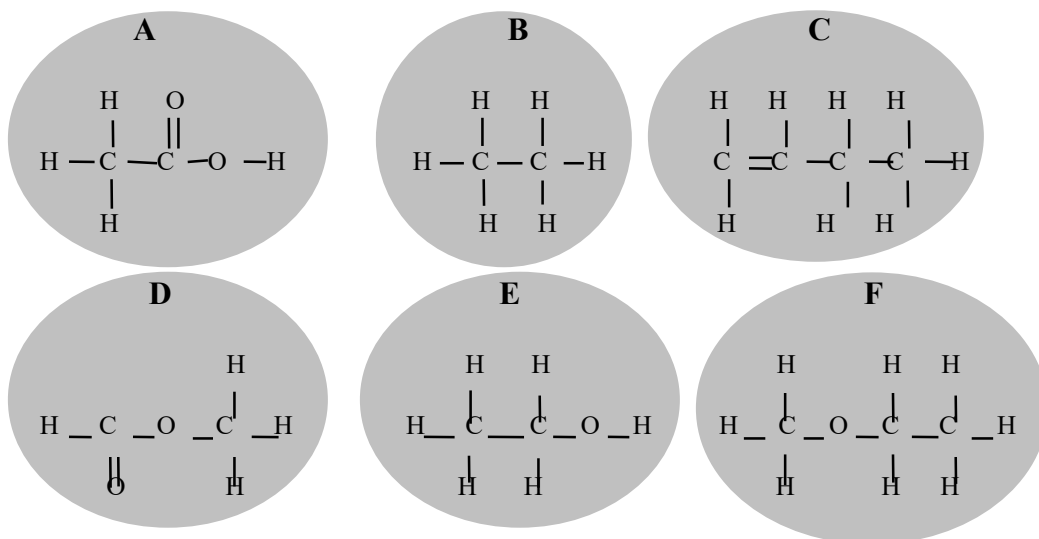
(e) two compounds which are in the same homologous series

..... [1]

(f) two compounds that react together to produce an ester

..... [1]

3 The structures of six compounds, **A** - **F**, are shown below.



(a) Use the letters **A** to **F**, to answer the following questions.

- (i) Which compounds are isomers?
- (ii) Which compound reacts with sodium carbonate?
- (iii) Which compound is an unsaturated hydrocarbon?
- (iv) Which compound can be made by reacting an organic acid with an alcohol?

(v) Which compound is formed by the oxidation of compound **E**?

[5]

(b) Compound **E** is the *second* member of a homologous series. Write the formula of the *first* member of this series.

..... [1]

(c) Compound **F** has molecular formula $\text{C}_3\text{H}_8\text{O}$. Draw the structure of another compound with this molecular formula.

[1]

4 Some vegetable oils contain an organic acid called linoleic acid, which is unsaturated.

(a) What is meant by the term *unsaturated*?

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

(b) Name the reagent used and give the observation in a simple chemical test which would confirm that

(i) linoleic acid is unsaturated.

reagent:

.....
observation:

(ii) linoleic acid is an acid:

reagent:

.....
observation:

..... [4]

(c) Linoleic acid has molecular formula $C_{17}H_{32}O_2$. How many $C=C$ bonds are present in one molecule of linoleic acid? Explain your answer.

number of $C=C$ bonds:

explanation:

..... [2]

Section C : Essay Questions

1 Ethanol is used in some countries as a liquid fuel instead of petrol. The ethanol is manufactured by fermentation of cane sugar.

(a) (i) Describe how sugar can be converted into ethanol, which is suitable for use as a fuel.

.....
.....
.....
..... [3]

(ii) Name the gas produced in the fermentation reaction and describe how you would test for it.

.....
.....
..... [2]

(b) Suggest **two** advantages of using ethanol in place of petrol as a fuel.

.....
.....
..... [2]

(c) (i) When ethanol is completely burnt in air, 1370 kJ of heat is evolved from one mole of ethanol. Construct the equation for the burning of ethanol, including ΔH in the equation.

[2]

(ii) State one other reaction of ethanol with air and write the equation for the reaction.

..... [1]

- 2 Vegetable fats and oils are organic compounds formed from the reaction of alcohols with carboxylic acids.

Saturated carboxylic acids have the general formula $C_nH_{(2n+1)}COOH$.

- (a) What type of organic compound are fats and oils?

..... [1]

- (b) *Unsaturated* fats and oils are healthier in peoples' diets than saturated ones.

- (i) Explain the meaning of the term *unsaturated*.

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

- (ii) Suggest a chemical test that might be used to find out if a fat or oil is saturated or unsaturated. Your answer should include the name of the reagent used and the expected observations pertinent to the test.

.....
.....
.....
..... [3]

- (iii) Palmitic acid, $C_{15}H_{31}COOH$, and oleic acid, $C_{17}H_{33}COOH$, are two common carboxylic acids found combined with alcohols in fats and oils. Explain briefly which one of these acids should be healthier for a person's diet?

.....
.....
.....
..... [2]