AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.8.2.3

Test for carbon dioxide

Past-paper questions

Tier	**Foundation**
Question groups	**7**
Available paper years	**2019–2025**

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.

5.8.2.3 Test for carbon dioxide

Question 01

June 2019 | 8464/C/2F | Original Q1

0 1 . 1 This question is about gases.

Draw **one** line from each substance to the description of the substance.

[3 marks]

Substance	Description of substance
	Compound
Air	Element
Carbon dioxide	Hydrocarbon
Oxygen	Metal
	Mixture

5.8.2.3 Test for carbon dioxide

Question 01 · continued

0 1 . 2 What is used to test for each of the gases?

Draw **one** line from each gas to the test for the gas.

[2 marks]

Gas	Test
Carbon dioxide	A glowing splint
	A lighted splint
Oxygen	Limewater
	Litmus paper

0 1 . 3 Give **two** reasons why the percentage of carbon dioxide in the air has decreased in the last 2.7 billion years.

[2 marks]

Tick (✓) **two** boxes.

- Combustion ☐
- Dissolved in oceans ☐
- Intense volcanic activity ☐
- Photosynthesis ☐
- Respiration ☐

5.8.2.3 Test for carbon dioxide

Question 01 · continued June 2019 | 8464/C/2F | Original Q1

Oxygen reacts with sulfur dioxide.

The reaction is reversible.

0 1 . 4 What is the symbol for a reversible reaction?

[1 mark]

_____

0 1 . 5 Complete the sentence.

[1 mark]

In a reversible reaction the forward reaction is exothermic, so the

reverse reaction is _____ .

0 1 . 6 A reversible reaction happens in apparatus which stops the escape of reactants and products.

Complete the sentence.

[1 mark]

Equilibrium is reached when the forward and reverse reactions happen at

exactly the same _____ .

10

5.8.2.3 Test for carbon dioxide

Question 02

0 8 Some students investigated the thermal decomposition of metal carbonates.

The word equation for the reaction is:

metal carbonate → metal oxide + carbon dioxide

The students made the following hypothesis:

'When heated the same mass of any metal carbonate produces the same mass of carbon dioxide.'

The students heated a test tube containing copper carbonate.

Table 4 shows their results.

Table 4

Time the test tube containing copper carbonate was heated in mins	0	2	4	6
Mass of test tube and contents in g	17.7	17.1	17.0	17.0

5.8.2.3 Test for carbon dioxide

Question 02 · continued

Plan a method the students could use to test their hypothesis.

You should show how the students use their results to test the hypothesis.

You do **not** need to write about safety precautions.

[6 marks]

6

5.8.2.3 Test for carbon dioxide

Question 03

November 2020 | 8464/C/2F | Original Q6

0 6 This question is about the Earth's resources.

When most fuels burn carbon dioxide is produced.

Propane (C_3H_8) is a fuel.

0 6 . 1 Balance the equation for the combustion of propane.

[1 mark]

$$C_3H_8 + ____ O_2 \rightarrow 3\,CO_2 + 4\,H_2O$$

0 6 . 2 Describe the test for carbon dioxide.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 6 . 3 Propane can be cracked to produce propene and hydrogen.

Complete the symbol equation for the reaction.

[1 mark]

$$\underset{\text{propane}}{C_3H_8} \rightarrow \underset{\text{propene}}{_____} + \underset{\text{hydrogen}}{H_2}$$

5.8.2.3 Test for carbon dioxide

Question 03 · continued

0 6 . 4 Describe the test for hydrogen.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 6 . 5 Propene is an alkene.

Describe the test for alkenes.

Give the colour change in the test.

[3 marks]

Test _____

Colour change _____ to _____

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5.8.2.3 Test for carbon dioxide

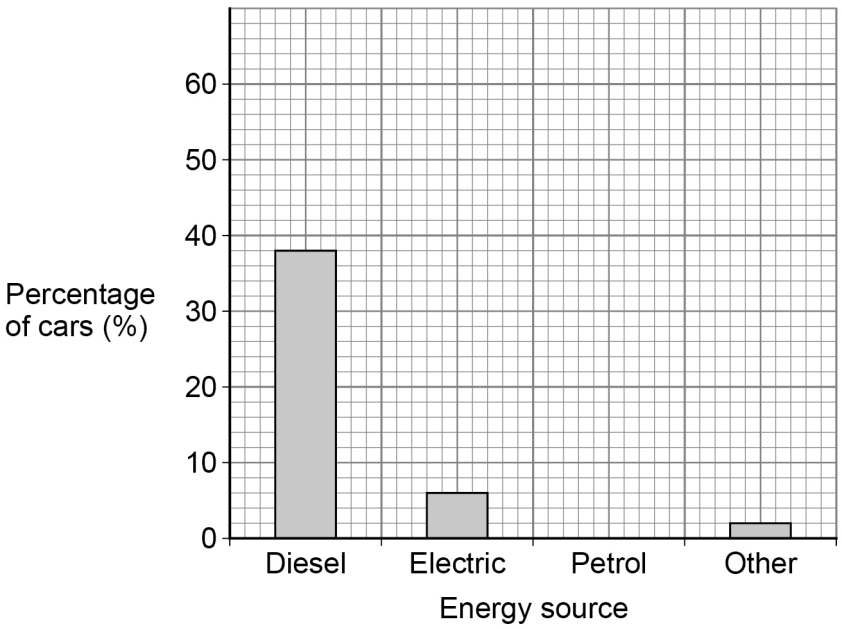
Question 04

November 2021 | 8464/C/2F | Original Q2

0 2 Cars cause atmospheric pollution.

0 2 . 1 **Figure 2** shows the percentage of cars in the UK using different energy sources.

Figure 2



The percentage of cars using petrol is 54%.

Draw the bar for petrol on **Figure 2**.

[1 mark]

Question 2 continues on the next page

5.8.2.3 Test for carbon dioxide

Question 04 · continued

Some car emissions contain nitrogen dioxide.

Table 1 shows the concentration of nitrogen dioxide in the air in three different areas for 1 week.

Table 1

	Concentration of nitrogen dioxide in the air in arbitrary units		
Day	**City centre**	**Countryside**	**Motorway**
Monday	35	8	22
Tuesday	37	8	23
Wednesday	37	8	23
Thursday	34	8	23
Friday	37	8	23
Saturday	29	7	20
Sunday	22	6	17

0 2 . 2 Which column of data has the greatest range?

[1 mark]

Tick (✓) **one** box.

City centre ☐

Countryside ☐

Motorway ☐

5.8.2.3 Test for carbon dioxide

Question 04 · continued

0 2 . 3 Explain why the concentration of nitrogen dioxide in the air is lower on Sunday.

[2 marks]

0 2 . 4 Calculate the mean value for the concentration of nitrogen dioxide in the air in the city centre for the days from Monday to Friday.

Use **Table 1**.

[2 marks]

Mean value for concentration of nitrogen dioxide = _____ arbitrary units

Question 2 continues on the next page

5.8.2.3 Test for carbon dioxide

Question 04 · continued

Nitrogen dioxide is removed from car emissions by catalytic converters.

0 2 . 5 Which **two** of the following are correct statements about catalysts?

[2 marks]

Tick (✓) **two** boxes.

- Catalysts are included in the chemical equation for a reaction. ☐
- Catalysts are **not** used up in a reaction. ☐
- Catalysts decrease the surface area of the reactants. ☐
- Catalysts increase the concentration of the reactants. ☐
- Catalysts lower the activation energy of a reaction. ☐

0 2 . 6 The catalyst in catalytic converters contains platinum.

Platinum is an unreactive metal obtained from the Earth's crust.

Complete the sentence.

Choose the answer from the box.

[1 mark]

finite resource	**formulation**	**renewable resource**

Platinum is a _____ .

5.8.2.3 Test for carbon dioxide

Question 04 · continued

0 2 . 7 Emissions from cars that burn fossil fuels contain carbon dioxide.

What is used to test for carbon dioxide?

[1 mark]

Tick (✓) **one** box.

Burning splint ☐

Glowing splint ☐

Limewater ☐

10

Turn over for the next question

5.8.2.3 Test for carbon dioxide

Question 05

June 2023 | 8464/C/1F | Original Q6

0 6 This question is about carbon dioxide.

Carbon dioxide is soluble in water and forms an acidic solution.

0 6 . 1 Which ion makes the solution acidic?

[1 mark]

_____

0 6 . 2 Name an indicator that could be used to test if the solution is acidic.

Give the result of the test.

[2 marks]

Indicator _____

Result _____

_____

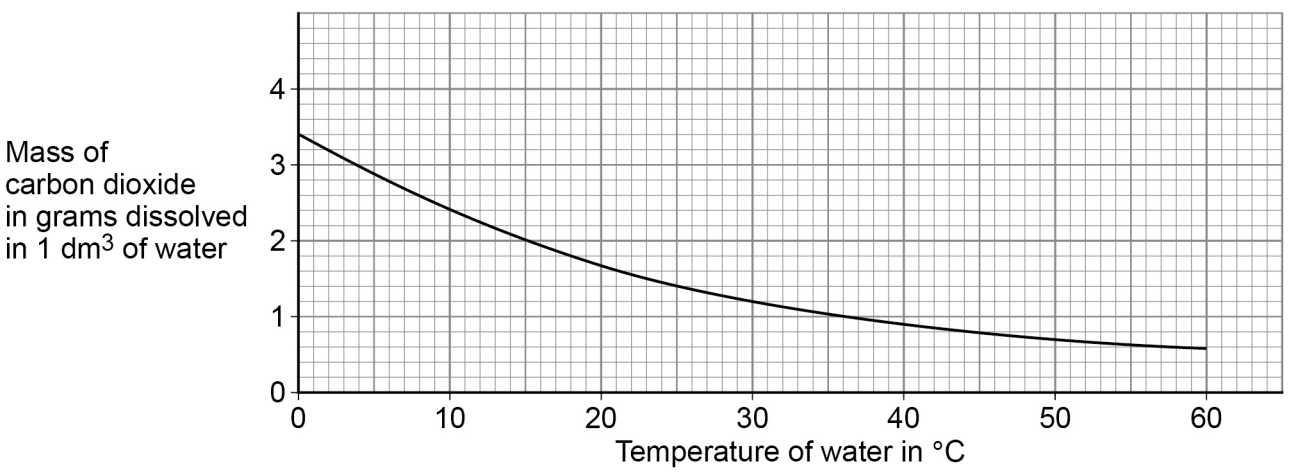
Question 6 continues on the next page

5.8.2.3 Test for carbon dioxide

Question 05 · continued

Figure 14 shows the mass of carbon dioxide that will dissolve in 1 dm^3 of water at different temperatures.

Figure 14



0 6 . 3 How does the solubility of carbon dioxide change as the temperature of the water increases?

[1 mark]

Tick (✓) **one** box.

The solubility decreases ☐

The solubility does not change ☐

The solubility increases ☐

5.8.2.3 Test for carbon dioxide

Question 05 · continued

0 6 . 4 Carbon dioxide dissolves in water to form an acidic solution.

How does the pH of the solution change as the temperature of the water increases?

Use **Figure 14**.

[1 mark]

Tick (✓) **one** box.

pH of the solution decreases ☐

pH of the solution does not change ☐

pH of the solution increases ☐

Calcium carbonate reacts with hydrochloric acid to produce carbon dioxide.

The equation for the reaction is:

$$CaCO_3(s) + 2\,HCl(aq) \longrightarrow CaCl_2(aq) + CO_2(g) + H_2O(\mathbf{x})$$

0 6 . 5 What is the state symbol (**x**) in the equation?

[1 mark]

Tick (✓) **one** box.

(aq) ☐ (g) ☐ (l) ☐ (s) ☐

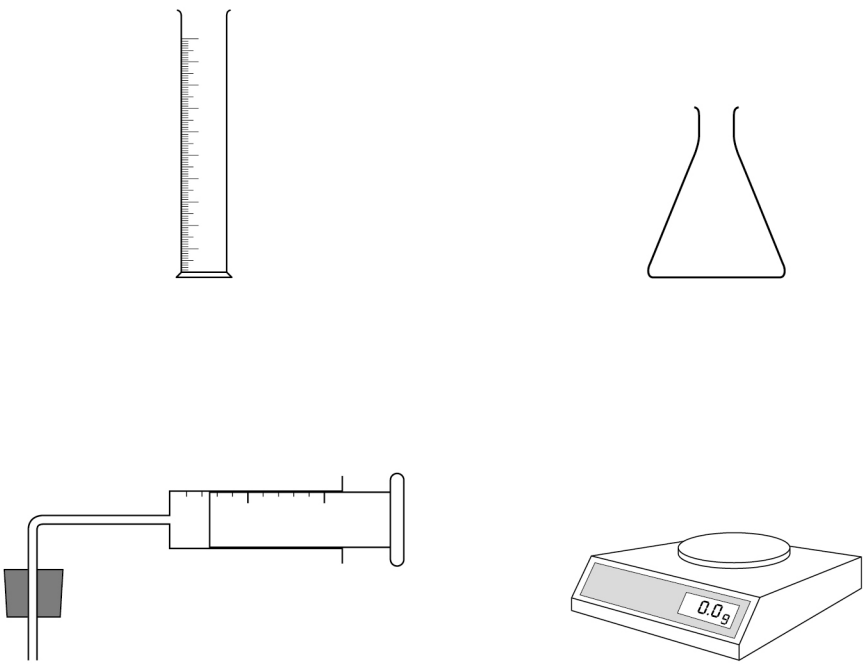
Question 6 continues on the next page

5.8.2.3 Test for carbon dioxide

Question 05 · continued

0 6 . 6 **Figure 15** shows equipment a student used for an investigation.

Figure 15



Gas syringe

5.8.2.3 Test for carbon dioxide

Question 05 · continued

The student investigated the volume of carbon dioxide produced when different masses of calcium carbonate react with hydrochloric acid.

Describe a method the student could use.

[6 marks]

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5.8.2.3 Test for carbon dioxide

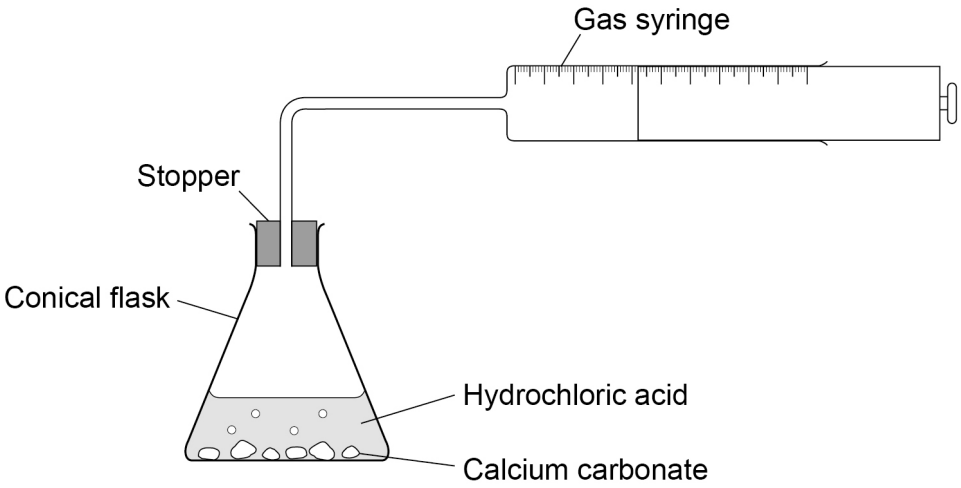
Question 06

June 2025 | 8464/C/2F | Original Q2

0 2 A student investigated the reaction of calcium carbonate with hydrochloric acid.

Figure 2 shows the apparatus.

Figure 2



This is the method used.

1. Measure 50 cm^3 of hydrochloric acid into a conical flask.

2. Add 4.0 g of calcium carbonate to the conical flask.

3. Insert the stopper into the conical flask as quickly as possible.

4. Start a timer.

5. Measure the volume of gas collected every 30 seconds for 3 minutes.

6. Repeat steps 1 to 5 using different concentrations of hydrochloric acid.

0 2 . 1 Name a suitable piece of equipment to measure 4.0 g of calcium carbonate.

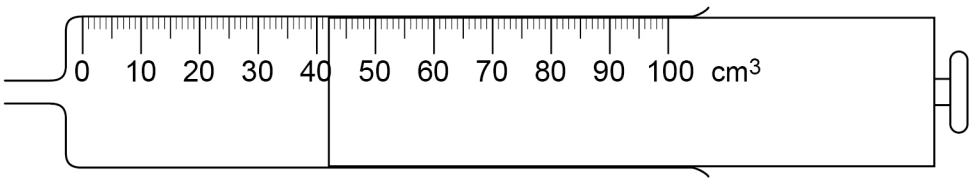
[1 mark]

5.8.2.3 Test for carbon dioxide

Question 06 · continued

0 2 . 2 **Figure 3** shows the gas syringe during the investigation.

Figure 3



What is the reading on the gas syringe?

[1 mark]

_____ cm^3

0 2 . 3 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

Concentration of hydrochloric acid ☐

Mass of calcium carbonate ☐

Temperature of the room ☐

0 2 . 4 Why did the student insert the stopper into the conical flask as quickly as possible in step 3?

[1 mark]

_____

_____

Question 2 continues on the next page

5.8.2.3 Test for carbon dioxide

0 2 . 5 The gas produced during the investigation is carbon dioxide.

The test for carbon dioxide uses limewater.

What is the chemical name for limewater?

[1 mark]

Tick (✓) **one** box.

Calcium hydroxide solution ☐

Potassium carbonate solution ☐

Sodium chloride solution ☐

5.8.2.3 Test for carbon dioxide

0 2 . 6 The student measured the volume of gas collected every 30 seconds for 3 minutes.

The volume of gas was zero at the start.

For one concentration of hydrochloric acid, the volumes of gas collected were:

43 cm^3 66 cm^3 78 cm^3 83 cm^3 84 cm^3 85 cm^3

Complete **Table 3**.

You should:

- add headings to each column
- add units
- add all of the results to the table.

[4 marks]

Table 3

0	0

0 2 . 7 The student used a different concentration of hydrochloric acid.

18 cm^3 of gas was collected in the first 30 seconds.

Calculate the mean rate of reaction for the first 30 seconds.

Use the equation:

$$\text{mean rate of reaction} = \frac{\text{volume of gas collected in cm}^3}{\text{time taken in seconds}}$$

Choose the unit from the box.

[3 marks]

cm^3	**cm^3/s**	**s**	**s/cm^3**

Mean rate of reaction = _____ Unit _____

0 2 . 8 Increasing the concentration of hydrochloric acid increases the rate of the reaction.

What are **two** reasons why?

[2 marks]

Tick (✓) **two** boxes.

- The particles are closer together. ☐
- The particles collide more frequently. ☐
- The particles have a lower surface area. ☐
- The particles have less energy. ☐
- The particles move faster. ☐

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5.8.2.3 Test for carbon dioxide

Question 07

June 2025 | 8464/C/2F | Original Q3

0 3 Screenwash is a mixture designed to keep car windscreens clean.

The components in screenwash include glycerol, methanol and water.

0 3 . 1 Screenwash is made by mixing the components in carefully measured quantities so that the product has the required properties.

What name is given to this type of mixture?

[1 mark]

Tick (✓) **one** box.

- Catalyst ☐
- Formulation ☐
- Polymer ☐

0 3 . 2 Glycerol has the formula $C_3H_8O_3$

How many atoms are there in one molecule of glycerol?

[1 mark]

Tick (✓) **one** box.

3 ☐ 8 ☐ 11 ☐ 14 ☐

Question 3 continues on the next page

5.8.2.3 Test for carbon dioxide

Question 07 · continued

0 3 . 3 Incomplete combustion happens when glycerol burns in limited oxygen.

Incomplete combustion produces carbon monoxide gas.

Why can the production of carbon monoxide gas be a problem?

[1 mark]

Tick (✓) **one** box.

Carbon monoxide is a greenhouse gas. ☐

Carbon monoxide is a toxic gas. ☐

Carbon monoxide is an acidic gas. ☐

0 3 . 4 Complete combustion happens when methanol (CH_4O) burns in excess oxygen.

Balance the equation for the reaction.

[1 mark]

$$2\,CH_4O + 3\,O_2 \rightarrow ____ CO_2 + 4\,H_2O$$

5.8.2.3 Test for carbon dioxide

Question 07 · continued

Methanol can be produced by the reaction of carbon dioxide with hydrogen.

0 3 . 5 Describe the test for hydrogen gas.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

0 3 . 6 Carbon dioxide is a greenhouse gas.

An increase in greenhouse gases in the atmosphere has led to an increase in average global temperature.

The increase in average global temperature has caused global climate change.

Give **two** effects of global climate change.

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

5.8.2.3 Test for carbon dioxide

Question 07 · continued

Anhydrous cobalt chloride can be used to test for water.

The word equation for the reaction is:

anhydrous cobalt chloride (blue) + water ⇌ hydrated cobalt chloride (pink)

0 3 . 7 Suggest **one** observation that could be made when water is added to anhydrous cobalt chloride.

[1 mark]

0 3 . 8 The reaction between anhydrous cobalt chloride and water is exothermic.

What type of reaction is the reverse reaction?

[1 mark]

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