AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.8.2.3

Test for carbon dioxide

Past-paper questions

Tier	**Foundation**
Question groups	**24**
Available paper years	**2007–2024**

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.

4.8.2.3 Test for carbon dioxide

Question 01

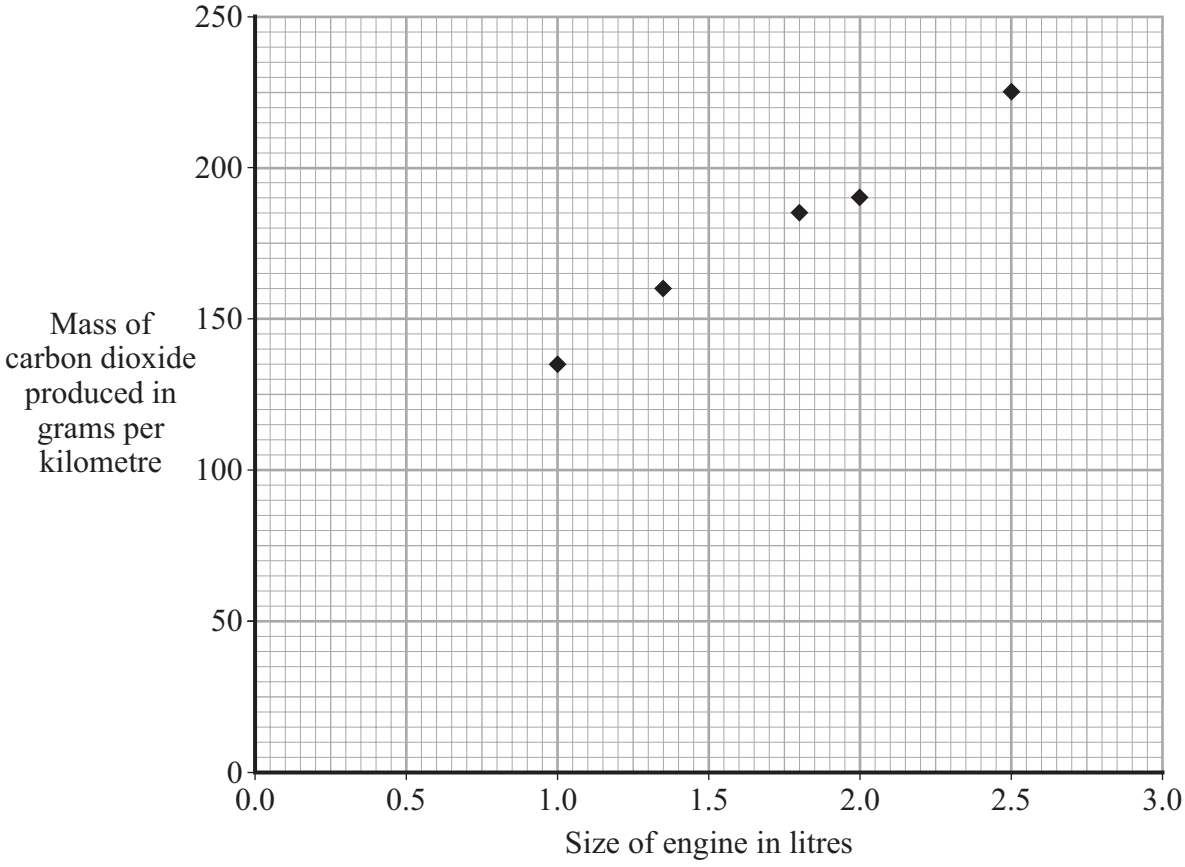
June 2007 | CHY1A | Original Q8 | Legacy

QUESTION EIGHT

Technicians at a car manufacturing company carried out tests on carbon dioxide emissions from their new range of cars.

First, they tested a small, lightweight, four-seater car with a 1.0 litre petrol engine.
They repeated the tests on similar cars, under similar conditions but with different engine sizes.

The results of their tests are shown on the graph.



8A What relationship is supported by these data?

1 Large engines produce more carbon dioxide per kilometre than small engines.

2 Small engines are more economical than large engines.

3 The mass of carbon dioxide produced per kilometre is directly proportional to the engine size.

4 A 2.0 litre engine produces twice as much carbon dioxide per kilometre as a 1.0 litre engine.

4.8.2.3 Test for carbon dioxide

Question 01 · continued June 2007 | CHY1A | Original Q8 | Legacy

8B What could the technicians do to improve the reliability of the data in this investigation?

1 repeat the tests with different numbers of passengers in the cars

2 repeat the tests and calculate the mean (average) mass of carbon dioxide produced

3 repeat the tests and use the lowest mass of carbon dioxide produced

4 repeat the tests and use the highest mass of carbon dioxide produced

8C A car salesman claimed that a large, heavy, eight-seater car with the same 2.5 litre petrol engine would produce only 225 grams of carbon dioxide per kilometre.

Was this a fair claim from the data?

1 No, because the reading on the graph is 230 grams of carbon dioxide per kilometre.

2 No, because the result may be different for a heavier vehicle.

3 Yes, because that is the value shown on the graph.

4 Yes, because a 2.5 litre engine will always give the same results.

8D In another series of tests under the same conditions, the small, lightweight, four-seater car with a 2.0 litre diesel engine produced 150 grams of carbon dioxide per kilometre.

What is the best conclusion about petrol and diesel engines that can be drawn from these data?

1 Diesel engines are more efficient than petrol engines.

2 Diesel engines always produce less carbon dioxide than petrol engines.

3 The type of fuel used in a car engine may affect the amount of carbon dioxide produced.

4 The type of fuel used in a car engine does not affect the amount of carbon dioxide produced.

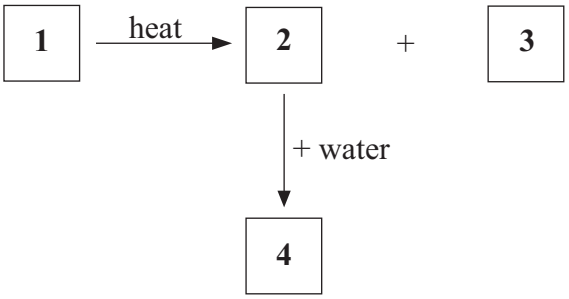
4.8.2.3 Test for carbon dioxide

Question 02

November 2007 | CHY1A | Original Q2 | Legacy

QUESTION TWO

The flow diagram shows what happens when a sample of limestone is strongly heated, and water is then added to the solid product.



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

A calcium carbonate

B calcium hydroxide

C calcium oxide

D carbon dioxide

4.8.2.3 Test for carbon dioxide

Question 03

January 2008 | CHY3F | Original Q2 | Legacy

2 A bottle of washing soda was found in a school laboratory. The modern name of washing soda is sodium carbonate.



A student tested the washing soda to prove that it was sodium carbonate.

(a) The student did a flame test to show that washing soda is a sodium compound.

The student used a clean wire to put the washing soda into the flame.

(i) Why should the wire be clean when used for a flame test?

.....

(1 mark)

(ii) The table shows some properties of metals.

Two of these are properties that the wire must have if it is used for a flame test.

Put a tick (✓) next to the **two** correct properties.

Property	(✓)
Good electrical conductor	
High density	
High melting point	
Low boiling point	
Unreactive	

(2 marks)

4.8.2.3 Test for carbon dioxide

Question 03 · continued

BLANK

(iii) Which **one** of the following flame colours shows that washing soda is a sodium compound?

Draw a ring around your answer.

brick-red **lilac** **yellow-orange**

(1 mark)

(b) The student used dilute hydrochloric acid to show that washing soda was a carbonate. Carbon dioxide gas was given off.

(i) Describe what you **see** happening when a gas is given off.

.....

.....

(1 mark)

(ii) The student used limewater to prove that the gas given off was carbon dioxide.

Complete this sentence by choosing the correct word from the box.

clear	**colourless**	**milky**

When carbon dioxide reacts with limewater, the limewater turns

..... .

(1 mark)

(c) Instrumental methods are used to identify chemicals.

Describe some advantages of instrumental methods compared with chemical tests by considering:

- the length of time needed to carry out a test
- the amount of chemical used.

.....

.....

.....

.....

.....

(2 marks)

8

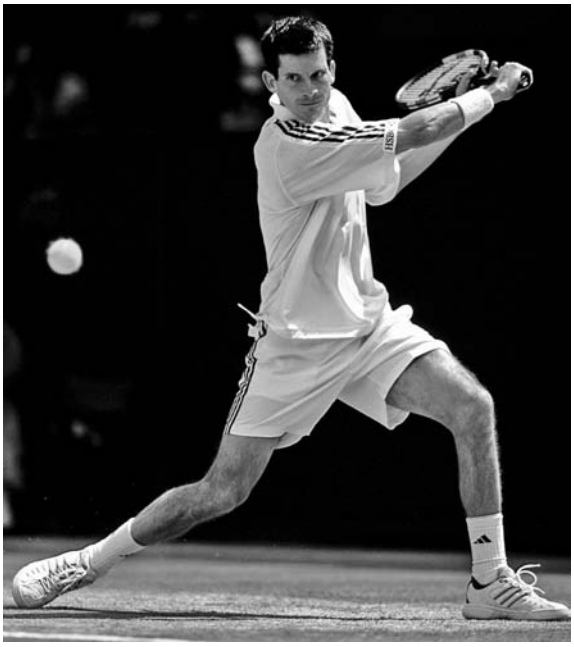
4.8.2.3 Test for carbon dioxide

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)

4.8.2.3 Test for carbon dioxide

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

4.8.2.3 Test for carbon dioxide

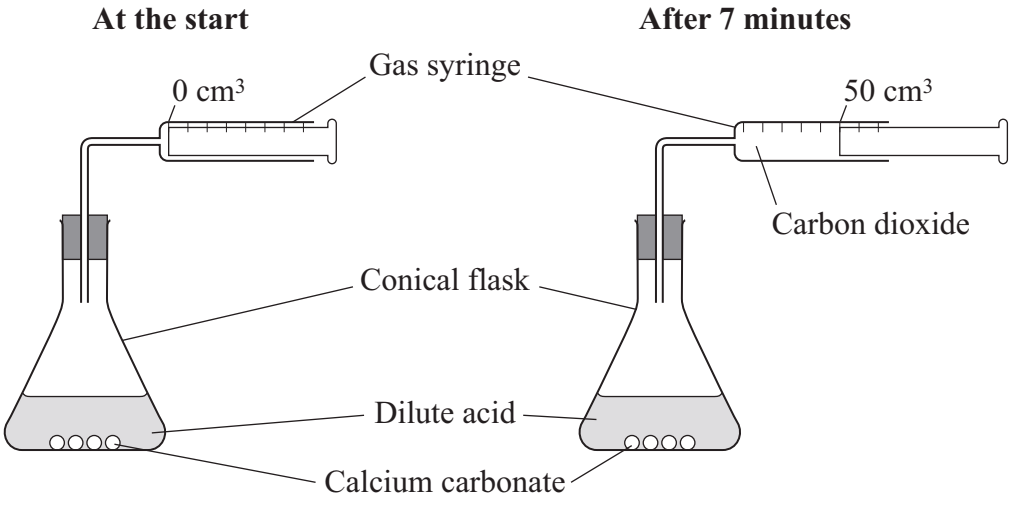
Question 05

November 2008 | CHY1AP | Original Q7 | Legacy

QUESTION SEVEN

Calcium carbonate reacts with a dilute acid to give off carbon dioxide gas.

The apparatus below was used to measure the volume of carbon dioxide given off.



The following results were obtained.

Time in minutes	Volume of gas in cm^3
0	0
1	20
2	30
3	40
4	45
5	50
6	50
7	50

4.8.2.3 Test for carbon dioxide

Question 05 · continued

7A During which period was the most carbon dioxide gas given off?

1 0–1 minutes

2 1–2 minutes

3 2–3 minutes

4 3–4 minutes

7B How long did it take for all the carbon dioxide gas to be given off?

1 4 minutes

2 5 minutes

3 6 minutes

4 7 minutes

7C Which of the following is the best reason for the volume of gas remaining at 50 cm^3 ?

1 Both the calcium carbonate and the dilute acid had all reacted.

2 The calcium carbonate had all reacted.

3 The dilute acid had all reacted.

4 The gas syringe was full.

7D Which of the following actions would give a more precise value for the time that the reaction stopped?

1 using a larger conical flask

2 using a larger gas syringe

3 weighing the calcium carbonate before and after the experiment

4 measuring the volume of carbon dioxide gas every 30 seconds

4.8.2.3 Test for carbon dioxide

Question 06

June 2009 | CHY1AP | Original Q1 | Legacy

QUESTION ONE

This question is about limestone.

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

A calcium carbonate

B carbon dioxide

C calcium oxide

D calcium hydroxide

1	This is a gas made when limestone is heated strongly.
2	Limestone is mainly made up of this compound.
3	This is another name for slaked lime.
4	This is another name for quicklime.

4.8.2.3 Test for carbon dioxide

Question 07

November 2010 | CHY1AP | Original Q6 | Legacy

QUESTION SIX

Limestone is used for building. Acid rain can damage limestone buildings because limestone is mainly calcium carbonate. Calcium carbonate reacts with acid rain to produce carbon dioxide.

A scientist tests limestone with an acid rain solution to see how much damage occurs.

The scientist:

- weighed a piece of limestone
- put the limestone in the acid rain solution
- after 1 day, took the piece of limestone out of the solution and dried the surface
- reweighed the piece of limestone.

The scientist repeated this process with the same piece of limestone for 10 days.

The results are shown in the table.

Time in days	0	1	2	3	4	5	6	7	8	9	10
Mass in g	10.0	10.2	9.5	8.9	8.4	8.0	7.7	7.5	7.3	7.3	7.3

6A A gas that causes acid rain is . . .

1 carbon monoxide.

2 sulfur dioxide.

3 carbon dioxide.

4 nitrogen.

6B The mass of the piece of limestone increased during the first day because . . .

1 carbon dioxide was produced.

2 the acid was diluted with water.

3 the limestone soaked up some of the acid rain solution.

4 the substances were mixed.

4.8.2.3 Test for carbon dioxide

Question 07 · continued

6C The mass of the piece of limestone decreased during the 10 days because . . .

1 there was an error using the balance.

2 carbon dioxide was given off.

3 the acid rain had been absorbed.

4 all the calcium carbonate had reacted.

6D After 11 days, the mass of the piece of limestone would be . . .

1 10.0 g.

2 8.4 g.

3 7.3 g.

4 6.5 g.

Turn over for the next question

4.8.2.3 Test for carbon dioxide

Question 08

2 Read the information in the box and then answer the questions.

> Seidlitz Powder is a medicine.
>
> Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid. The other powder is wrapped in blue paper and contains sodium hydrogencarbonate.
>
> The contents of the blue paper are dissolved in water and the contents of the white paper are added. This causes a reaction that produces carbon dioxide gas. The mixture is safe to drink when the reaction stops.

2 (a) Suggest why Seidlitz Powder comes as two separate powders.

.....

(1 mark)

2 (b) The reaction produces carbon dioxide gas.

2 (b) (i) What would you see during the reaction?

.....

(1 mark)

2 (b) (ii) Which state symbol in a chemical equation shows that carbon dioxide is a gas?

Draw a ring around **one** answer.

(s) **(l)** **(aq)** **(g)**

(1 mark)

2 (b) (iii) Draw a ring around the correct answer to complete the sentence.

Carbon dioxide can be identified because it turns [limescale / limestone / limewater] milky.

(1 mark)

4.8.2.3 Test for carbon dioxide

Question 08 · continued

2 (c) Sodium hydrogencarbonate contains sodium ions. Sodium ions can be identified by flame tests.

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

Sodium ions give a [blue / red / yellow] flame.

(1 mark)

2 (d) Some Seidlitz Powder was bought on the Internet for £5. However, when tested, it was found to be only magnesium sulfate, worth a few pence.

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

2 (d) (i) The test for sulfate ions uses [barium chloride / silver nitrate / sodium hydroxide] solution.

(1 mark)

2 (d) (ii) A positive test for sulfate ions produces a [blue / red / white] precipitate.

(1 mark)

2 (d) (iii) Suggest **one** disadvantage of buying medicines on the Internet.

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.....

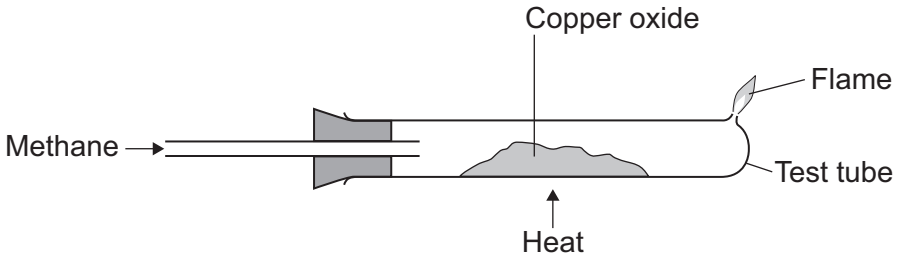
(1 mark)

8

4.8.2.3 Test for carbon dioxide

Question 09

7 An experiment was done on the reaction of copper oxide (CuO) with methane (CH_4).



7 (a) The equation for this reaction is shown below.

$$4CuO(s) + CH_4(g) \rightarrow 4Cu(s) + 2H_2O(g) + CO_2(g)$$

The water and carbon dioxide produced escapes from the test tube.

Use information from the equation to explain why.

.....

(1 mark)

7 (b) (i) Calculate the relative formula mass (M_r) of copper oxide (CuO).

Relative atomic masses (A_r): O = 16; Cu = 64.

.....

.....

.....

Relative formula mass (M_r) = ...

(2 marks)

7 (b) (ii) Calculate the percentage of copper in copper oxide.

.....

.....

.....

Percentage of copper = ... %

(2 marks)

4.8.2.3 Test for carbon dioxide

Question 09 · continued

7 (b) (iii) Calculate the mass of copper that could be made from 4.0 g of copper oxide.

.....

.....

Mass of copper = ... g

(1 mark)

7 (c) The experiment was done three times.
The mass of copper oxide used and the mass of copper made was measured each time.
The results are shown in the table.

	Experiment		
	1	**2**	**3**
Mass of copper oxide used in g	4.0	4.0	4.0
Mass of copper made in g	3.3	3.5	3.2

7 (c) (i) Calculate the mean mass of copper made in these experiments.

.....

.....

Mean mass of copper made = ... g

(1 mark)

7 (c) (ii) Suggest how the results of these experiments could be made more precise.

.....

.....

(1 mark)

7 (c) (iii) The three experiments gave slightly different results for the mass of copper made.
This was caused by experimental error.

Suggest **two** causes of experimental error in these experiments.

1 .....

.....

2 .....

.....

(2 marks)

10

4.8.2.3 Test for carbon dioxide

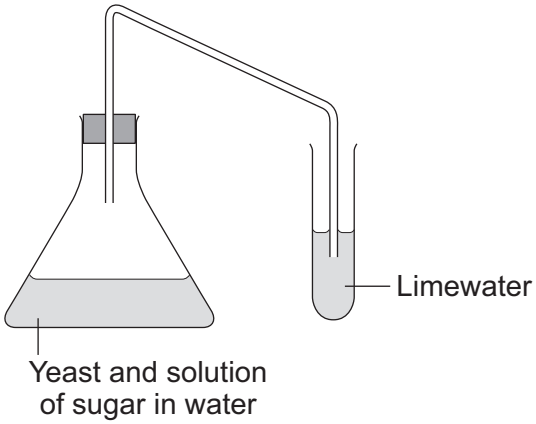
Question 10

January 2012 | CH1FP | Original Q4 | Legacy

4 Two fuels that can be used for cars are:

- petrol from crude oil
- ethanol made from sugar in plants.

4 (a) A student used the apparatus shown to investigate the reaction to make ethanol from sugar.



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

This reaction to make ethanol from sugar is

combustion.

decomposition.

fermentation.

(1 mark)

4 (a) (ii) Complete the sentences.

The limewater turns ..... .

This happens because ..... .

(2 marks)

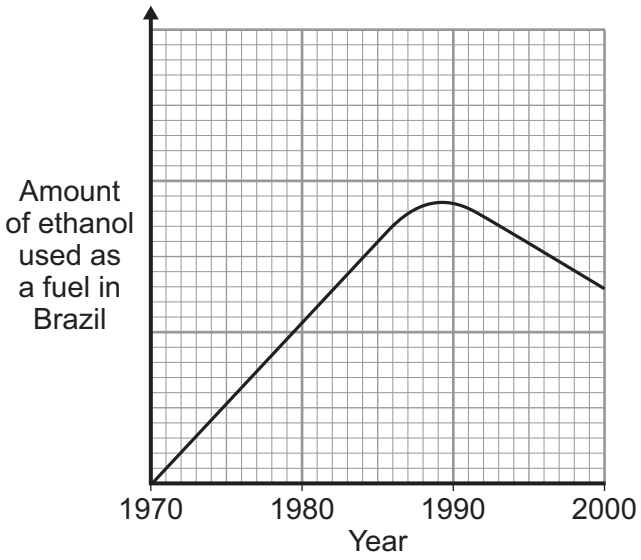
4.8.2.3 Test for carbon dioxide

Question 10 · continued

4 (b) In 1970, the Brazilian Government stated that all petrol must contain more than 25 % ethanol.

The reasons for this statement in 1970 were:
- Brazil did not have many oilfields
- Brazil has a climate suitable for growing sugar cane.

The graph shows the amount of ethanol used as a fuel in Brazil from 1970 to 2000.



4 (b) (i) Use the graph to describe the changes in the amount of ethanol used as a fuel in Brazil from 1970 to 2000.

.....

.....

.....

.....

(2 marks)

4 (b) (ii) In 2011, the Brazilian Government decided to reduce the amount of ethanol in petrol to 18 %.

Suggest **one** reason for their decision.

.....

.....

(1 mark)

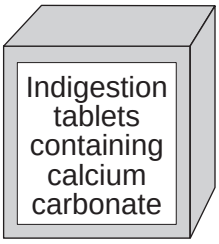
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4.8.2.3 Test for carbon dioxide

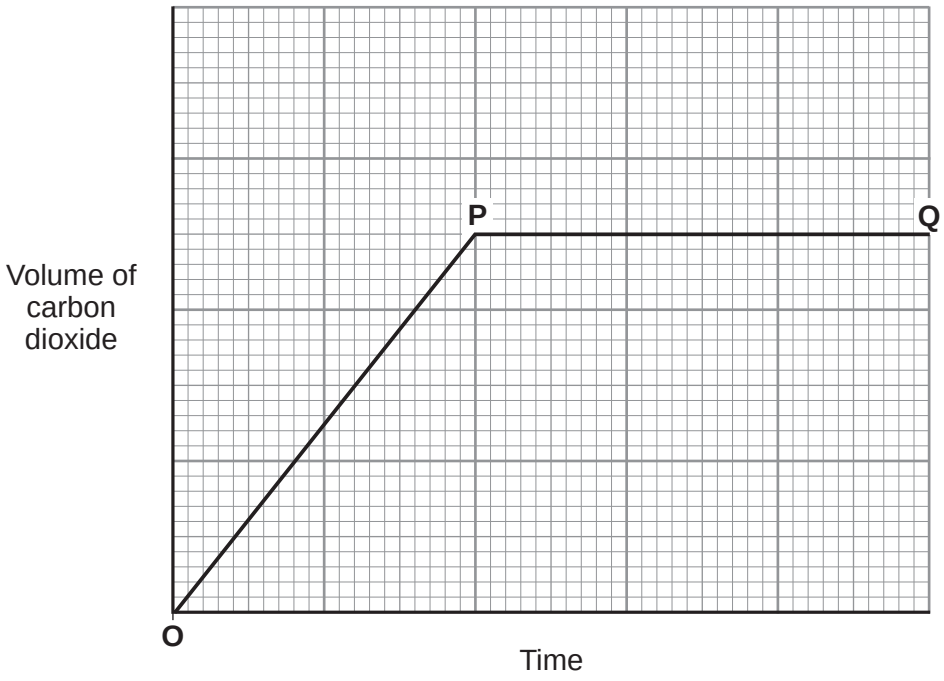
Question 11

June 2012 | CH1FP | Original Q4 | Legacy

4 Human stomachs contain hydrochloric acid.
Stomach ache can be caused by too much acid in the stomach.
Indigestion tablets can be used to reduce the amount of acid in the stomach.



4 (a) The graph shows how the volume of carbon dioxide produced changes with time, after some calcium carbonate is added to hydrochloric acid.



4 (a) (i) Complete the sentence to explain what happens between **O** and **P**.

Between **O** and **P** the calcium carbonate and hydrochloric acid ..... .

(1 mark)

4 (a) (ii) Complete the sentence to explain what happens at **P**.

At **P** the calcium carbonate and hydrochloric acid .....

because .....

(2 marks)

4.8.2.3 Test for carbon dioxide

Question 11 · continued

4 (a) (iii) Describe the test for carbon dioxide gas.

Test .....

Result of the test .....

(2 marks)

4 (b) Calcium carbonate is found in limestone.
Limestone is removed from the ground by quarrying.



Tick (✓) **one** advantage and tick (✓) **one** disadvantage of quarrying limestone.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
Quarrying limestone destroys the shells and skeletons of marine organisms that formed the limestone.		
Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel.		
Quarrying limestone provides building materials, employment and new road links.		
Quarrying limestone removes ores from the ground.		

(2 marks)

7

4.8.2.3 Test for carbon dioxide

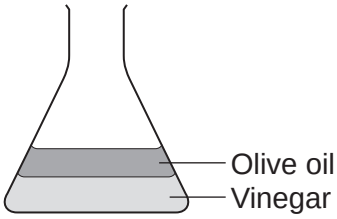
Question 12

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



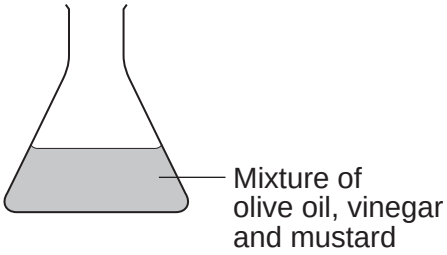
Tick (✓) **one** reason why the olive oil separates above the vinegar.

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.

.....

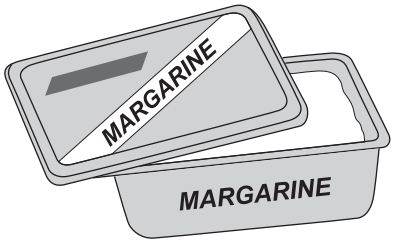
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(1 mark)

4.8.2.3 Test for carbon dioxide

Question 12 · continued June 2012 | CH1FP | Original Q5 | Legacy

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

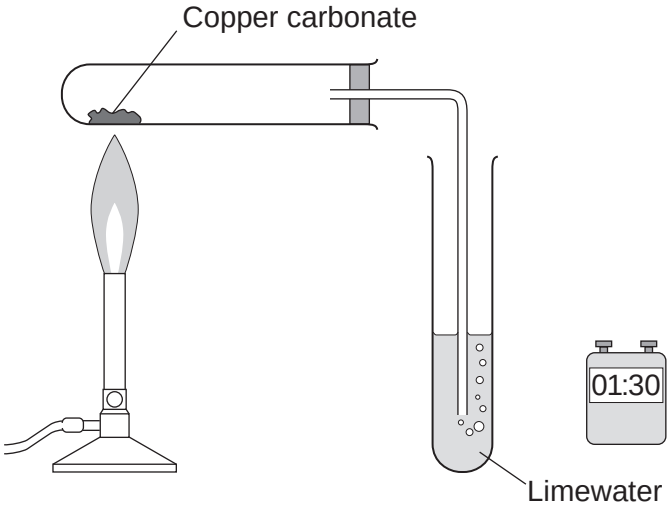
4.8.2.3 Test for carbon dioxide

Question 13

January 2013 | CH1FP | Original Q6 | Legacy

6 Carbon dioxide is produced when copper carbonate is heated.

A student investigated heating copper carbonate.
The student used the apparatus to measure how long it took for carbon dioxide to be produced.
The student also noted what happened during each minute for three minutes.



6 (a) The student used changes to the limewater to measure how long it took for carbon dioxide to be produced.

Describe how.

.....

.....

.....

.....

(2 marks)

4.8.2.3 Test for carbon dioxide

Question 13 · continued

6 (b) The student wrote down her observations.

Time interval in minutes	Observations
Between 0 and 1	A slow release of gas bubbles. The limewater did not change. The solid in the test tube was green.
Between 1 and 2	A fast release of gas bubbles. The limewater changed at 1 minute 10 seconds.
Between 2 and 3	No release of gas bubbles. The solid in the test tube was black.

6 (b) (i) Suggest the reason for the student's observations between 0 and 1 minute.

.....

.....

.....

.....

.....

(2 marks)

6 (b) (ii) Explain the student's observations between 1 and 2 minutes.

.....

.....

.....

.....

(2 marks)

6 (b) (iii) Explain the student's observations between 2 and 3 minutes.

.....

.....

.....

.....

(2 marks)

8

4.8.2.3 Test for carbon dioxide

Question 14

June 2013 | CH1FP | Original Q3 | Legacy

3 Carbon dioxide is produced when metal carbonates are heated.

3 (a) (i) Draw a ring around the correct answer to complete the word equation.

magnesium carbonate ⟶ [magnesium / magnesium hydroxide / magnesium oxide] + carbon dioxide

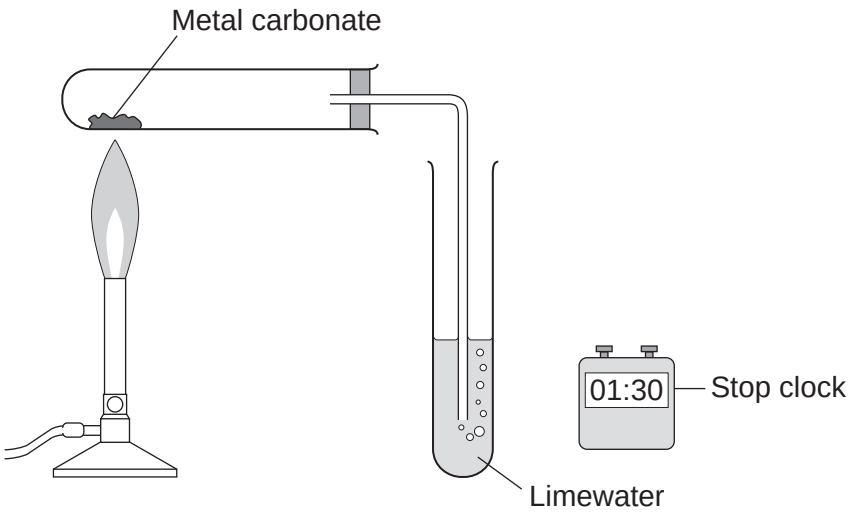
(1 mark)

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

The reaction to produce carbon dioxide from magnesium carbonate is [combustion. / decomposition. / fermentation.]

(1 mark)

3 (b) A student investigated what happens when metal carbonates are heated.



The student:

- used the apparatus to investigate heating four metal carbonates
- started the stop clock at the same time as he began to heat the metal carbonate
- stopped the stop clock when carbon dioxide was produced.

4.8.2.3 Test for carbon dioxide

Question 14 · continued

The student's results are shown in the table.

Metal carbonate	Time taken for the production of carbon dioxide to start in seconds
Calcium carbonate	163
Copper carbonate	24
Magnesium carbonate	92
Zinc carbonate	67

3 (b) (i) Tick (✓) the type of graph the student should draw from these results.

Type of graph	Tick (✓)
Bar chart	
Line graph	
Scatter graph	

(1 mark)

3 (b) (ii) Use the Chemistry Data Sheet to help you to answer this question.

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

The more reactive the metal in the carbonate the [less / more / same] time is taken for the production of carbon dioxide to start.

(1 mark)

3 (b) (iii) How did the student know that carbon dioxide was produced?

Use the diagram of the apparatus to help you to answer this question.

.....

.....

.....

.....

(2 marks)

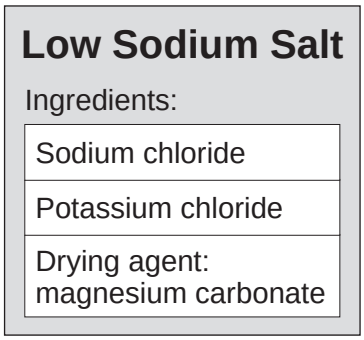
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4.8.2.3 Test for carbon dioxide

Question 15

June 2013 | CH3FP | Original Q2 | Legacy

2 Low sodium salt is used on food. This label is from a packet of low sodium salt.



A chemist tests the low sodium salt for the substances on the label.

2 (a) The chemist tests for sodium ions and potassium ions using a flame test.

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

2 (a) (i) In a flame test, sodium ions produce a [lilac / red / yellow] colour.

(1 mark)

2 (a) (ii) In a flame test, potassium ions produce a [lilac / red / yellow] colour.

(1 mark)

4.8.2.3 Test for carbon dioxide

Question 15 · continued

2 (b) The chemist added hydrochloric acid to low sodium salt. Carbon dioxide gas was produced.

Describe the test for carbon dioxide and give the result of the test.

.....

.....

.....

.....

(2 marks)

2 (c) The chemist made a solution of low sodium salt.

2 (c) (i) Tick (✓) **one** box to show the chemical used to test for chloride ions.

	Tick (✓)
Barium chloride solution	
Silver nitrate solution	
Sodium sulfate solution	

(1 mark)

2 (c) (ii) Sodium hydroxide solution is used to test for magnesium ions.

Draw a ring around the colour of precipitate produced by this test.

brown **green** **white**

(1 mark)

6

Turn to page 7 for the next question

4.8.2.3 Test for carbon dioxide

Question 16

June 2014 | CH1FP | Original Q3 | Legacy

3 Limestone is used for statues and buildings.

Limestone contains calcium carbonate ($CaCO_3$).

3 (a) **Figure 2** shows a limestone quarry.

Figure 2



3 (a) (i) Suggest **one** problem quarrying limestone will cause for people living nearby.

[1 mark]

.....

.....

3 (a) (ii) Suggest **one** benefit of quarrying limestone for people living nearby.

[1 mark]

.....

.....

3 (a) (iii) Why are limestone statues and buildings damaged by rain?

[1 mark]

.....

.....

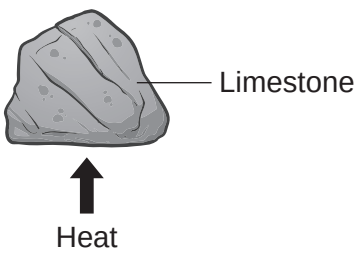
Question 3 continues on the next page

4.8.2.3 Test for carbon dioxide

Question 16 · continued

3 (b) A student investigated what happens when limestone is heated, as shown in **Figure 3**.

Figure 3



This is the method the student used:

- measure the mass of limestone before heating
- measure the mass of solid product after heating
- repeat the experiment two more times.

The student's results are shown in **Table 2**.

Table 2

	Experiment 1	Experiment 2	Experiment 3
Mass of limestone before heating in g	5.0	5.0	5.0
Mass of solid product after heating in g	3.6	3.4	3.8
Mass lost in g	1.4	1.6	

3 (b) (i) Calculate the mass lost in experiment **3**.

[1 mark]

.....

.....

Mass lost = ... g

3 (b) (ii) Calculate the mean mass lost in the three experiments.

[1 mark]

.....

.....

Mean mass lost = ... g

4.8.2.3 Test for carbon dioxide

Question 16 · continued

3 (b) (iii) Suggest **one** reason why the mass lost was **not** the same for the three experiments.

[1 mark]

.....

.....

3 (c) The word equation for the reaction when calcium carbonate is heated is:

calcium carbonate ⟶ calcium oxide + carbon dioxide

3 (c) (i) Complete the sentence.

[1 mark]

The reaction when calcium carbonate is heated is called

thermal ..... .

3 (c) (ii) Heating 5.0 g of calcium carbonate produces 2.8 g of calcium oxide.

Calculate the mass of carbon dioxide produced.

[1 mark]

.....

.....

Mass of carbon dioxide = ... g

3 (c) (iii) Describe how to test a gas to show that it is carbon dioxide.

[2 marks]

Test .....

.....

Result .....

.....

10

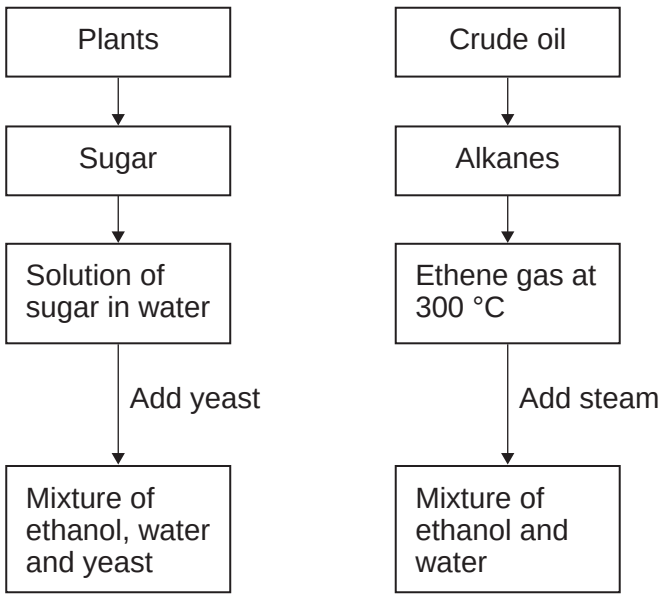
4.8.2.3 Test for carbon dioxide

Question 17

June 2016 | CH1FP | Original Q4 | Legacy

4 **Figure 8** shows how ethanol is made from plants and from crude oil.

Figure 8



4 (a) (i) What is the name of the reaction to produce ethanol from sugar?

[1 mark]

Tick (✓) **one** box.

- fermentation ☐
- polymerisation ☐
- reduction ☐

4 (a) (ii) What is the name of the reaction to produce ethanol from ethene?

[1 mark]

Tick (✓) **one** box.

- bioleaching ☐
- displacement ☐
- hydration ☐

4.8.2.3 Test for carbon dioxide

Question 17 · continued

4 (a) (iii) A lot of the ethanol produced is used as a fuel for cars.

What are **two** reasons why most of this ethanol is made from plants and **not** from crude oil?

[2 marks]

Tick (✓) **two** boxes.

Resources of crude oil are non-renewable. ☐

Ethanol from plants is more flammable. ☐

Producing ethanol from plants is not sustainable. ☐

Ethanol from plants has a different formula. ☐

Producing ethanol from plants uses less energy. ☐

Question 4 continues on the next page

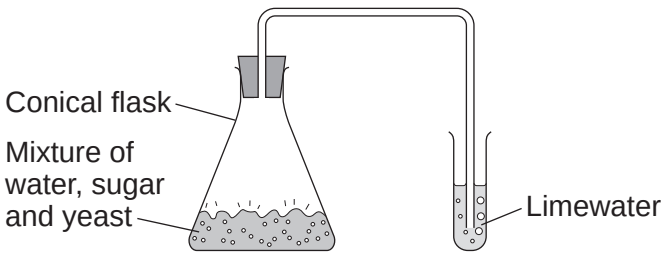
4.8.2.3 Test for carbon dioxide

Question 17 · continued

4 (b) A student made ethanol from sugar.

Figure 9 shows the apparatus used.

Figure 9



4 (b) (i) What change is seen in the limewater?

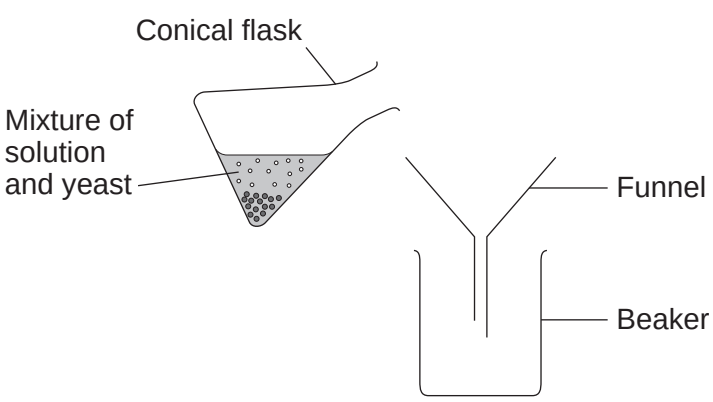
Give a reason for your answer.

[2 marks]

4 (b) (ii) The student wanted to separate the solid yeast from the solution.

Figure 10 shows the apparatus used.

Figure 10



What is missing from the apparatus in **Figure 10**?

[1 mark]

4.8.2.3 Test for carbon dioxide

Question 17 · continued

4 (c) Vegetable oils are made from plants.

4 (c) (i) Which statement is correct?

[1 mark]

Tick (✓) **one** box.

Vegetable oils have lower boiling points than water. ☐

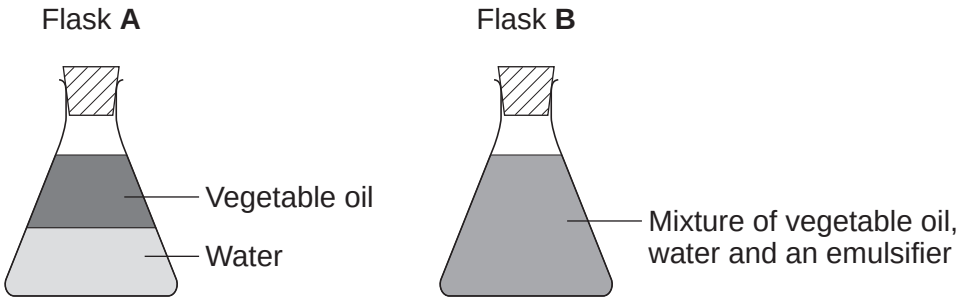
Vegetable oils cook foods at higher temperatures than boiling water. ☐

Cooking in vegetable oils decreases the energy content of the food. ☐

4 (c) (ii) A student puts different mixtures into two flasks, **A** and **B**. The student shakes the flasks.

Figure 11 shows the two flasks after they have been shaken and left to stand for one minute.

Figure 11



Complete the sentences.

[2 marks]

The mixture in flask **A** separates because _____

_____

The mixture in flask **B** does not separate because _____

_____

10

4.8.2.3 Test for carbon dioxide

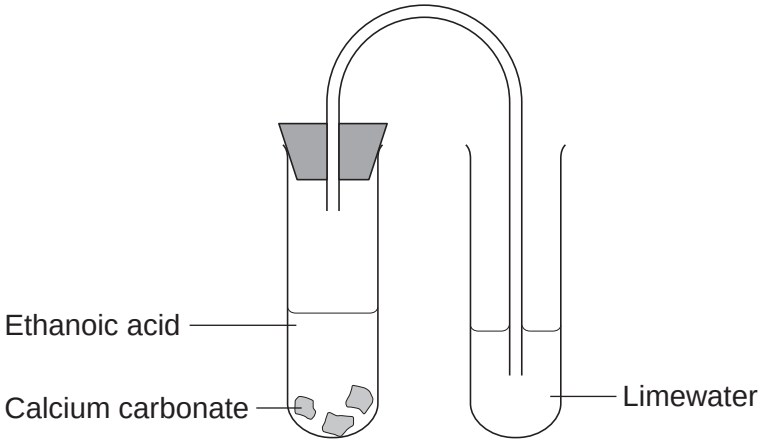
Question 18

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 _____

_____

_____

_____

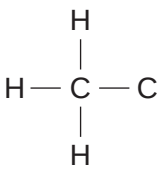
Question 5 continues on the next page

4.8.2.3 Test for carbon dioxide

Question 18 · continued

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

[1 mark]



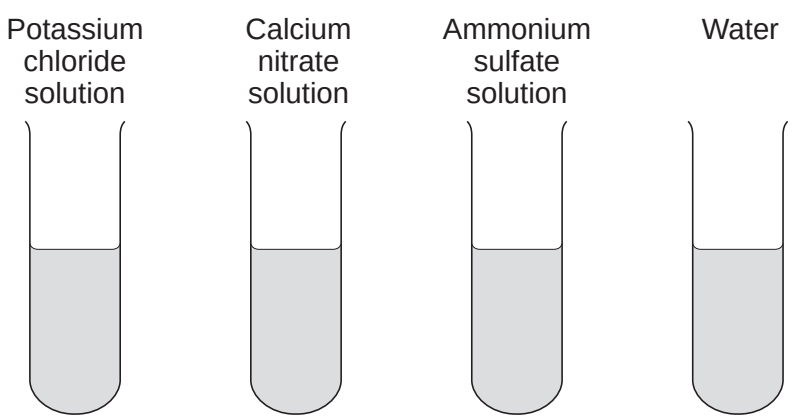
5 (a) (iii) Ethanoic acid is a carboxylic acid.
Complete the sentence.

[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.

4.8.2.3 Test for carbon dioxide

Question 18 · 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

4.8.2.3 Test for carbon dioxide

Question 19

June 2019 | 8462/2F | Original Q7

0 7 Some students investigated the rate of decomposition of hydrogen peroxide.

The equation for the reaction is:

hydrogen peroxide → water + oxygen

0 7 . 1 Complete the sentence.

Choose an answer from the box.

[1 mark]

a burning splint	**a glowing splint**
damp litmus paper	**limewater**

The students tested the gas produced to show that it was oxygen.

The students used _____ .

Student **A** investigated the effect of the particle size of a manganese dioxide catalyst on the rate of the reaction.

This is the method used.

1. Measure 25 cm^3 hydrogen peroxide solution into a conical flask.

2. Add some fine manganese dioxide powder to the conical flask.

3. Measure the volume of oxygen produced every 30 seconds for 10 minutes.

4. Repeat steps 1 to 3 two more times.

5. Repeat steps 1 to 4 with coarse manganese dioxide lumps.

4.8.2.3 Test for carbon dioxide

Question 19 · continued

0 7 . 2 The method student **A** used did **not** give repeatable results.

How could student **A** make the results repeatable?

[1 mark]

Tick (✓) **one** box.

- Student **A** should make measurements every 2 minutes. ☐
- Student **A** should measure the mass of manganese dioxide. ☐
- Student **A** should use 50 cm^3 hydrogen peroxide. ☐
- Student **A** should use a beaker instead of a conical flask. ☐

Student **B** used a method which gave repeatable results.

0 7 . 3 How could student **B** improve the accuracy of these results?

[1 mark]

Tick (✓) **one** box.

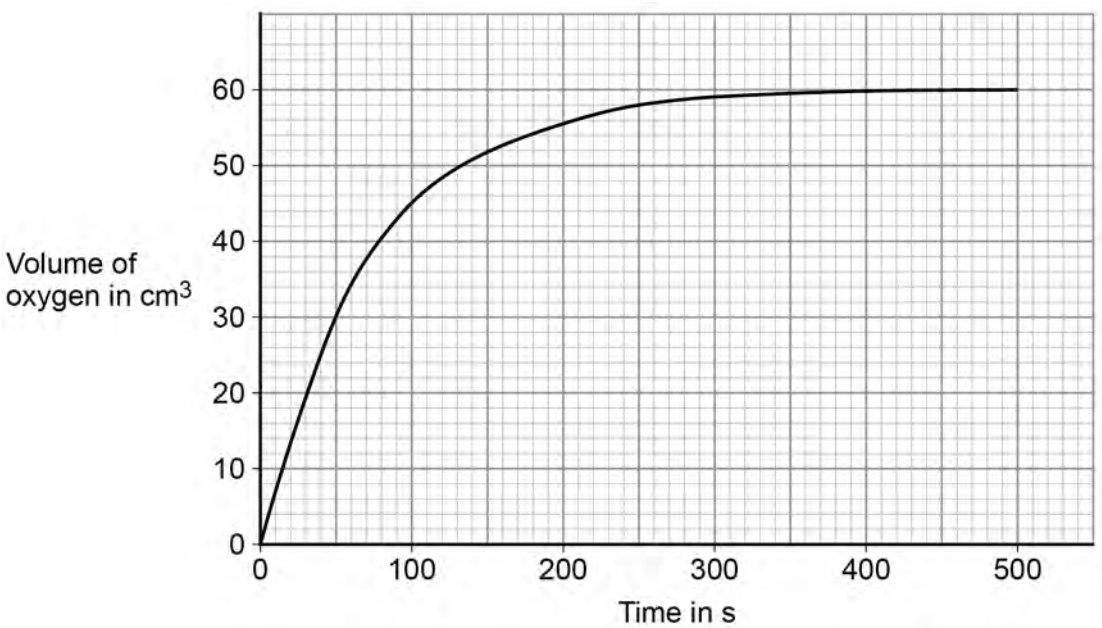
- Calculate a mean but do not include any anomalous results. ☐
- Calculate a mean but do not include the first set of results. ☐
- Record the results in a table and plot the results on a bar chart. ☐
- Record the results in a table and plot the results on a line graph. ☐

4.8.2.3 Test for carbon dioxide

Question 19 · continued

Figure 5 shows student **B**'s results for coarse manganese dioxide lumps.

Figure 5



0 7 . 4 Calculate the mean rate of reaction between 30 and 250 seconds for coarse manganese dioxide lumps.

Use **Figure 5** and the equation:

$$\text{Mean rate of reaction} = \frac{\text{Volume of oxygen formed}}{\text{Time taken}}$$

Give your answer to 3 significant figures.

[4 marks]

Volume of oxygen formed _____

Time taken _____

_____

_____

_____

_____

Mean rate of reaction = _____ cm^3/s

4.8.2.3 Test for carbon dioxide

Question 19 · continued

0 7 . 5 Fine manganese dioxide powder produces a higher rate of reaction than coarse manganese dioxide lumps.

Sketch on **Figure 5** the results you would expect for student **B**'s experiment with fine manganese dioxide powder.

[2 marks]

0 7 . 6 Hydrogen peroxide molecules collide with manganese dioxide particles during the reaction.

Why does fine manganese dioxide powder produce a higher rate of reaction than coarse manganese dioxide lumps?

[1 mark]

Tick (✓) **one** box.

- Fine manganese dioxide powder has a larger surface area. ☐
- Fine manganese dioxide powder has larger particles. ☐
- Fine manganese dioxide powder produces less frequent collisions. ☐

4.8.2.3 Test for carbon dioxide

Question 20

June 2019 | 8462/2F | Original Q9

0 9 This question is about lithium carbonate.

Lithium carbonate is used in medicines.

Figure 7 shows a tablet containing lithium carbonate.

Figure 7



0 9 . 1 Lithium carbonate contains lithium ions and carbonate ions.

A student tested the tablet for lithium ions and for carbonate ions.

The student used:

- a metal wire
- dilute hydrochloric acid
- limewater.

Plan an investigation to show the presence of lithium ions **and** of carbonate ions in the tablet.

You should include the results of the tests for the ions.

[6 marks]

4.8.2.3 Test for carbon dioxide

Question 20 · continued

0 9 . 2 The tablet also contains other substances.

The substances in tablets are present in fixed amounts.

What name is given to mixtures like tablets?

[1 mark]

0 9 . 3 The tablet has a mass of 1.20 g and contains 700 mg of lithium carbonate.

Calculate the percentage by mass of lithium carbonate in this tablet.

[3 marks]

Percentage by mass of lithium carbonate = _____ %

10

4.8.2.3 Test for carbon dioxide

Question 21

November 2020 | 8462/2F | Original Q3

0 3 This question is about the rate of the reaction between hydrochloric acid and calcium carbonate.

A student investigated the effect of changing the size of calcium carbonate lumps on the rate of this reaction.

This is the method used.

1. Pour hydrochloric acid into a conical flask up to the 50 cm^3 line.
2. Add 10.0 g of small calcium carbonate lumps to the conical flask.
3. Attach a gas syringe to the conical flask.
4. Measure the volume of gas produced every 20 seconds for 100 seconds.
5. Repeat steps 1 to 4 using 10.0 g of large calcium carbonate lumps.

0 3 . 1 The student used the 50 cm^3 line on the conical flask to measure the volume of hydrochloric acid.

Suggest a piece of equipment the student could use to make the measurement of volume more accurate.

[1 mark]

0 3 . 2 Carbon dioxide gas is produced in the reaction between hydrochloric acid and calcium carbonate.

Which test is used to identify carbon dioxide gas?

[1 mark]

Tick (✓) **one** box.

- A burning splint pops ☐
- A glowing splint relights ☐
- Damp litmus paper is bleached ☐
- Limewater turns milky ☐

4.8.2.3 Test for carbon dioxide

Question 21 · continued

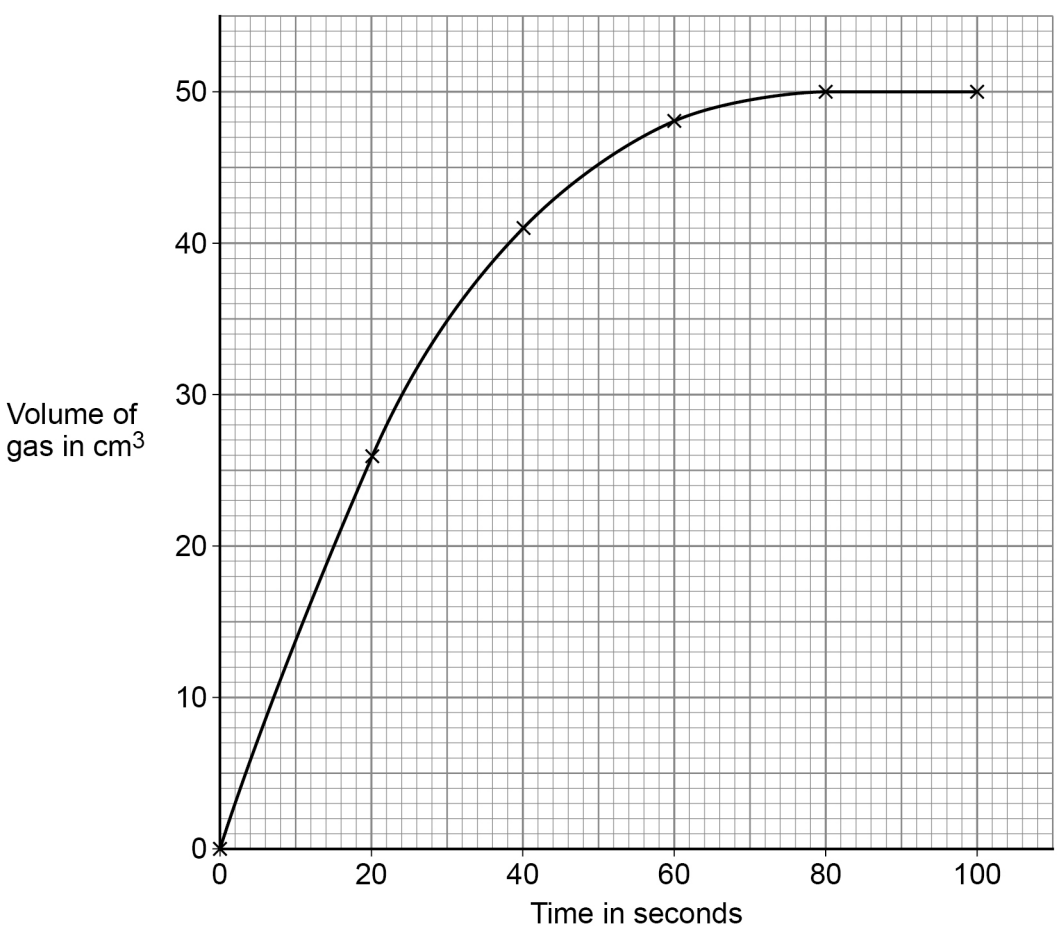
Table 2 shows the student's results for large calcium carbonate lumps.

Table 2

Time in seconds	Volume of gas in cm^3
0	0
20	16
40	30
60	40
80	46
100	48

Figure 4 shows the student's results for small calcium carbonate lumps.

Figure 4



4.8.2.3 Test for carbon dioxide

Question 21 · continued

0 3 . 3 Complete **Figure 4**.

You should:

- plot the data for large calcium carbonate lumps from **Table 2** on **Figure 4**
- draw a line of best fit for large calcium carbonate lumps.

[3 marks]

0 3 . 4 Determine the mean rate of reaction using **small** calcium carbonate lumps between 0 seconds and 60 seconds.

Use the equation:

$$\text{mean rate of reaction} = \frac{\text{volume of gas produced}}{\text{time taken}}$$

Use **Figure 4**.

[3 marks]

Mean rate of reaction = _____ cm^3/s

0 3 . 5 Describe what happens to the volume of gas collected using **small** calcium carbonate lumps:

- between 0 and 20 seconds
- between 80 and 100 seconds.

Use **Figure 4**.

[2 marks]

Between 0 and 20 seconds _____

Between 80 and 100 seconds _____

4.8.2.3 Test for carbon dioxide

Question 21 · continued

0 3 . 6 The balance used to weigh 10.0 g of calcium carbonate lumps caused an error.

The balance always read 0.2 g before being used.

What type of error was caused by the balance?

[1 mark]

Tick (✓) **one** box.

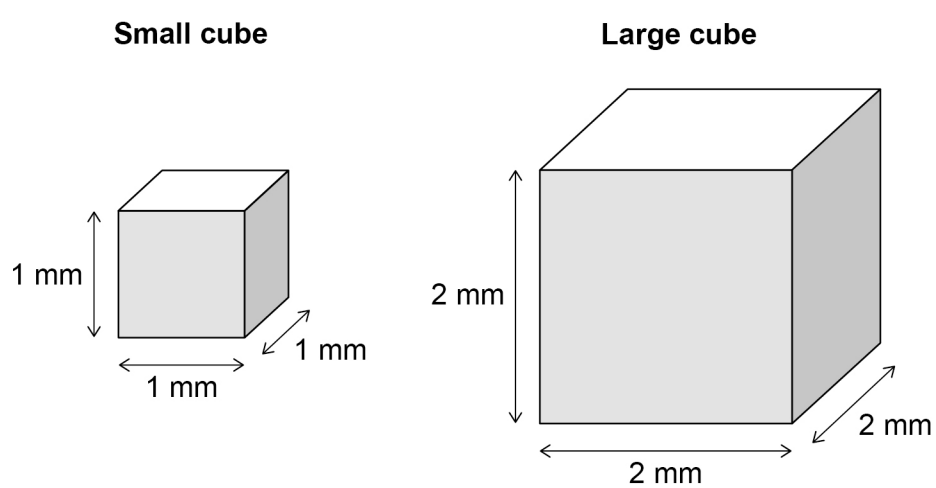
Human error ☐

Random error ☐

Systematic error ☐

Figure 5 shows the dimensions of two cubes of calcium carbonate.

Figure 5



4.8.2.3 Test for carbon dioxide

Question 21 · continued

0 3 . 7 A cube of calcium carbonate has six faces.

Calculate the total surface area of the **large** cube of calcium carbonate.

Use **Figure 5**.

[3 marks]

Total surface area = _____ mm^2

0 3 . 8 The large cube of calcium carbonate was divided into eight smaller cubes.

The eight smaller cubes have a greater total surface area than the one large cube.

Compare the rate of reaction when using the eight smaller cubes with the rate of reaction when using the large cube.

Complete the sentence.

Choose the answer from the box.

[1 mark]

faster	**slower**	**the same**

The rate of reaction of the eight smaller cubes is _____.

15

4.8.2.3 Test for carbon dioxide

Question 22

November 2021 | 8462/2F | Original Q6

0 6 Potash alum is a chemical compound.

Potash alum contains potassium ions, aluminium ions and sulfate ions.

0 6 . 1 Which **two** methods can be used to identify the presence of potassium ions in potash alum solution?

[2 marks]

Tick (✓) **two** boxes.

- Flame emission spectroscopy ☐
- Flame test ☐
- Measuring boiling point of solution ☐
- Paper chromatography ☐
- Using litmus paper ☐

0 6 . 2 Sodium hydroxide solution is used to test for some metal ions.

Sodium hydroxide solution is added to a solution of potash alum until a precipitate forms.

Complete the sentence.

Choose the answer from the box.

[1 mark]

blue	**brown**	**green**	**white**

The colour of the precipitate formed is _____.

4.8.2.3 Test for carbon dioxide

Question 22 · continued

0 6 . 3 Complete the sentence.

Choose the answer from the box.

[1 mark]

barium chloride solution	**limewater**
red litmus paper	**silver nitrate solution**

Sulfate ions can be identified using dilute hydrochloric acid

and _____.

0 6 . 4 A solution of potash alum has a concentration of 258 g/dm^3

Calculate the mass of potash alum needed to make 800 cm^3 of a solution of potash alum with a concentration of 258 g/dm^3

Give your answer to 3 significant figures.

[4 marks]

Mass (3 significant figures) = _____ g

8

4.8.2.3 Test for carbon dioxide

Question 23

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.

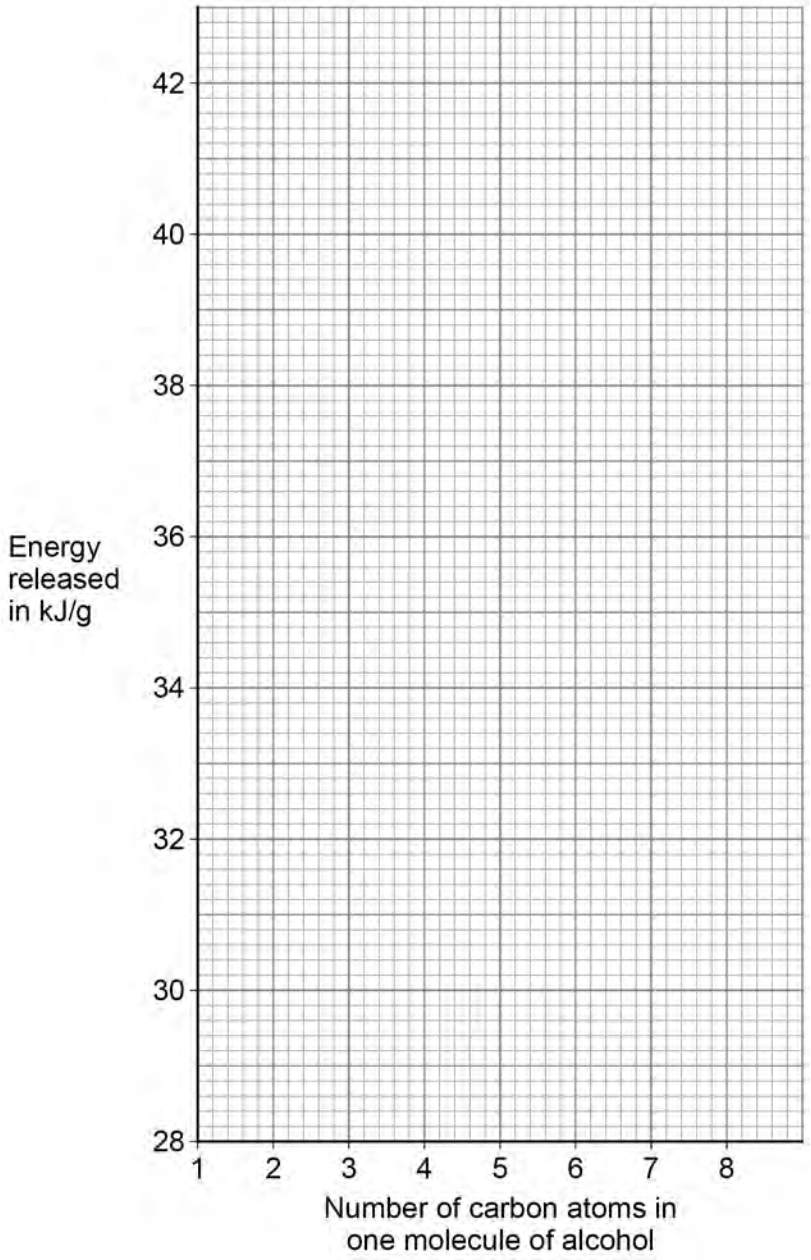
Plot the data from **Table 8** on **Figure 8**.

[2 marks]

4.8.2.3 Test for carbon dioxide

Question 23 · 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

4.8.2.3 Test for carbon dioxide

Question 23 · 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]

_____

_____

4.8.2.3 Test for carbon dioxide

Question 23 · continued

Ethanoic acid can be produced from ethanol.

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

[1 mark]

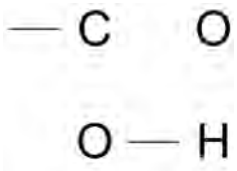
Tick (✓) **one** box.

- 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

4.8.2.3 Test for carbon dioxide

Question 23 · 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)

11

4.8.2.3 Test for carbon dioxide

Question 24

June 2024 | 8462/2F | Original Q7

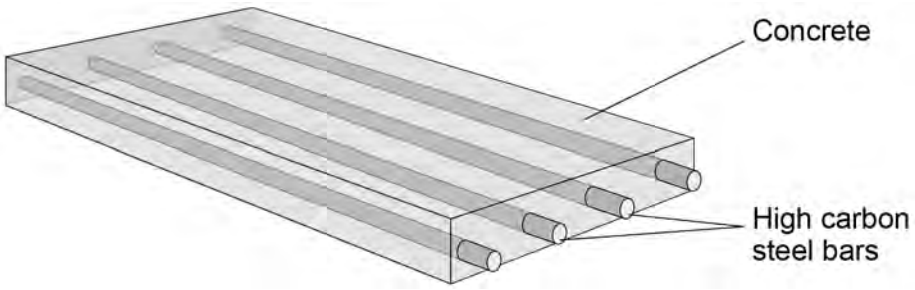
0 7 This question is about materials.

Pre-stressed concrete is a composite material.

The concrete is strengthened using high carbon steel bars.

Figure 8 shows the structure of a piece of pre-stressed concrete.

Figure 8



0 7 . 1 Which **two** words describe the high carbon steel bars?

[2 marks]

Tick (✓) **two** boxes.

- Alloy ☐
- Binder ☐
- Matrix ☐
- Ore ☐
- Reinforcement ☐

4.8.2.3 Test for carbon dioxide

Question 24 · continued

Limestone is mainly calcium carbonate.

Limestone is a raw material used in the production of concrete.

0 7 . 2 In the first part of the production of concrete:

- air is heated by burning methane
- the hot air is used to heat limestone
- the limestone decomposes.

The equation for the decomposition of limestone is:

calcium carbonate → calcium oxide + carbon dioxide

Give **two** ways in which a greenhouse gas is released in this process.

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 3 How could a sample of limestone be tested to show the presence of carbonate ions?

Complete the sentences.

Choose answers from the box.

[2 marks]

barium chloride	**hydrochloric acid**	**limewater**
sodium hydroxide		**universal indicator**

The substance added to the limestone is _____.

The gas produced is identified using _____.

Question 7 continues on the next page

4.8.2.3 Test for carbon dioxide

Question 24 · continued

Table 4 gives some information about plain concrete and pre-stressed concrete.

Table 4

	Plain concrete	Pre-stressed concrete
Cost in £ per m^3	75	225
Density in kg per m^3	2300	2500
Strength in arbitrary units	600	3000

0 7 . 4 Explain why pre-stressed concrete rather than plain concrete is used to make bridges that carry heavy lorries.

Use **Table 4**.

[2 marks]

4.8.2.3 Test for carbon dioxide

Question 24 · continued

0 7 . 5 **Figure 9** shows a garden path made of plain concrete slabs.

Figure 9



Suggest **two** reasons why plain concrete rather than pre-stressed concrete is used to make slabs for garden paths.

Use **Table 4**.

[2 marks]

1 _____

_____

2 _____

_____

10