AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.7.2.4

Carboxylic acids

Past-paper questions

Tier	**Foundation**
Question groups	**17**
Available paper years	**2007–2023**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.7.2.4 Carboxylic acids

Question 01

June 2007 | CHY1B | Original Q8 | Legacy

QUESTION EIGHT

The table shows the fats in 100 grams of butter and in 100 grams of a margarine spread called Activo.

		Butter	Activo
	Total fat	81.0 g	80.0 g
of which	saturates	51.2 g	26.3 g
	monounsaturates	27.5 g	18.8 g
	polyunsaturates	2.3 g	34.4 g
	trans fats	0 g	0.5 g

Fats can:

- increase a person's weight and cause obesity
- raise cholesterol levels in the blood.

Most human cholesterol is manufactured in the body; only about 4 % results from diet.

High cholesterol levels are linked to heart disease.

Saturated fats raise cholesterol levels.
The more unsaturated a fat, the better it is for lowering cholesterol levels.

8A The Activo company claims that Activo is healthier than butter.

This claim may not be reliable because . . .

1 the company's scientists are unqualified.

2 the company wants to increase sales of Activo.

3 Activo is cheaper than butter.

4 the company is unsure which fats Activo contains.

4.7.2.4 Carboxylic acids

Question 01 · continued June 2007 | CHY1B | Original Q8 | Legacy

8B From the information provided, it is safe to conclude that . . .

1 butter is the main cause of heart disease.

2 heart disease will be reduced by eating Activo instead of butter.

3 trans fats are more harmful than saturated fats.

4 there is more unsaturated fat in Activo than in butter.

8C An overweight person ate his normal diet, except that he stopped eating foods containing saturated fats. He was surprised that he continued to gain weight.

This could be because . . .

1 his diet still contained a high level of unsaturated fats.

2 his cholesterol level was reduced.

3 his cholesterol level was unchanged.

4 he was no longer eating any trans fats.

8D Designing surveys to compare the effects of butter and Activo in causing heart disease is difficult because . . .

1 they both contain similar amounts of fat.

2 other factors can cause heart disease.

3 Activo contains more polyunsaturates than butter.

4 people with heart disease will not take part in the survey.

4.7.2.4 Carboxylic acids

Question 02

3 High amounts of cholesterol in the blood can cause heart disease.

- Eating saturated fat increases the amount of cholesterol in blood.
- Eating monounsaturated fat does not increase the amount of cholesterol in blood.
- Eating polyunsaturated fat decreases the amount of cholesterol in blood.

(a) The amounts of saturated fat and polyunsaturated fat in different types of margarine are shown in the table.

Type of margarine	Description	Saturated fat, g per 100 g margarine	Polyunsaturated fat, g per 100 g margarine
W	Hard margarine from animal and vegetable oils	30	14
X	Soft margarine from animal and vegetable oils	27	16
Y	Hard margarine from vegetable oils only	30	10
Z	Soft margarine from vegetable oils only	26	18

Which type of margarine, **W**, **X**, **Y** or **Z**, would you consider best to use to lower blood cholesterol?

Explain your answer.

The best type of margarine to use is ..... .

Explanation .....

.....

.....

(2 marks)

4.7.2.4 Carboxylic acids

Question 02 · continued

BLANK

(b) Use the correct words from the box to complete the sentences.

higher	**hydrogen**	**lower**
oxygen	**saturated**	**unsaturated**

(i) Animal and vegetable oils that contain ..... fats can be hardened.
(1 mark)

(ii) When oils are hardened with ..... gas, a chemical change takes place, producing margarine which has a ..... melting point than the original oil.
(2 marks)

5

Turn over for the next question

4.7.2.4 Carboxylic acids

Question 03

March 2008 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

The table contains information about the percentages of fats in four different types of food.

Food	Saturated fat	Monounsaturated fat	Polyunsaturated fat
Butter	66%	30%	4%
Corn oil	13%	25%	62%
Olive oil	14%	9%	77%
Sunflower oil	11%	69%	20%

High levels of cholesterol in the blood can increase the risk of heart disease.

Saturated fats can increase blood cholesterol levels, but unsaturated fats can have the opposite effect.

7A The food which would probably increase cholesterol levels the most is . . .

1 butter.

2 corn oil.

3 olive oil.

4 sunflower oil.

4.7.2.4 Carboxylic acids

Question 03 · continued

7B The food that contains the highest percentage of unsaturated fat is . . .

1 butter.

2 corn oil.

3 olive oil.

4 sunflower oil.

7C Butter is a solid fat but the other three foods in the table are oils.

This is because . . .

1 butter has a higher melting point than the oils.

2 butter has a lower boiling point than the oils.

3 butter has a higher density than the oils.

4 butter contains a lower percentage of polyunsaturated fat than the oils.

7D Some margarines made from olive oil or sunflower oil contain artificial colourings.

These colourings can be detected and identified by . . .

1 reacting with a catalyst.

2 distillation.

3 reacting with bromine.

4 chromatography.

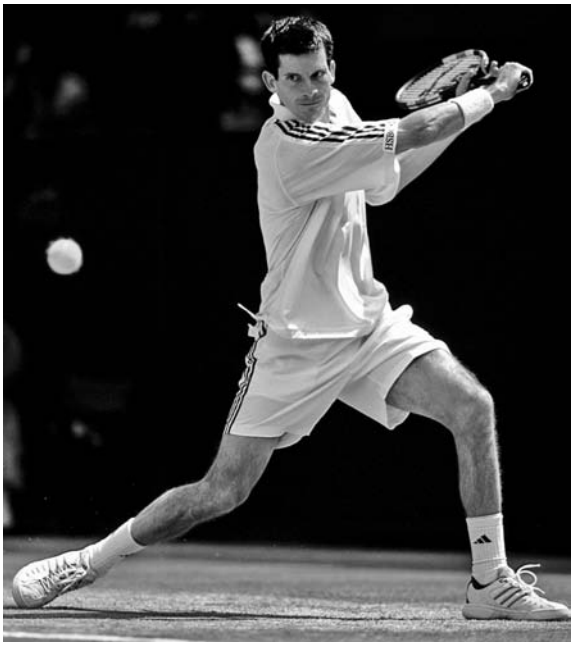
4.7.2.4 Carboxylic acids

Question 04

June 2008 | CHY3F | Original Q3 | Legacy

3 The information in the box was on the internet.

Breathtaking Finish



Tim Henman used *smelling salts* to help revive his fortunes at Wimbledon yesterday.

The active chemical in *smelling salts* is ammonium carbonate, $(NH_4)_2CO_3$.

A student tested some *smelling salts* to prove that they contained ammonium ions and carbonate ions.

3 (a) Complete these sentences by choosing the correct substances from the box.

3 (a) (i) Test for carbonate ions.

ammonia	**carbon dioxide**	**hydrochloric acid**
limewater	**water**	

The student added ..... to the smelling salts.

A gas called ..... was given off.

This gas turned ..... milky.

(3 marks)

4.7.2.4 Carboxylic acids

Question 04 · continued

for mark

3 (a) (ii) Test for ammonium ions.

ammonia	**carbon dioxide**	**hydrochloric acid**
litmus	**sodium hydroxide**	

The student added ..... to the smelling salts.

A gas called ..... was given off.

This gas turned ..... paper blue.

(3 marks)

3 (b) Suggest why ammonium ions **cannot** be identified using a flame test.

.....

.....

(1 mark)

7

4.7.2.4 Carboxylic acids

Question 05

March 2010 | CHY1BP | Original Q4 | Legacy

QUESTION FOUR

The table below shows the masses of some gases given off when one gram of each of the polymers, **A**, **B**, **C** and **D**, are burnt in air.

		Combustion products in mg						
	Polymer name	**C_2H_4**	**CH_4**	**CO_2**	**CO***	**NO_2***	**HCN***	**NH_3***
A	Kevlar	–	–	1850	50	10	14	0.5
B	Acrylic	5	17	1300	170	45	40	3.0
C	66 Nylon	50	25	1200	250	20	30	–
D	Polyester	6	10	1000	350	–	–	–

Toxic gases are marked with *.

Match polymers, **A**, **B**, **C** and **D**, with the numbers **1–4** below.

1 the polymer that produces the most HCN

2 the polymer that produces the most ethene

3 the polymer that produces no hydrocarbons

4 the polymer that produces the largest total mass of toxic gases

4.7.2.4 Carboxylic acids

Question 06

June 2019 | CHY3F | Original Q1 | Legacy

1 The table shows some information about acids and alkalis.

Name of acid or alkali	Type	Ions produced in solution		pH	Effect on Universal Indicator
Hydrochloric acid	Strong acid	H^+	Cl^-	1	Goes red
Sodium hydroxide	Strong alkali	Na^+	OH^-	13	Goes purple

Use the information in the table to help you answer parts **(a)** and **(b)**.

1 (a) Draw a ring around the correct answer to complete each sentence.

1 (a) (i) Hydrochloric acid is acidic.

This is because it contains [Cl^- / H^+ / OH^-] ions.

(1 mark)

1 (a) (ii) Sodium hydroxide solution is alkaline.

This is because it contains [H^+ / Na^+ / OH^-] ions.

(1 mark)

1 (a) (iii) The pH of acids is [higher than / lower than / the same as] the pH of alkalis.

(1 mark)

4.7.2.4 Carboxylic acids

Question 06 · continued

1 (b) Ethanoic acid is a weak acid.

Universal Indicator can be used to show that hydrochloric acid is a stronger acid than ethanoic acid of the same concentration.

Explain how.

.....

.....

.....

.....

(2 marks)

1 (c) Draw a ring around the correct answer to complete this sentence.

Strong acids and strong alkalis are | completely / not / partially | ionised in water.

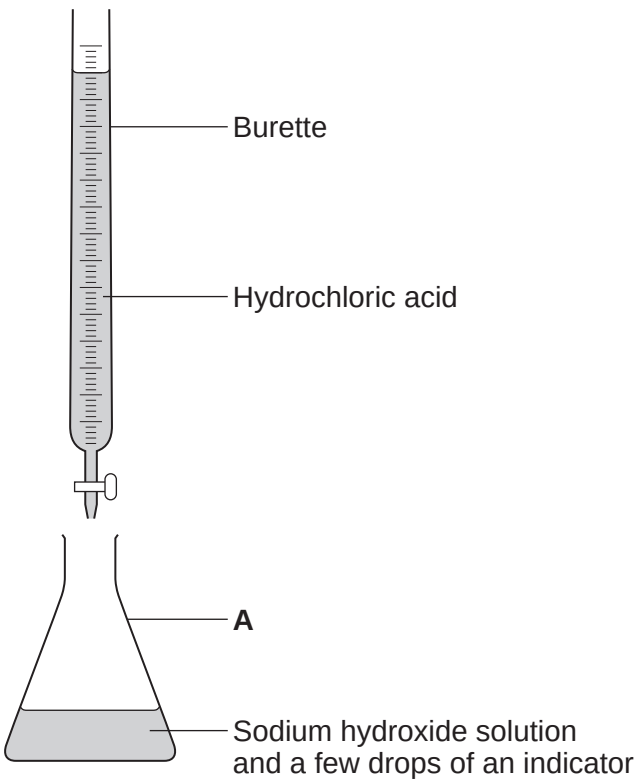
(1 mark)

Question 1 continues on the next page

4.7.2.4 Carboxylic acids

Question 06 · continued

1 (d) The diagram shows the apparatus used to find the volume of hydrochloric acid that reacts with 25.0 cm^3 of sodium hydroxide solution.



1 (d) (i) Which **one** of the following is the correct name for **A**?

Draw a ring around your answer.

beaker **conical flask** **pipette**

(1 mark)

1 (d) (ii) Use the correct word from the box to complete the sentence.

distillation	filtration	titration

The method used to find the volume of acid that reacts with a known volume of alkali is ..... .

(1 mark)

1 (d) (iii) Suggest **one** way to make the results more reliable.

.....

(1 mark)

9

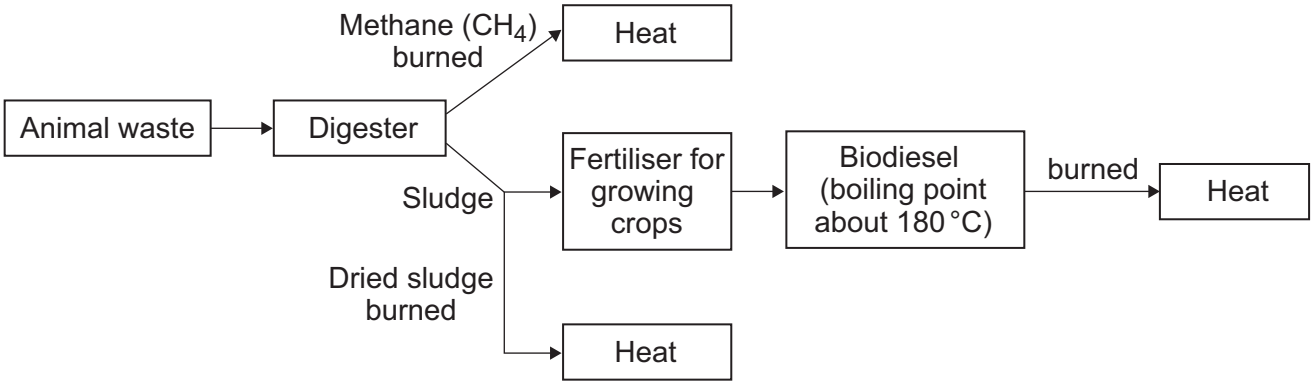
4.7.2.4 Carboxylic acids

Question 07

November 2010 | CHY1AP | Original Q3 | Legacy

QUESTION THREE

The diagram shows how animal waste can be used to produce heat.



Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A Biodiesel

B Methane

C Animal waste

D Dried sludge

1	This substance is the raw material for the process.
2	This fuel is a gas.
3	This fuel is a liquid.
4	This fuel is a solid.

4.7.2.4 Carboxylic acids

Question 08

January 2011 | CHY3F | Original Q3 | Legacy

3 This label was on a bottle of vinegar.



Vinegar contains ethanoic acid, which is a *weak* acid.

3 (a) Draw a ring around the correct answer to complete the sentences.

3 (a) (i) Ethanoic acid is an acid because it contains [hydrogen / hydroxide / oxide] ions.

(1 mark)

3 (a) (ii) Ethanoic acid is a *weak* acid because it is [completely / not / partially] ionised in water.

(1 mark)

3 (b) Magnesium ribbon can be used in a test to show that ethanoic acid is a weaker acid than hydrochloric acid.

3 (b) (i) State **one** way of making this test fair.

.....

.....

(1 mark)

3 (b) (ii) Give the results of this test.

.....

.....

.....

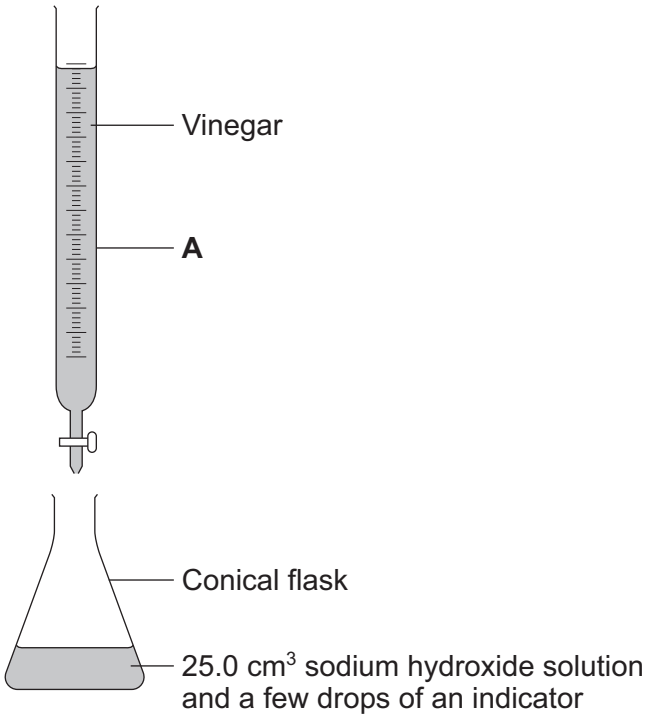
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(2 marks)

4.7.2.4 Carboxylic acids

Question 08 · continued

3 (c) The diagram shows the apparatus a student used to find the volume of vinegar that reacts with 25.0 cm^3 of sodium hydroxide solution.



3 (c) (i) Choose the correct word from the box to complete the sentence.

filtration	**polymerisation**	**titration**

The name of this method is ..... .

(1 mark)

3 (c) (ii) Which **one** of the following is the correct name for apparatus **A**?

Draw a ring around **one** answer.

burette **measuring cylinder** **pipette**

(1 mark)

3 (c) (iii) State how the student knew when enough vinegar had been added.

.....

.....

(1 mark)

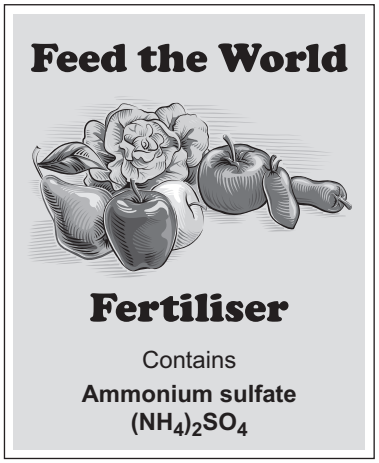
8

4.7.2.4 Carboxylic acids

Question 09

June 2011 | CHY3F | Original Q3 | Legacy

3 Ammonium sulfate is an artificial fertiliser.



3 (a) A student tested this fertiliser to prove that it contained ammonium ions and sulfate ions.

Draw a ring around the correct answer to complete each sentence.

3 (a) (i) Test for ammonium ions (NH_4^+).

The student added [sodium chloride solution / sodium hydroxide solution / dilute sulfuric acid] to the fertiliser.

A gas called ammonia was produced.

Ammonia turns damp litmus paper [blue. / green. / red.]

(2 marks)

3 (a) (ii) Test for sulfate ions (SO_4^{2-}).

The student added [barium chloride / silver nitrate / sodium chloride] solution to a solution of the fertiliser.

A [blue / red / white] precipitate was formed.

(2 marks)

4.7.2.4 Carboxylic acids

Question 09 · continued

3 (b) Ammonium sulfate is made by reacting sulfuric acid with ammonia solution.

Sulfuric acid is a *strong* acid.

Draw a ring around the correct answer to complete the sentence.

The word *strong* means that the acid is

- difficult to break.
- very concentrated.
- fully ionised in water.

(1 mark)

3 (c) Use the information about acids in the table to help you answer these questions.

Name of chemical	Ions produced in aqueous solution		pH	Universal Indicator added
Ethanoic acid	H^+	CH_3COO^-	5	Goes orange
Sulfuric acid	H^+	SO_4^{2-}	1	Goes red

Draw a ring around the correct answer to complete each sentence.

3 (c) (i) Sulfuric acid and ethanoic acid are both acids because they contain

- CH_3COO^- ions.
- H^+ ions.
- SO_4^{2-} ions.

(1 mark)

3 (c) (ii) Sulfuric acid is a stronger acid than ethanoic acid.

The pH of stronger acids is

- higher than
- lower than
- the same as

the pH of weaker acids.

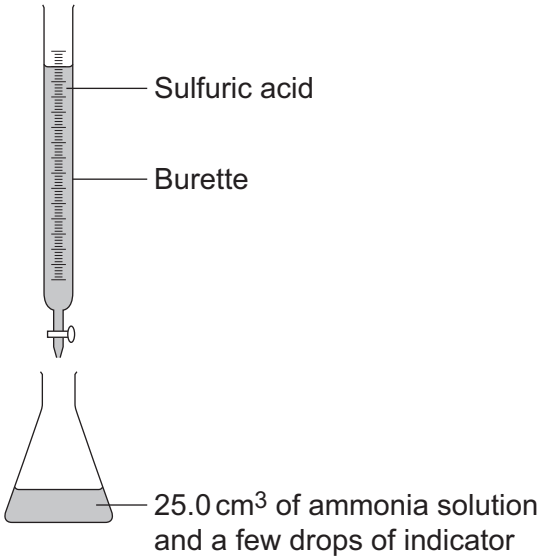
(1 mark)

4.7.2.4 Carboxylic acids

Question 09 · continued

3 (d) The volume of sulfuric acid that reacts with 25.0 cm^3 of ammonia solution can be found by titration.

The diagram shows the apparatus used for the titration.



A student did the titration five times and recorded the following results.

Titration	1	2	3	4	5
Volume of acid added in cm^3	13.3	13.9	13.2	13.1	13.2

3 (d) (i) How did the student know when enough sulfuric acid had been added to neutralise the ammonia solution?

.....

.....

(1 mark)

3 (d) (ii) The student did **not** use one of the results because it was anomalous.

Which result was anomalous? .....

(1 mark)

3 (d) (iii) Use the **other** four results to calculate the mean volume of sulfuric acid that reacted with the ammonia.

.....

.....

Mean volume = ... cm^3

(1 mark)

10

4.7.2.4 Carboxylic acids

Question 10

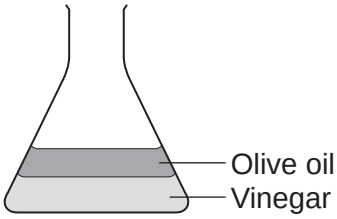
June 2012 | CH1FP | Original Q5 | Legacy

5 Olive oil is used to make salad dressings and margarine.

5 (a) Vinegar is often used in salad dressings.
Vinegar contains 95% water and 5% ethanoic acid.

5 (a) (i) To make a simple salad dressing add olive oil to vinegar and shake.
After a few minutes the mixture separates.

Simple salad dressing



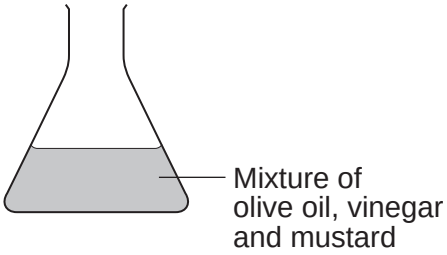
Tick (✓) **one** reason why the olive oil separates above the vinegar.

Reason	Tick (✓)
Olive oil does not dissolve in vinegar.	
Olive oil has a higher density than vinegar.	
Olive oil has a higher boiling point than vinegar.	

(1 mark)

5 (a) (ii) To make a French salad dressing add mustard to the olive oil and vinegar and shake.
After several minutes the mixture does **not** separate.

French salad dressing



The olive oil, vinegar and mustard mixture does **not** separate.
Give **one** reason why.

.....

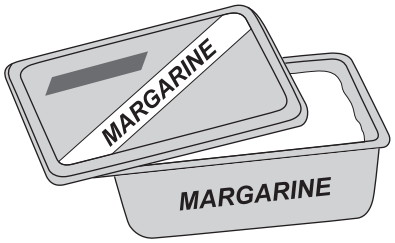
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(1 mark)

4.7.2.4 Carboxylic acids

Question 10 · continued

5 (b) Olive oil contains *unsaturated* compounds. Olive oil can be hardened to make margarine.



5 (b) (i) Draw a ring around the correct answer to complete the sentence.

Unsaturated compounds contain | double | ionic | metallic | carbon-carbon bonds.

(1 mark)

5 (b) (ii) Draw **one** line from the test that would detect unsaturated compounds to the result of the test.

Test	Result of test
Add bromine water	Turns cloudy
Add limewater	Turns colourless
Add water	Turns orange

(1 mark)

5 (c) Olives grow on trees.
When olive oil is burned it produces carbon dioxide.

5 (c) (i) Burning olive oil as a fuel is said to be 'carbon neutral'.
Suggest why.

.....

.....

(1 mark)

5 (c) (ii) Olive oil is too expensive to use as biodiesel fuel.
Suggest another reason why olive oil should **not** be used as a fuel.

.....

.....

(1 mark)

6

4.7.2.4 Carboxylic acids

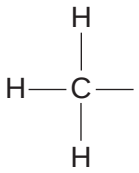
Question 11

June 2013 | CH3FP | Original Q8 | Legacy

8 This question is about organic compounds.

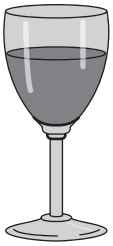
8 (a) Wine contains ethanol (CH_3CH_2OH).

8 (a) (i) Complete the displayed structure of ethanol.



(1 mark)

8 (a) (ii) Wine left in a glass for several days turns sour.
The sour taste is caused by ethanoic acid.



Complete the sentences.

The ethanoic acid is produced from a reaction between ethanol

and ..... .

This type of reaction is ..... .

(2 marks)

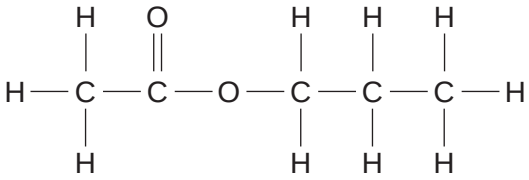
4.7.2.4 Carboxylic acids

Question 11 · continued

8 (b) Propyl ethanoate, a fragrance, can be produced by reacting ethanoic acid with an alcohol.

Propyl ethanoate is a member of a series of organic compounds. The members of the series all have the same functional group.

The displayed structure of propyl ethanoate is:



8 (b) (i) Draw a ring around the functional group for this series on the displayed structure of propyl ethanoate.

(1 mark)

8 (b) (ii) Name the series of organic compounds with this functional group.

.....

(1 mark)

8 (b) (iii) The alcohol used to make propyl ethanoate has the formula $CH_3CH_2CH_2OH$

Name this alcohol.

.....

(1 mark)

6

4.7.2.4 Carboxylic acids

Question 12

June 2015 | CH3FP | Original Q5 | Legacy

5 This question is about organic compounds.

5 (a) Ethanol burns in air.

Use the correct answer from the box to complete the word equation for the reaction.

[1 mark]

carbon	hydrogen	oxygen

ethanol + ... → carbon dioxide + water

5 (b) Use the correct answer from the box to complete the sentence.

[1 mark]

milk	hard water	vinegar

Ethanoic acid is in ..... .

5 (c) Ethanoic acid is a carboxylic acid.

Which diagram, **A**, **B** or **C**, has a ring around the functional group of a carboxylic acid?

Write your answer in the box.

[1 mark]

Diagram A

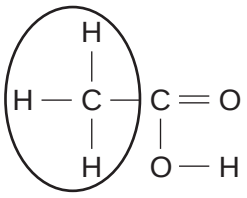


Diagram B

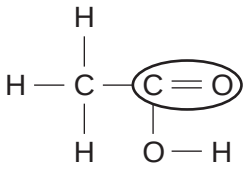


Diagram C

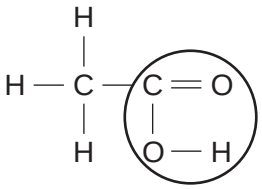


Diagram ☐

4.7.2.4 Carboxylic acids

Question 12 · continued

5 (d) Ethyl propanoate is produced by reacting ethanol with propanoic acid.

What type of organic compound is ethyl propanoate?

[1 mark]

Tick (✓) **one** box.

Alcohol ☐

Carboxylic acid ☐

Ester ☐

5 (e) Organic compounds such as ethyl propanoate are used in perfumes.

Give **two** properties of these compounds that make them suitable for use in perfumes.

[2 marks]

.....

.....

6

4.7.2.4 Carboxylic acids

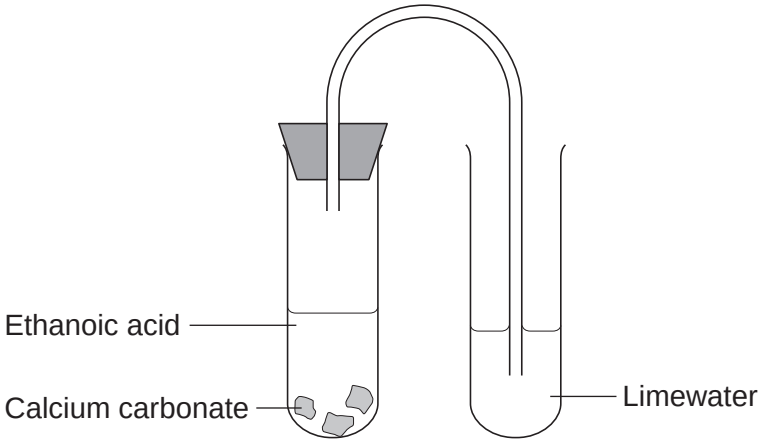
Question 13

June 2016 | CH3FP | Original Q5 | Legacy

5 This question is about reactions of ethanoic acid and the analysis of salts.

5 (a) **Figure 7** shows the apparatus used to investigate the reaction of ethanoic acid with calcium carbonate.

Figure 7



5 (a) (i) Describe a change that would be seen in each test tube.

Give a reason for each change.

[4 marks]

Test tube 1 _____

_____

_____

_____

Test tube 2 _____

_____

_____

_____

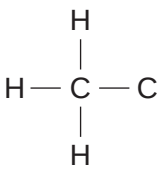
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4.7.2.4 Carboxylic acids

Question 13 · continued

5 (a) (ii) Complete the displayed structure of ethanoic acid.

[1 mark]



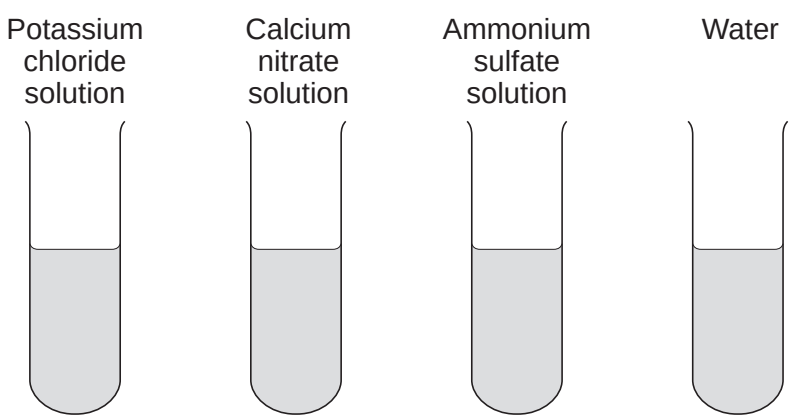
5 (a) (iii) Ethanoic acid is a carboxylic acid.
Complete the sentence.

[2 marks]

Carboxylic acids react with alcohols in the presence of an _____ catalyst to produce pleasant-smelling compounds called _____ .

5 (b) **Figure 8** shows four test tubes containing three different salt solutions and water.

Figure 8



Each solution and the water was tested with:

- silver nitrate in the presence of dilute nitric acid
- barium chloride in the presence of dilute hydrochloric acid.

4.7.2.4 Carboxylic acids

Question 13 · continued

Complete the table of results.

[2 marks]

	Potassium chloride solution	Calcium nitrate solution	Ammonium sulfate solution	Water
Test with silver nitrate in the presence of dilute nitric acid			no change	no change
Test with barium chloride in the presence of dilute hydrochloric acid		no change	white precipitate	

5 (c) Flame tests can be used to identify metal ions.

5 (c) (i) Complete the following sentences.

[2 marks]

The flame colour for potassium ions is _____ .

The flame colour for calcium ions is _____ .

5 (c) (ii) Give **one** reason why a flame test would **not** show the presence of both potassium ions and calcium ions in a mixture.

[1 mark]

_____

_____

_____

12

4.7.2.4 Carboxylic acids

Question 14

June 2017 | CH3FP | Original Q1 | Legacy

1 This question is about elements and compounds.

1 (a) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

densities	numbers	weights

The elements in the modern periodic table are arranged in order of their atomic _____ .

1 (a) (ii) Use the correct answer from the box to complete the sentence.

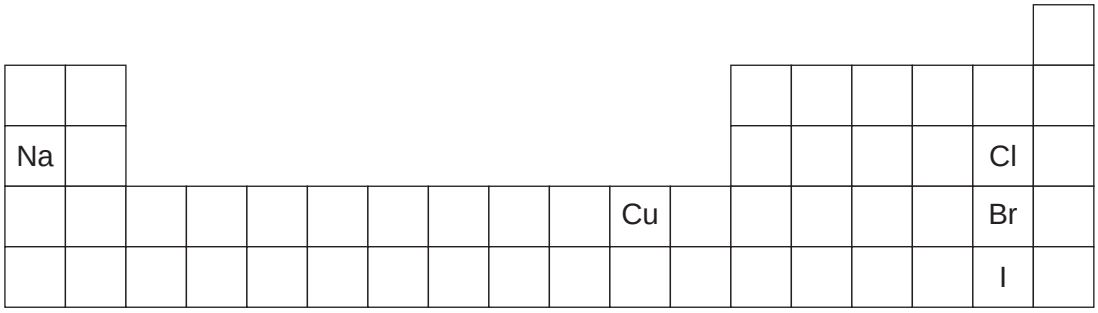
[1 mark]

electrons	neutrons	protons

The outer shells of atoms of elements in the same group have the same number of _____ .

1 (b) **Figure 1** shows the position of five elements in the modern periodic table.

Figure 1



1 (b) (i) Which **one** of the elements in **Figure 1** is a gas at room temperature?

[1 mark]

_____

4.7.2.4 Carboxylic acids

Question 14 · continued

1 (b) (ii) Which **one** of the elements in **Figure 1** is a transition metal?

[1 mark]

_____

1 (b) (iii) Complete the sentence.

[1 mark]

In the modern periodic table, bromine (Br) is in Group _____ .

1 (c) Bromine reacts with sodium iodide to produce iodine.

The word equation for the reaction is:

bromine + sodium iodide ⟶ iodine + sodium bromide

1 (c) (i) What type of reaction is this?

[1 mark]

Tick (✓) **one** box.

Combustion ☐

Displacement ☐

Neutralisation ☐

1 (c) (ii) Use the Chemistry Data Sheet to help you answer this question.

Which halogen would react with sodium chloride solution to produce chlorine?

[1 mark]

Tick (✓) **one** box.

Bromine ☐

Fluorine ☐

Iodine ☐

Question 1 continues on the next page

4.7.2.4 Carboxylic acids

Question 14 · continued

1 (d) Silver nitrate in the presence of dilute nitric acid is used to test for iodide ions.

What colour precipitate is produced?

[1 mark]

Tick (✓) **one** box.

Cream ☐

White ☐

Yellow ☐

4.7.2.4 Carboxylic acids

Question 14 · continued

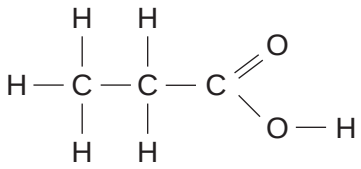
1 (e) Propanoic acid is a compound containing carbon atoms.

1 (e) (i) **Figure 2** shows the displayed structure of propanoic acid.

Draw a ring around the functional group of propanoic acid in **Figure 2**.

[1 mark]

Figure 2



1 (e) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

carbon dioxide	hydrogen	oxygen

Propanoic acid reacts with carbonates to produce _____ .

1 (e) (iii) Use the correct answer from the box to complete the sentence.

[1 mark]

alkalis	esters	fuels

Propanoic acid reacts with alcohols to produce pleasant smelling compounds called _____ .

11

4.7.2.4 Carboxylic acids

Question 15

June 2018 | 8462/2F | Original Q9

0 9 Methylated spirit is a useful product made from a mixture of substances.

Table 6 shows the mass of the substances in a sample of methylated spirit.

Table 6

Substance	Mass in grams
Ethanol	265.5
Methanol	23.3
Pyridine	3.0
Methyl violet	1.5

0 9 . 1 What name is given to a useful product such as methylated spirit?

[1 mark]

_____

0 9 . 2 Calculate the percentage by mass of methanol in methylated spirit.

Use **Table 6**.

[2 marks]

_____

_____

_____

_____

Percentage = _____ %

Question 9 continues on the next page

4.7.2.4 Carboxylic acids

Question 15 · continued

Methylated spirit contains ethanol and is available cheaply.

Methylated spirit also contains:

- pyridine which has a very unpleasant smell
- methyl violet which makes the mixture purple.

0 9 . 3 Suggest why pyridine and methyl violet are added to ethanol to make methylated spirit.

[1 mark]

0 9 . 4 Suggest **one** use of methylated spirit.

[1 mark]

0 9 . 5 Describe how ethanol is produced from sugar solution.

Give the name of this process.

[3 marks]

4.7.2.4 Carboxylic acids

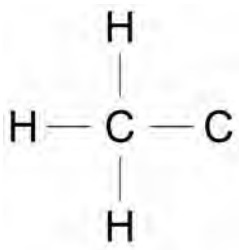
Question 15 · continued

0 9 . 6 **Figure 9** shows part of the displayed formula for ethanol.

Complete **Figure 9**.

[1 mark]

Figure 9



0 9 . 7 Name the gas produced when sodium is added to ethanol.

[1 mark]

0 9 . 8 Methanol is used to produce methanoic acid.

What type of substance reacts with methanol to produce methanoic acid?

[1 mark]

4.7.2.4 Carboxylic acids

Question 16

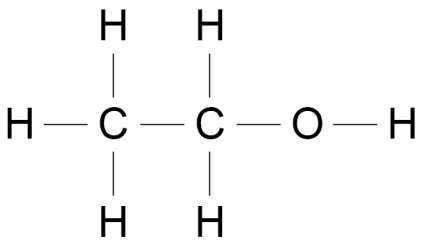
November 2020 | 8462/2F | Original Q7

0 7 This question is about ethanol and ethanoic acid.

Ethanol is an alcohol.

0 7 . 1 **Figure 7** shows the displayed structural formula of ethanol.

Figure 7



Draw a circle on **Figure 7** around the alcohol functional group.

[1 mark]

0 7 . 2 An ethanol molecule contains atoms of three different elements.

Complete **Table 5** to show:

- the name of each element
- the symbol for each element
- the number of atoms of each element in one molecule of ethanol.

Use **Figure 7**.

[3 marks]

Table 5

Name of element	Symbol for element	Number of atoms in one molecule of ethanol
Carbon	C	
Hydrogen		6
	O	1

Question 16 · continued

0 7 . 3 Ethanol removes grass stains from clothes.

What type of substance is ethanol when used to remove grass stains?

[1 mark]

Tick (✓) **one** box.

A solute ☐

A solution ☐

A solvent ☐

Wine contains ethanol.

Wine is produced from grape juice by fermentation.

0 7 . 4 Complete the sentence.

[1 mark]

Grape juice can be fermented to produce wine because

grape juice contains _____.

0 7 . 5 What is added to grape juice to cause fermentation?

[1 mark]

_____

4.7.2.4 Carboxylic acids

Question 16 · continued

0 7 . 6 Ethanol reacts with ethanoic acid to produce an ester.

What is the name of the ester produced when ethanol reacts with ethanoic acid?

[1 mark]

Tick (✓) **one** box.

Ethane ☐

Ethene ☐

Ethyl ethanoate ☐

0 7 . 7 Ethanoic acid reacts with sodium carbonate.

The equation for the reaction is:

$$2\,CH_3COOH(aq) + Na_2CO_3(s) \rightarrow 2\,CH_3COONa(aq) + H_2O(l) + CO_2(g)$$

What is the name of the liquid produced by this reaction?

[1 mark]

_____

0 7 . 8 Vinegar is a solution that contains ethanoic acid.

400 cm^3 of vinegar contains 20 g of ethanoic acid.

Calculate the mass of ethanoic acid in 1.0 dm^3 of vinegar.

[3 marks]

_____

_____

_____

_____

_____

_____

Mass = _____ g

12

4.7.2.4 Carboxylic acids

Question 17

June 2023 | 8462/2F | Original Q9

0 9 This question is about alcohols and carboxylic acids.

Alcohols are used as fuels.

A student burned 1.00 g of six alcohols and determined the energy released from each.

Table 8 shows the results.

Table 8

Alcohol	Formula of one molecule of the alcohol	Energy released in kJ/g
Ethanol	C_2H_5OH	29.6
Propanol	C_3H_7OH	33.6
Butanol	C_4H_9OH	36.1
Pentanol	$C_5H_{11}OH$	37.7
Hexanol	$C_6H_{13}OH$	38.9
Heptanol	$C_7H_{15}OH$	39.8

0 9 . 1 Calculate the mass of ethanol that must be burned to release the same amount of energy as burning 1.00 g of heptanol.

[2 marks]

Mass = _____ g

0 9 . 2 The energy released in kJ/g varies with the number of carbon atoms in one molecule of each alcohol.

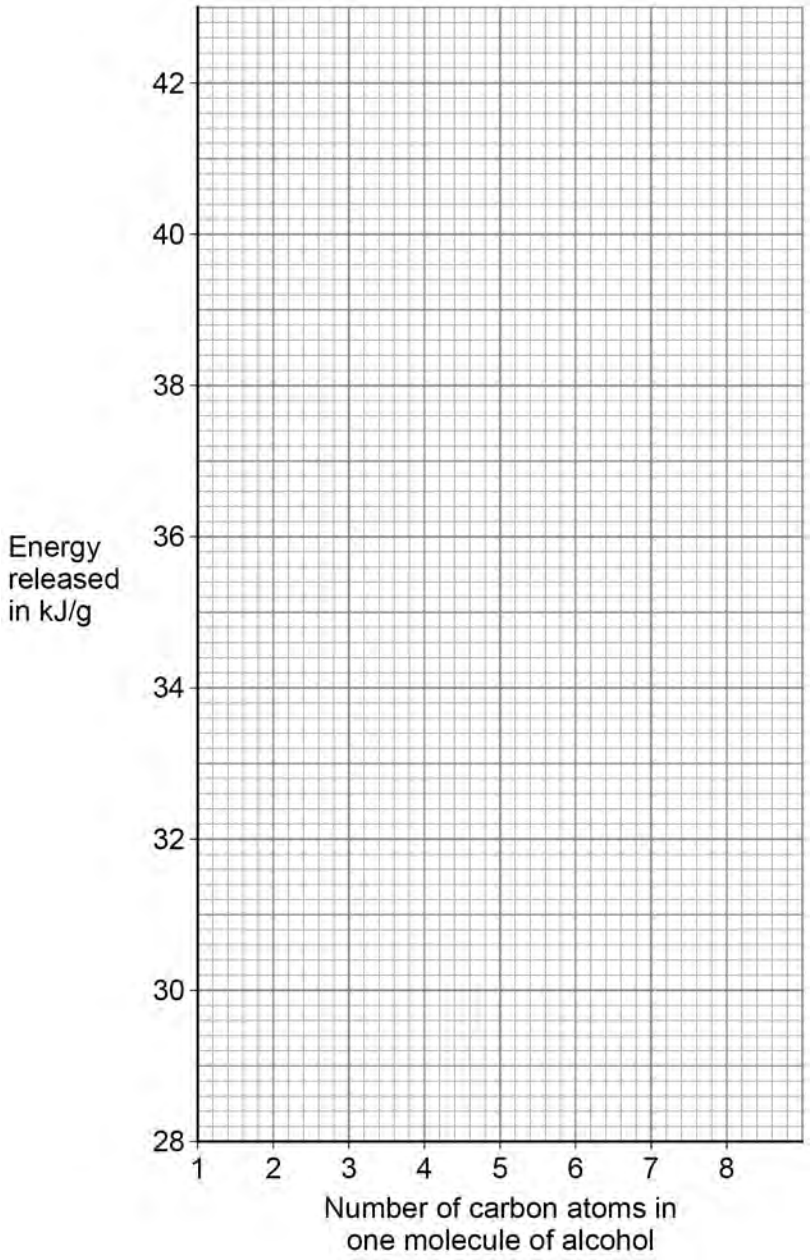
Plot the data from **Table 8** on **Figure 8**.

[2 marks]

4.7.2.4 Carboxylic acids

Question 17 · continued

Figure 8



0 9 . 3 Estimate the energy released in kJ when 1.00 g of octanol ($C_8H_{17}OH$) is burned.

Use **Figure 8**.

[1 mark]

Energy released = _____ kJ

4.7.2.4 Carboxylic acids

Question 17 · continued

Carbon dioxide is produced when alcohols are burned.

Carbon dioxide is identified by bubbling the gas through limewater.

0 9 . 4 Complete the sentence.

Choose the answer from the box.

[1 mark]

calcium chloride	**calcium hydroxide**	**calcium nitrate**	**calcium sulfate**

Limewater is an aqueous solution of _____.

0 9 . 5 Give the result of the test when carbon dioxide is bubbled through limewater.

[1 mark]

_____

_____

4.7.2.4 Carboxylic acids

Question 17 · continued

June 2023 | 8462/2F | Original Q9

Ethanoic acid can be produced from ethanol.

0 9 . 6 What is reacted with ethanol to produce ethanoic acid?

[1 mark]

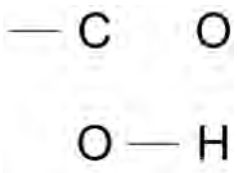
Tick (✓) **one** box.

- A halogen ☐
- An alkali metal ☐
- An oxidising agent ☐
- Water ☐

0 9 . 7 Ethanoic acid contains the functional group –COOH

Complete the displayed structural formula of this functional group.

[1 mark]



Question 9 continues on the next page

4.7.2.4 Carboxylic acids

Question 17 · continued

0 9 . 8 Ethanoic acid reacts with different compounds.

Draw **one** line from each compound to a product of the reaction of the compound with ethanoic acid.

[2 marks]

Compound	Product of the reaction with ethanoic acid
Ethanol	Carbon dioxide
Sodium carbonate	Ethene
	Ethyl ethanoate
	Hydrogen
	Poly(ethene)

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