AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.9.2.1

Greenhouse gases

Past-paper questions

Tier	**Foundation**
Question groups	**7**
Available paper years	**2018–2025**

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.

5.9.2.1 Greenhouse gases

Question 01

June 2018 | 8464/C/2F | Original Q7

0 7 This question is about the Earth's atmosphere.

0 7 . 1 Carbon dioxide is a greenhouse gas.

What is another greenhouse gas?

[1 mark]

Tick **one** box.

- Argon ☐
- Methane ☐
- Nitrogen ☐
- Oxygen ☐

0 7 . 2 Greenhouse gases cause global climate change.

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

[2 marks]

1 _____

_____

2 _____

_____

0 7 . 3 4.1 kg of a plastic, used to make plastic bottles, has a carbon footprint of 6.0 kg of carbon dioxide.

Calculate the carbon footprint of **one** plastic bottle of mass 23.5 g

[2 marks]

_____

_____

_____

_____

Carbon footprint = _____ kg of carbon dioxide

5.9.2.1 Greenhouse gases

Question 01 · continued

0 7 . 4 Give **one** way that carbon dioxide emissions can be reduced when a plastic bottle is manufactured.

[1 mark]

0 7 . 5 Explain how the percentages of nitrogen, oxygen and carbon dioxide in the Earth's atmosphere today have changed from the Earth's early atmosphere.

[6 marks]

12

5.9.2.1 Greenhouse gases

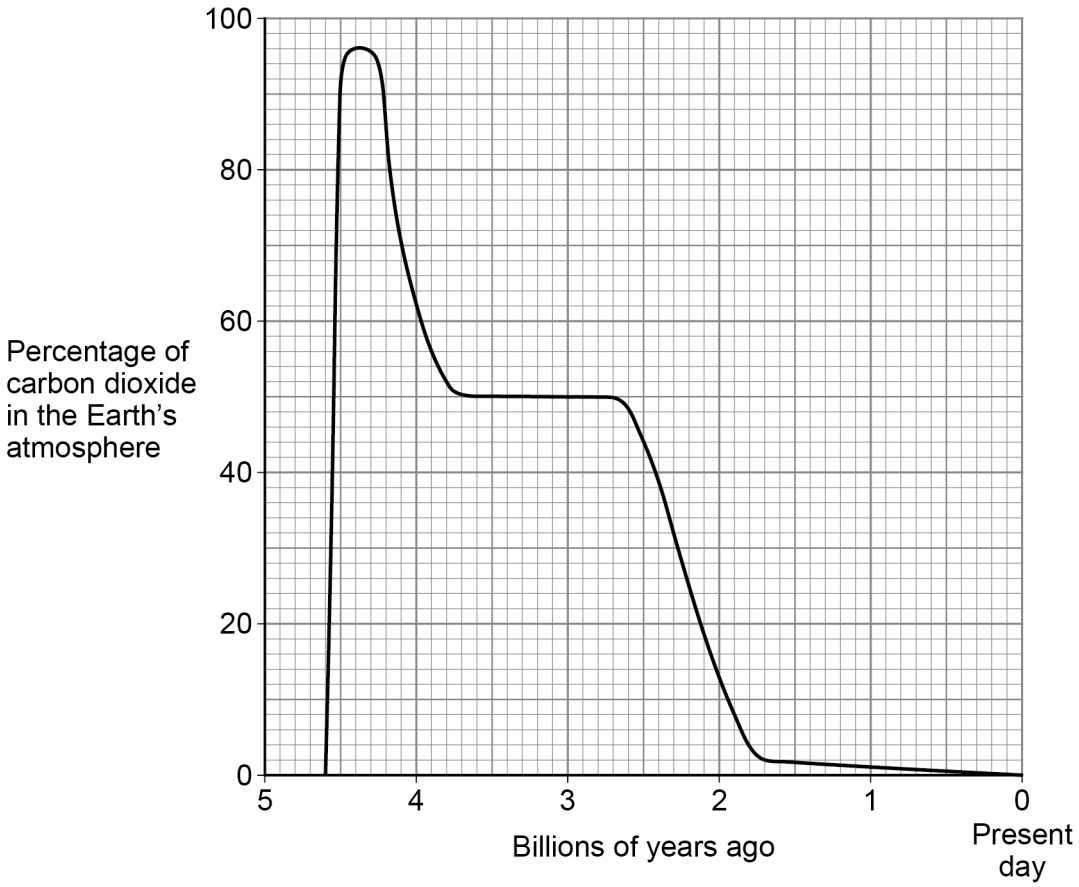
Question 02

November 2020 | 8464/C/2F | Original Q2

0 2 This question is about carbon dioxide in the Earth's atmosphere.

Figure 2 shows how the percentage of carbon dioxide in the Earth's atmosphere has changed over 4.6 billion years.

Figure 2



0 2 . 1 What was the highest percentage of carbon dioxide in the Earth's atmosphere?

Use **Figure 2**.

[1 mark]

Highest percentage = _____ %

5.9.2.1 Greenhouse gases

Question 02 · continued

0 2 . 2 The percentage of carbon dioxide in the atmosphere has decreased since Earth's early atmosphere.

Which **two** processes have decreased the percentage of carbon dioxide in the Earth's atmosphere?

[2 marks]

Tick (✓) **two** boxes.

- Combustion of fuels ☐
- Formation of sedimentary rocks ☐
- Photosynthesis ☐
- Volcanic activity ☐

0 2 . 3 The total amount of carbon dioxide emitted over the life cycle of a product can be measured.

What name is given to the total amount of carbon dioxide emitted during the life cycle of a product?

[1 mark]

Tick (✓) **one** box.

- Carbon footprint ☐
- Global dimming ☐
- Greenhouse effect ☐

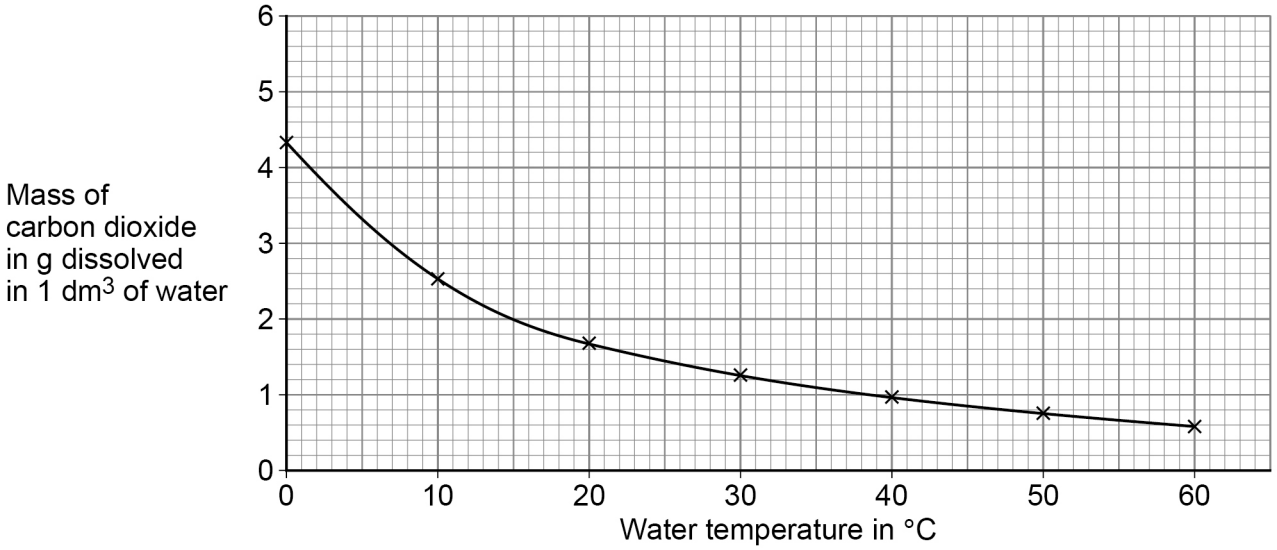
5.9.2.1 Greenhouse gases

Question 02 · continued

Carbon dioxide dissolves in water.

Figure 3 shows the mass of carbon dioxide dissolved in water at different temperatures.

Figure 3



0 2 . 4 Complete **Table 1**.

Use **Figure 3**.

[2 marks]

Table 1

Water temperature in °C	Mass of carbon dioxide in g dissolved in 1 dm^3 of water
5	
15	

0 2 . 5 Calculate the difference in the mass of carbon dioxide dissolved in 1 dm^3 of water at 5 °C and at 15 °C

Use **Table 1**.

[1 mark]

Mass = _____ g

5.9.2.1 Greenhouse gases

Question 02 · continued

0 2 . 6 Carbon dioxide is a greenhouse gas.

The greenhouse effect happens in four stages.

The four stages are:

Stage **A** Carbon dioxide stops longer wavelength radiation escaping

Stage **B** Radiation is absorbed by the Earth

Stage **C** Longer wavelength radiation is emitted

Stage **D** Shorter wavelength radiation enters the atmosphere.

What is the correct order of stages **A**, **B**, **C** and **D**?

[1 mark]

Tick (✓) **one** box.

C, **A**, **B**, **D** ☐

C, **D**, **B**, **A** ☐

D, **B**, **C**, **A** ☐

D, **C**, **B**, **A** ☐

0 2 . 7 Changes in the percentage of carbon dioxide in the Earth's atmosphere cause climate change.

Give **two** effects of climate change.

[2 marks]

1 _____

_____

2 _____

_____

10

5.9.2.1 Greenhouse gases

Question 03

November 2021 | 8464/C/2F | Original Q3

0 3 An increase in greenhouse gases in the Earth's atmosphere causes an increase in global temperature.

0 3 . 1 An increase in global temperature is a major cause of climate change.

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

[2 marks]

1 _____

_____

2 _____

_____

Question 3 continues on the next page

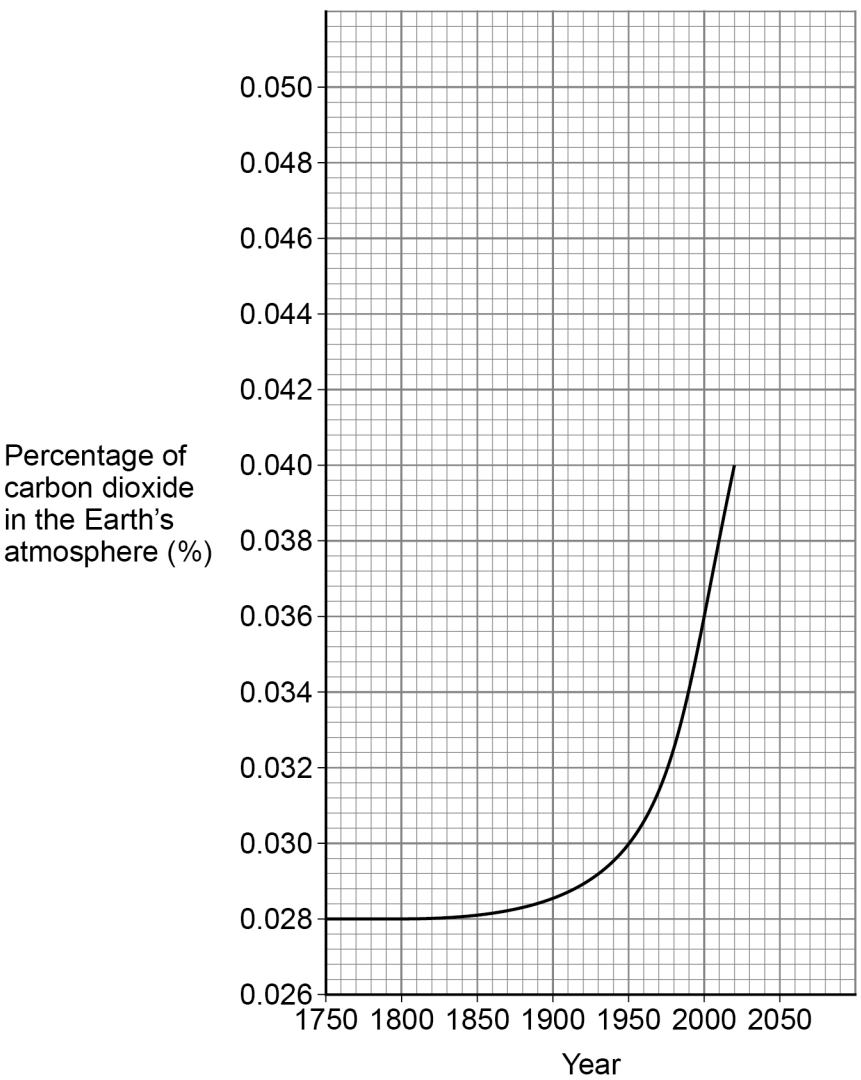
5.9.2.1 Greenhouse gases

Question 03 · continued

Carbon dioxide is a greenhouse gas.

Figure 3 shows the percentage of carbon dioxide in the Earth's atmosphere from 1750.

Figure 3



5.9.2.1 Greenhouse gases

Question 03 · continued

0 3 . 2 Describe the trend in the percentage of carbon dioxide in the Earth's atmosphere from 1750 to 2000.

Use **Figure 3**.

[2 marks]

0 3 . 3 Determine the change in the percentage of carbon dioxide in the Earth's atmosphere from 1950 to 2000.

Use **Figure 3**.

[2 marks]

Percentage of carbon dioxide in 1950 _____

Percentage of carbon dioxide in 2000 _____

Change in percentage of carbon dioxide = _____ %

0 3 . 4 Give **one** reason why the percentage of carbon dioxide in the atmosphere is changing.

[1 mark]

0 3 . 5 Predict the percentage of carbon dioxide in the Earth's atmosphere in 2050.

You should extend the graph line on **Figure 3**.

[2 marks]

Percentage of carbon dioxide in 2050 = _____ %

9

5.9.2.1 Greenhouse gases

Question 04

0 2 The Earth's atmosphere is always changing.

0 2 . 1 Gases in the Earth's early atmosphere caused changes on the Earth.

Draw **one** line from each change to the gas that caused the change.

[2 marks]

Change	Gas that caused the change
Oceans formed	Ammonia
Sedimentary rocks formed	Carbon dioxide
	Nitrogen
	Oxygen
	Water vapour

5.9.2.1 Greenhouse gases

Question 04 · continued

Table 1 shows the percentage of some gases in the atmospheres of Earth and Mars today.

Table 1

Gas	Percentage of gas in atmosphere (%)	
	Earth	Mars
Argon	0.90	1.9
Carbon dioxide	0.04	95
Nitrogen	78	2.6
Oxygen	21	0.20

0 2 . 2 Which gas has the highest percentage in the Earth's atmosphere?

[1 mark]

0 2 . 3 Calculate how many times more carbon dioxide there is in the atmosphere of Mars than in the atmosphere of Earth.

Use **Table 1**.

Give your answer in standard form.

[3 marks]

Number of times more carbon dioxide (in standard form) = _____

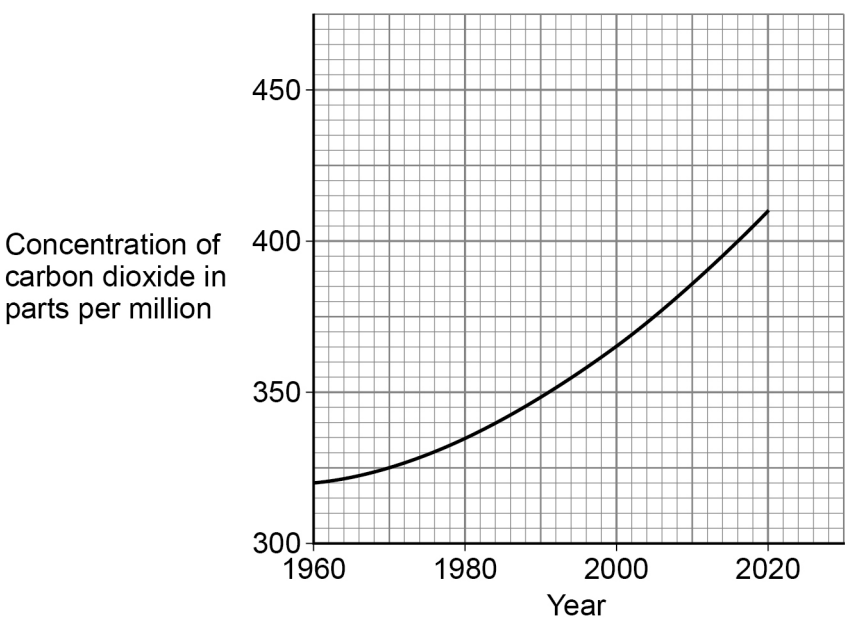
5.9.2.1 Greenhouse gases

Question 04 · continued

Carbon dioxide is a greenhouse gas.

0 2 . 4 **Figure 1** shows the concentration of carbon dioxide in the Earth's atmosphere from 1960 to 2020.

Figure 1



How has the concentration of carbon dioxide in the Earth's atmosphere changed from 1960 to 2020?

[1 mark]

Tick (✓) **one** box.

Decreased ☐

Stayed the same ☐

Increased ☐

5.9.2.1 Greenhouse gases

Question 04 · continued

0 2 . 5 Cars emit carbon dioxide.

A car emits 17.2 kg of carbon dioxide on a journey.

There are four people in the car.

Calculate the mass of carbon dioxide emitted per person.

[2 marks]

Mass of carbon dioxide = _____ kg

0 2 . 6 Planting trees helps to reduce climate change, because trees use carbon dioxide from the Earth's atmosphere.

Name the process in trees which uses carbon dioxide.

[1 mark]

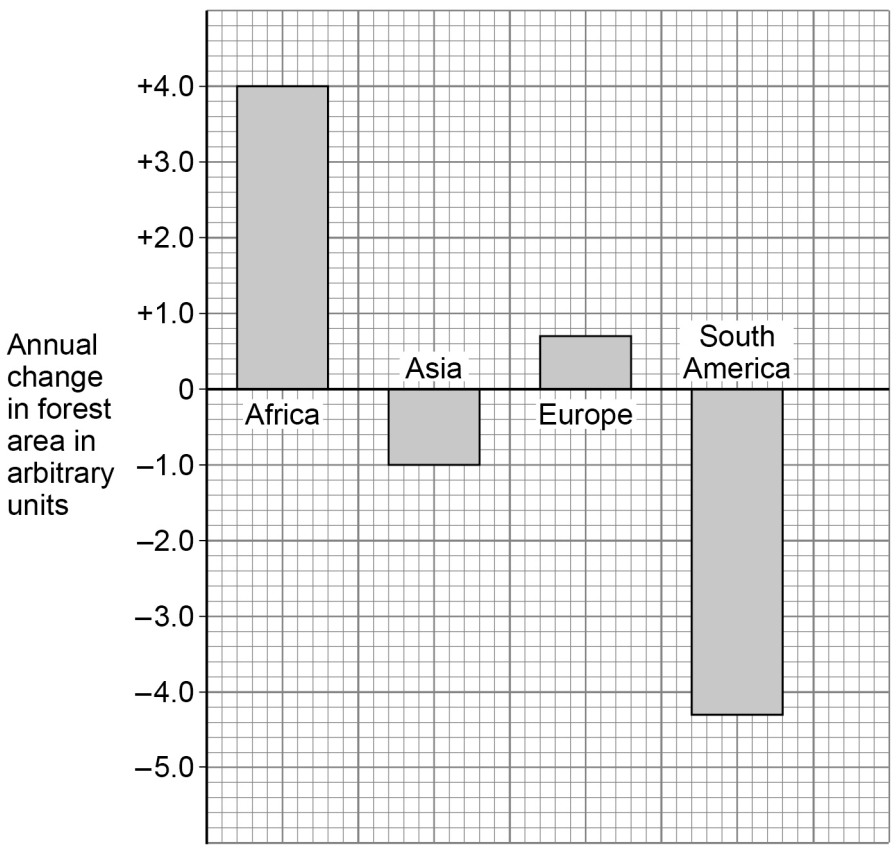
Question 2 continues on the next page

5.9.2.1 Greenhouse gases

Question 04 · continued

0 2 . 7 **Figure 2** shows the annual change in forest area in four different parts of the world.

Figure 2



Give **two** conclusions about the annual change in forest area.

[2 marks]

1 _____

_____

2 _____

_____

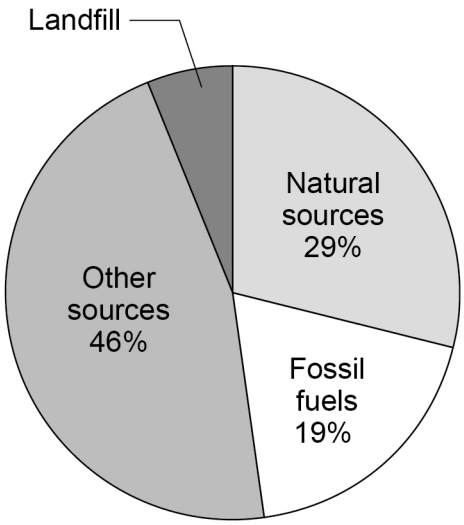
5.9.2.1 Greenhouse gases

Question 04 · continued

0 2 . 8 Methane is a greenhouse gas.

Figure 3 shows sources of methane emissions.

Figure 3



Determine the percentage (%) of methane emissions from landfill.

[1 mark]

Percentage = _____ %

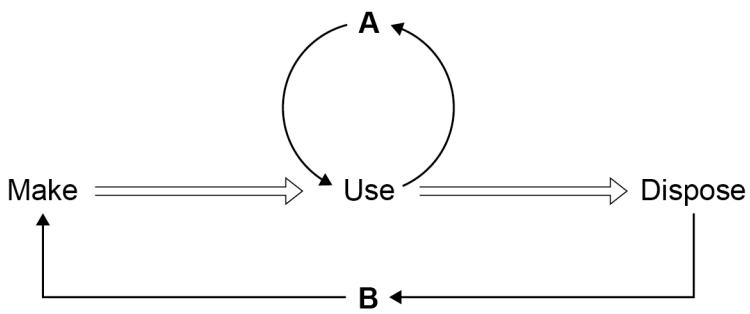
Question 2 continues on the next page

5.9.2.1 Greenhouse gases

Question 04 · continued

0 2 . 9 **Figure 4** shows two ways (**A** and **B**) of preventing used items going to landfill.

Figure 4



Name **A** and **B**.

Choose answers from the box.

[2 marks]

recycle	**reduce**	**release**	**reuse**	**reverse**

A _____

B _____

15

5.9.2.1 Greenhouse gases

Question 05

June 2024 | 8464/C/2F | Original Q1

0 1 The Earth's atmosphere has changed during the last 4.6 billion years.

0 1 . 1 What is the approximate percentage of nitrogen and of oxygen in the Earth's atmosphere today?

Draw **one** line from each gas to the percentage of that gas.

[2 marks]

Gas	Percentage (%) of gas
Nitrogen	20
	40
Oxygen	60
	80

0 1 . 2 The approximate percentage of carbon dioxide in the Earth's early atmosphere was 95%.

Which are **two** reasons why the percentage of carbon dioxide has **decreased** since the Earth's early atmosphere?

[2 marks]

Tick (✓) **two** boxes.

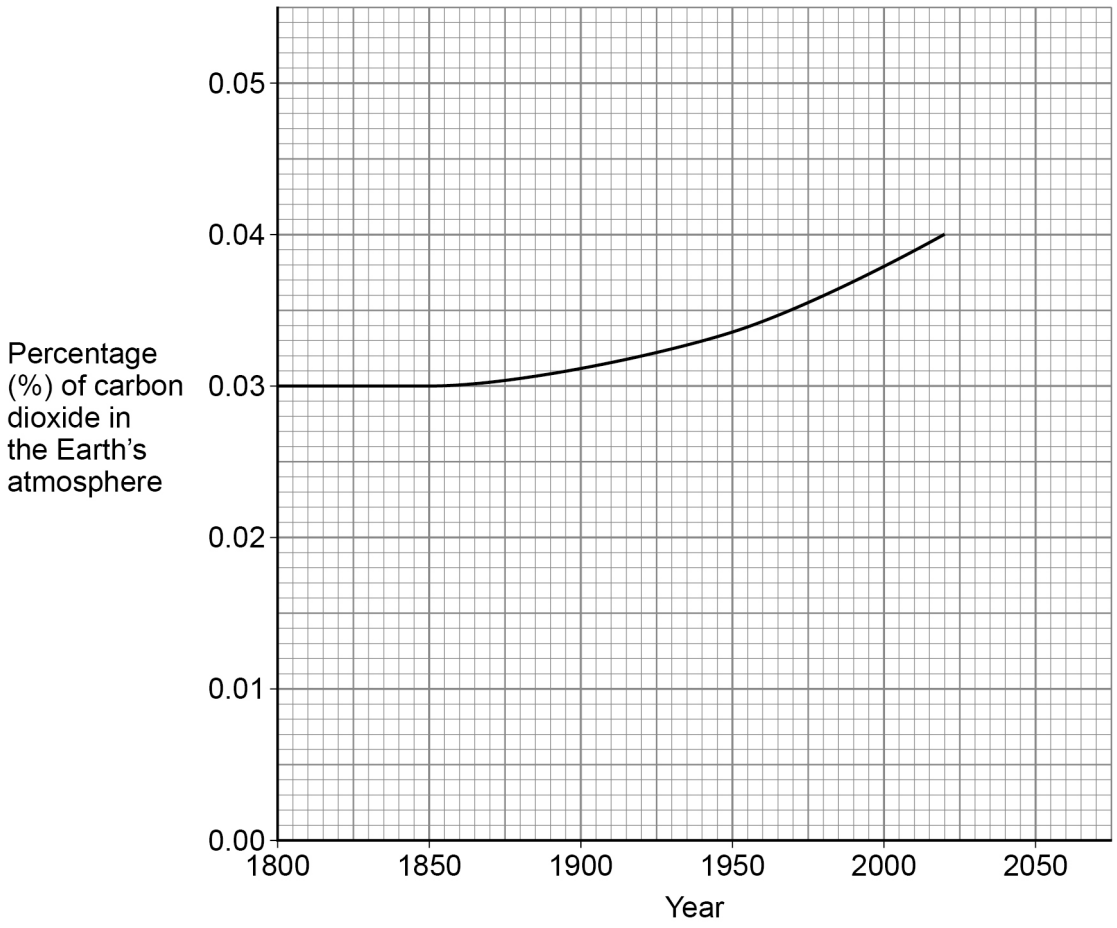
- Combustion of fuels ☐
- Deforestation ☐
- Dissolving in oceans ☐
- Photosynthesis ☐
- Respiration ☐

5.9.2.1 Greenhouse gases

Question 05 · continued

0 1 . 3 **Figure 1** shows the change in the percentage of carbon dioxide in the Earth's atmosphere from 1800 to 2020.

Figure 1



Describe the trend in the percentage of carbon dioxide in the Earth's atmosphere from 1800 to 2020.

Use data from **Figure 1**.

[3 marks]

5.9.2.1 Greenhouse gases

Question 05 · continued

Carbon dioxide is a greenhouse gas.

0 1 . 4 Which of the following is also a greenhouse gas?

[1 mark]

Tick (✓) **one** box.

- Argon ☐
- Methane ☐
- Nitrogen ☐
- Oxygen ☐

0 1 . 5 Which of the following is an environmental problem caused by greenhouse gases?

[1 mark]

Tick (✓) **one** box.

- Acid rain ☐
- Climate change ☐
- Global dimming ☐

5.9.2.1 Greenhouse gases

Question 05 · continued

0 1 . 6 Calculate the relative formula mass (M_r) of carbon dioxide (CO_2).

Relative atomic masses (A_r): C = 12 O = 16

[2 marks]

Relative formula mass of carbon dioxide = _____

11

Turn over for the next question

5.9.2.1 Greenhouse gases

Question 06

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

5.9.2.1 Greenhouse gases

Question 06 · 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]

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

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

5.9.2.1 Greenhouse gases

Question 06 · 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]

10

5.9.2.1 Greenhouse gases

Question 07

June 2025 | 8464/C/2F | Original Q6

0 6 The proportions of most gases in the Earth's atmosphere have not changed much for the past 200 million years.

0 6 . 1 About one-fifth of the atmosphere is oxygen.

Describe the test for oxygen gas.

Give the result of the test.

[2 marks]

Test _____

_____

Result _____

_____

0 6 . 2 **Table 5** shows the percentages of some gases in the Earth's early atmosphere and in the Earth's atmosphere today.

Table 5

	Percentage (%) of gas in the atmosphere	
Gas	**Earth's early atmosphere**	**Earth's atmosphere today**
Carbon dioxide	95	0.04
Nitrogen	3	78.0
Oxygen	Less than 1	21.0

5.9.2.1 Greenhouse gases

Question 07 · continued

Explain how the percentages of gases have changed from Earth's early atmosphere to Earth's atmosphere today.

You should refer to all three gases in **Table 5**.

[6 marks]

Extra space

0 6 . 3 Methane is a greenhouse gas.

Give **two** ways to reduce methane emissions into the atmosphere.

[2 marks]

1

2

5.9.2.1 Greenhouse gases

Question 07 · continued

The percentage of sulfur dioxide in the Earth's atmosphere increased between 1850 and 1980.

0 6 . 4 Describe how sulfur dioxide emissions are produced.

[2 marks]

0 6 . 5 Give **one** harmful effect of sulfur dioxide emissions.

[1 mark]

0 6 . 6 Suggest **one** reason why the percentage of sulfur dioxide in the Earth's atmosphere has decreased since 1980.

[1 mark]

14