AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 5.9.1.1

The proportions of different gases in the atmosphere

Past-paper questions

Tier	**Foundation**
Question groups	**9**
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.

5.9.1.1 The proportions of different gases in the atmosphere

Question 01

June 2018 | 8464/C/2F | Original Q4

0 4 . 1 What percentage of the Earth's atmosphere is nitrogen?

[1 mark]

Tick **one** box.

5% ☐ 20% ☐ 50% ☐ 80% ☐

0 4 . 2 During the first billion years of the Earth's existence the amount of nitrogen in the atmosphere increased.

Give **one** source of this nitrogen.

[1 mark]

_____

0 4 . 3 Nitrogen is used to make ammonia.

The word equation for the reaction is:

nitrogen + hydrogen _____ ammonia

Write the correct symbol in the equation to show that it is a reversible reaction.

[1 mark]

0 4 . 4 A reversible reaction can reach equilibrium.

Complete the sentence.

[1 mark]

Equilibrium is reached when the forward reaction and the reverse reaction happen at the same _____ .

0 4 . 5 Fertilisers are formulations containing nitrogen.

What is a formulation?

[1 mark]

_____

_____

5.9.1.1 The proportions of different gases in the atmosphere

Question 01 · continued

0 4 . 6 **Table 4** shows percentages of chemical elements in a fertiliser.

Table 4

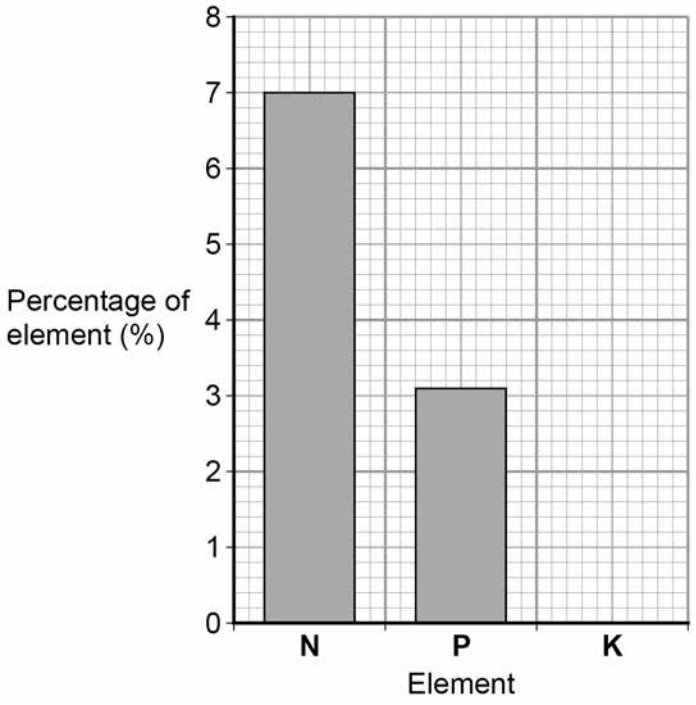
Element	Percentage (%)
Nitrogen (N)	7.0
Phosphorus (P)	3.1
Potassium (K)	5.8

Draw the bar for potassium on **Figure 8**

Use the information in **Table 4**

[1 mark]

Figure 8



5.9.1.1 The proportions of different gases in the atmosphere

Question 01 · continued

0 4 . 7 A fertiliser contains 0.225 g of iron per 3.0 g of fertiliser.

Which calculation gives the percentage of iron in the fertiliser?

[1 mark]

Tick **one** box.

$\frac{0.225}{3.0 \times 100}$ ☐

$\frac{3.0 \times 100}{0.225}$ ☐

$\frac{0.225 \times 3.0}{100}$ ☐

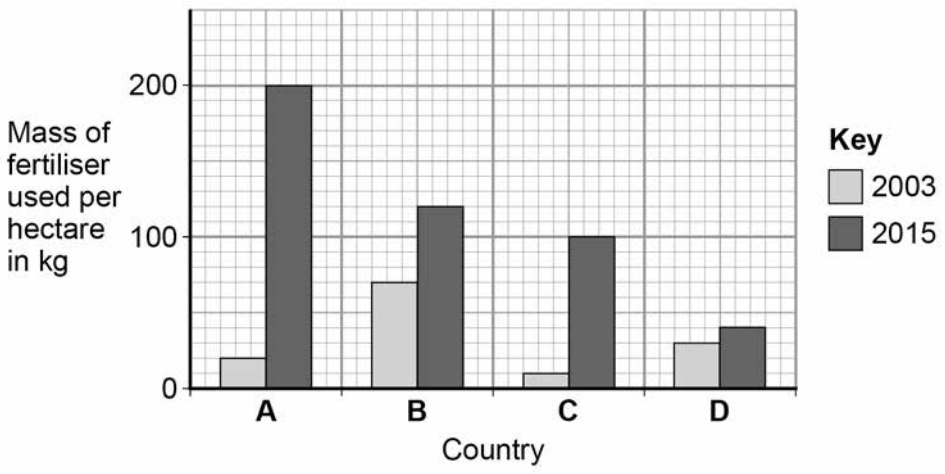
$\frac{0.225 \times 100}{3.0}$ ☐

5.9.1.1 The proportions of different gases in the atmosphere

Question 01 · continued

0 4 . 8 **Figure 9** shows the use of fertiliser in four different countries, **A**, **B**, **C** and **D**, in 2003 and 2015

Figure 9



A student said:

'**much** more fertiliser was used in 2015 than in 2003'

Is the student correct?

Use data from **Figure 9** to justify your answer.

[3 marks]

10

5.9.1.1 The proportions of different gases in the atmosphere

Question 02

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

5.9.1.1 The proportions of different gases in the atmosphere

Question 02 · 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

5.9.1.1 The proportions of different gases in the atmosphere

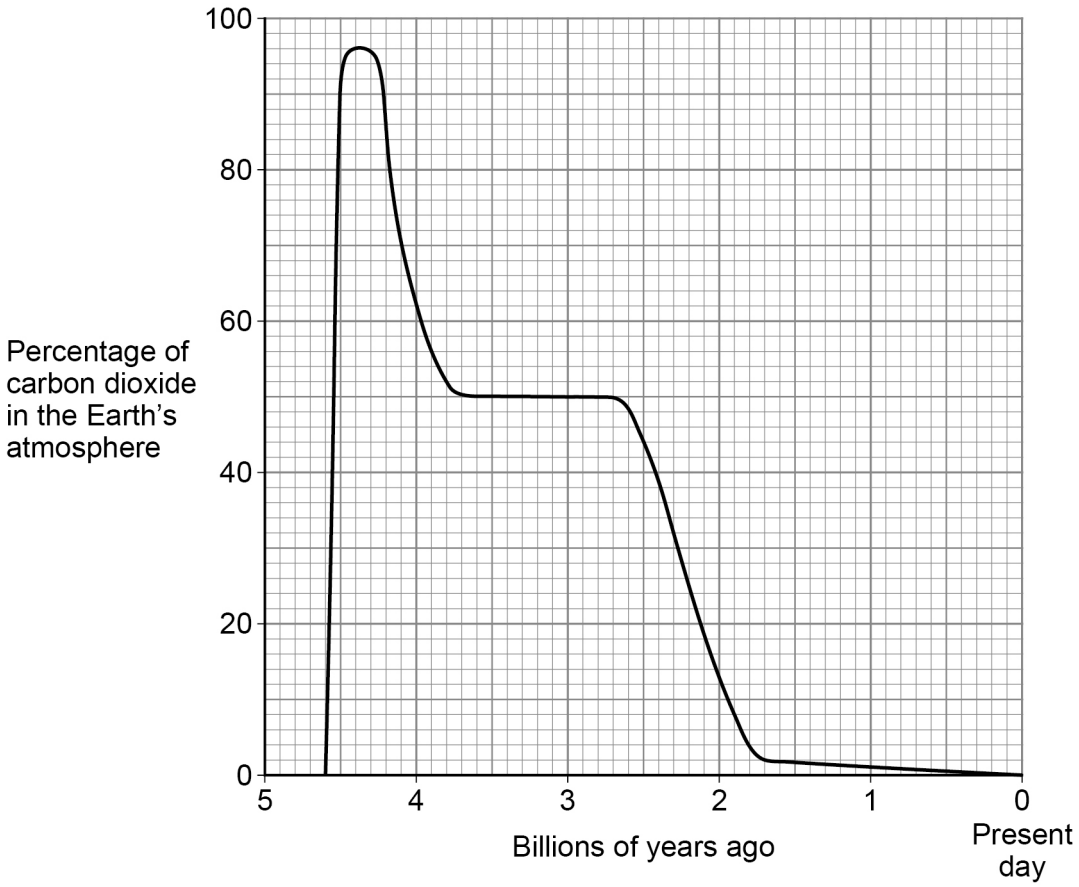
Question 03

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 = _____ %

5.9.1.1 The proportions of different gases in the atmosphere

Question 03 · 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 ☐

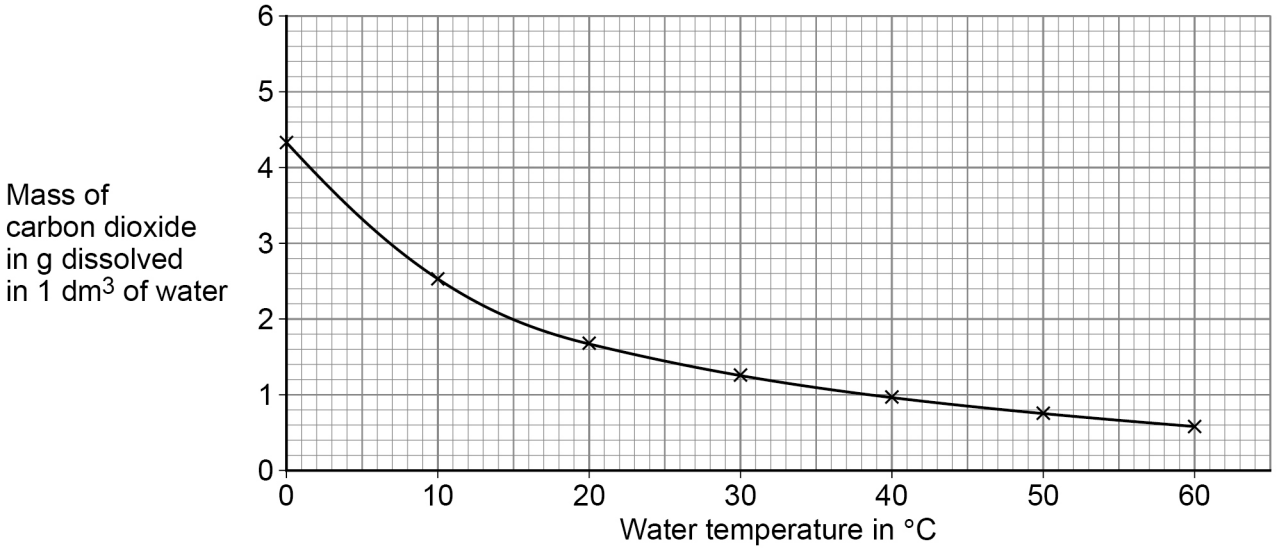
5.9.1.1 The proportions of different gases in the atmosphere

Question 03 · 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

5.9.1.1 The proportions of different gases in the atmosphere

Question 03 · 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

5.9.1.1 The proportions of different gases in the atmosphere

Question 04

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

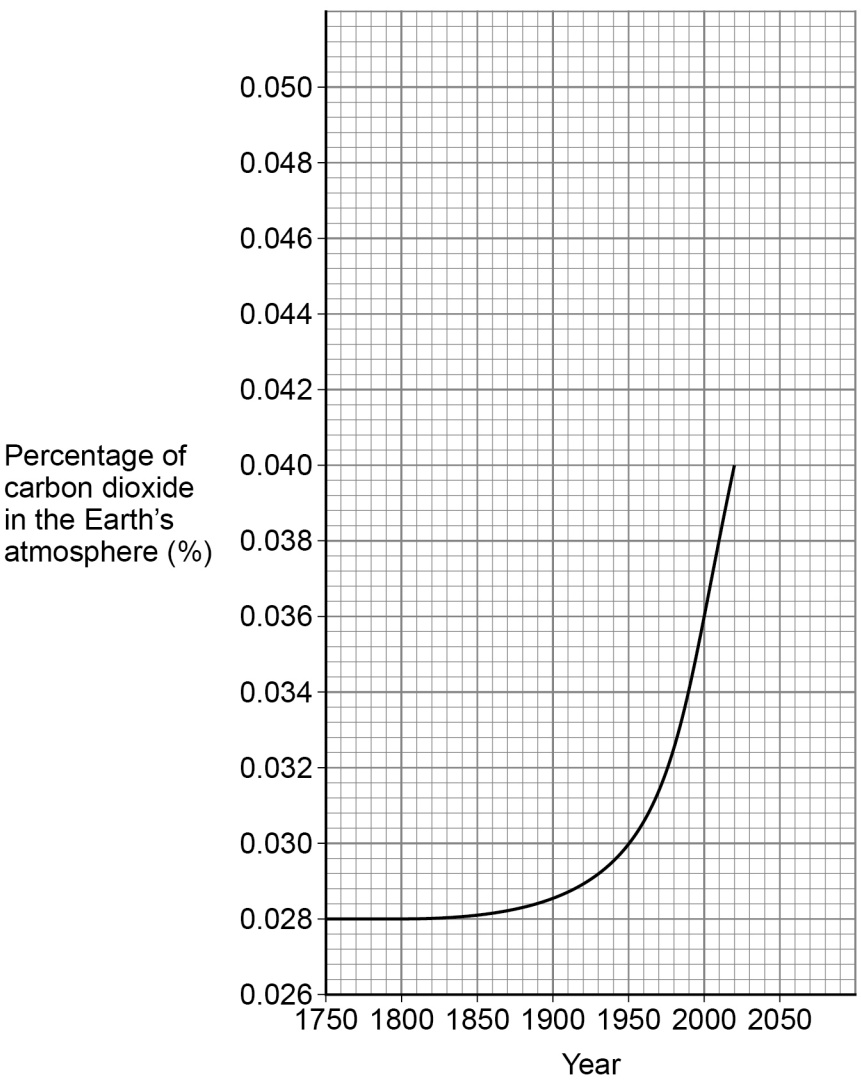
5.9.1.1 The proportions of different gases in the atmosphere

Question 04 · continued

Carbon dioxide is a greenhouse gas.

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

Figure 3



5.9.1.1 The proportions of different gases in the atmosphere

Question 04 · 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

5.9.1.1 The proportions of different gases in the atmosphere

Question 05

November 2021 | 8464/C/2F | Original Q4

0 4 This question is about the atmospheres of Earth and Mars.

0 4 . 1 Earth's early atmosphere may have been like the atmosphere of Mars today.

Why are scientists **not** certain about the percentage of gases in the Earth's early atmosphere?

[1 mark]

0 4 . 2 What was formed from the water vapour in the Earth's early atmosphere?

[1 mark]

Tick (✓) **one** box.

- Crude oil ☐
- Limestone ☐
- Natural gas ☐
- Oceans ☐

5.9.1.1 The proportions of different gases in the atmosphere

Question 05 · continued

0 4 . 3 The Earth's atmosphere today consists mainly of nitrogen and oxygen.

Draw **one** line from each gas to what produced the gas.

[2 marks]

Gas	What produced the gas
Nitrogen	Animals
Oxygen	Oceans
	Algae
	Fossils
	Volcanoes

Question 4 continues on the next page

5.9.1.1 The proportions of different gases in the atmosphere

Table 2 shows the percentage of some gases in the atmospheres of Earth and Mars.

Table 2

Gas	Percentage of gas in atmosphere (%)	
	Earth	Mars
Argon	0.9	1.9
Carbon dioxide	0.04	95
Nitrogen	78	2.6
Oxygen	21	0.2

0 4 . 4 Why are animals **not** able to live on Mars?

[1 mark]

Tick (✓) **one** box.

The atmosphere of Mars does not contain enough argon. ☐

The atmosphere of Mars does not contain enough nitrogen. ☐

The atmosphere of Mars does not contain enough oxygen. ☐

0 4 . 5 There is more carbon dioxide on Mars than on Earth.

Which **other** gas is found in larger quantities on Mars than on Earth?

[1 mark]

5.9.1.1 The proportions of different gases in the atmosphere

0 4 . 6 Calculate how many times more nitrogen than oxygen there is in the atmosphere of Earth.

Use **Table 2**.

Give your answer to 2 significant figures.

[3 marks]

Number of times more nitrogen than oxygen (2 significant figures) = _____

9

Turn over for the next question

5.9.1.1 The proportions of different gases in the atmosphere

Question 06

June 2022 | 8464/C/2F | Original Q1

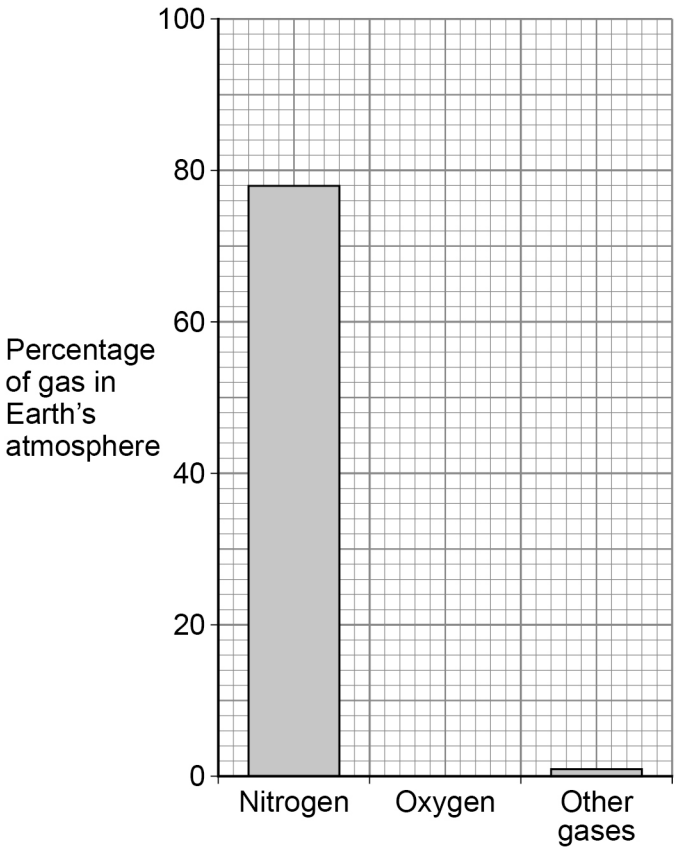
0 1 This question is about the Earth's atmosphere.

0 1 . 1 The Earth's atmosphere contains 21% oxygen.

Draw the bar for oxygen on **Figure 1**.

[1 mark]

Figure 1



0 1 . 2 What is used to test for oxygen gas?

[1 mark]

Tick (✓) **one** box.

- A burning splint ☐
- A glowing splint ☐
- Damp litmus paper ☐
- Limewater ☐

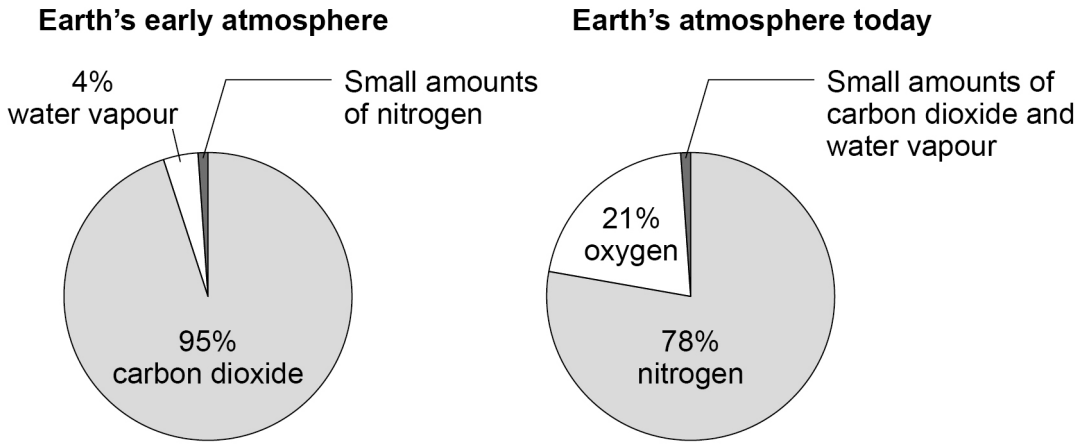
5.9.1.1 The proportions of different gases in the atmosphere

Question 06 · continued

The Earth's early atmosphere was very different from the Earth's atmosphere today.

Figure 2 shows the composition of the Earth's early atmosphere and of the Earth's atmosphere today.

Figure 2



0 1 . 3 The percentages of nitrogen and oxygen in the Earth's atmosphere today are different from the Earth's early atmosphere.

Complete the sentences.

Choose answers from the box.

Use **Figure 2**.

Each answer can be used once, more than once or not at all.

[2 marks]

decreased	**increased**	**stayed the same**

Since the Earth's early atmosphere, the percentage of nitrogen in the Earth's atmosphere has _____ .

Since the Earth's early atmosphere, the percentage of oxygen in the Earth's atmosphere has _____ .

5.9.1.1 The proportions of different gases in the atmosphere

Question 06 · continued

0 1 . 4 The Earth's atmosphere today contains a small amount of carbon dioxide.

Why has the percentage of carbon dioxide decreased since the Earth's early atmosphere?

[2 marks]

Tick (✓) **two** boxes.

- Dissolved in oceans ☐
- Formation of sedimentary rocks ☐
- Industrialisation ☐
- Respiration ☐
- Volcanic activity ☐

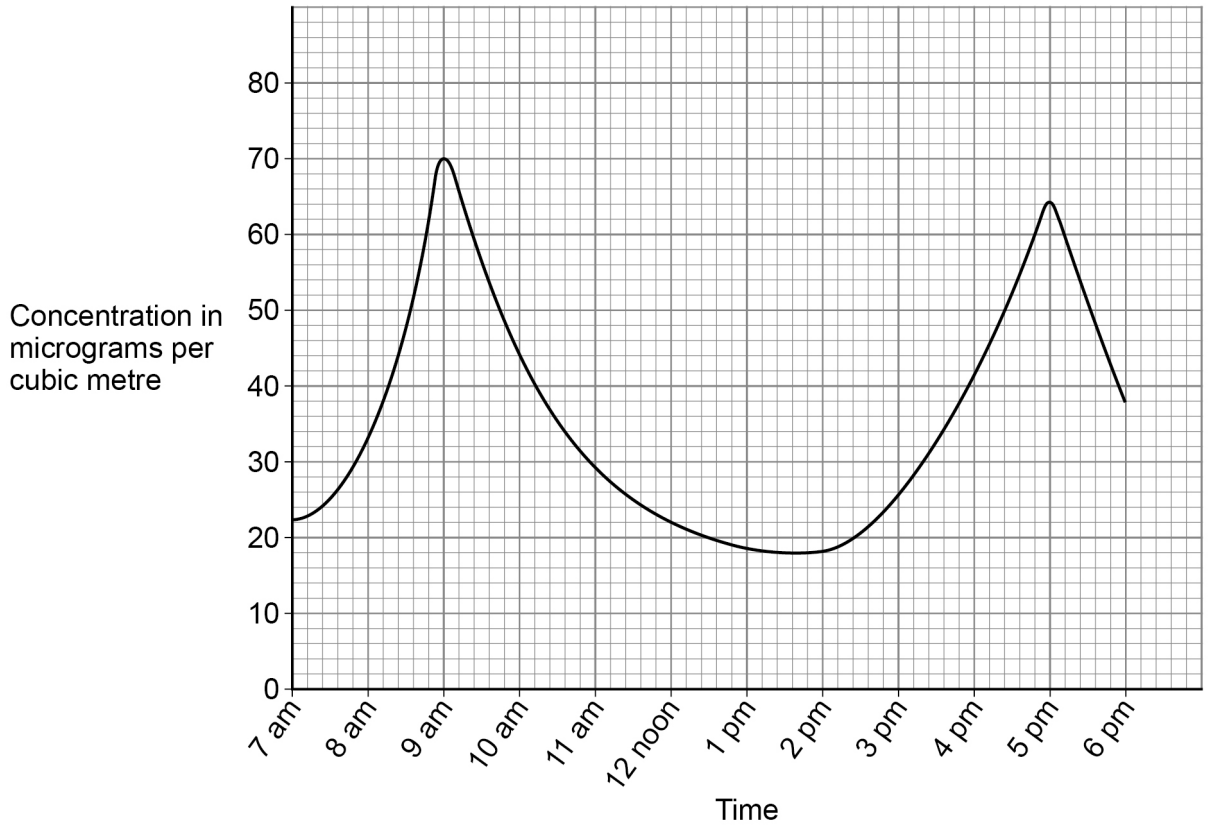
5.9.1.1 The proportions of different gases in the atmosphere

Question 06 · continued

Oxides of nitrogen are produced when nitrogen reacts with oxygen in car engines.

Figure 3 shows the concentration of oxides of nitrogen in the atmosphere during one day in a city.

Figure 3



0 1 . 5 Which **two times** have the highest concentrations of oxides of nitrogen in the atmosphere?

[2 marks]

1 _____

2 _____

0 1 . 6 Suggest why there are the highest concentrations of oxides of nitrogen at these times.

[1 mark]

_____

_____

9

5.9.1.1 The proportions of different gases in the atmosphere

Question 07

June 2023 | 8464/C/2F | Original Q2

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

5.9.1.1 The proportions of different gases in the atmosphere

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]

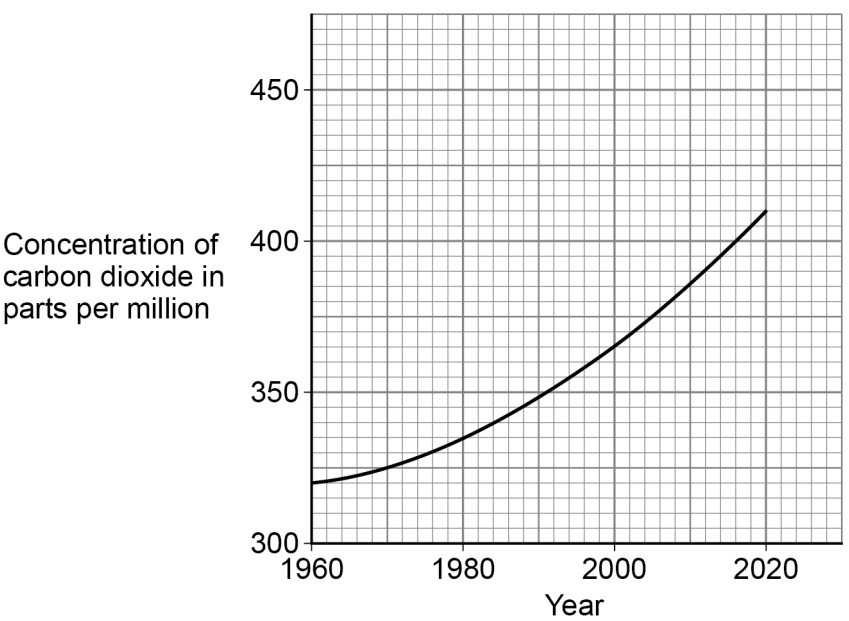
Number of times more carbon dioxide (in standard form) = _____

5.9.1.1 The proportions of different gases in the atmosphere

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 ☐

5.9.1.1 The proportions of different gases in the atmosphere

Question 07 · 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]

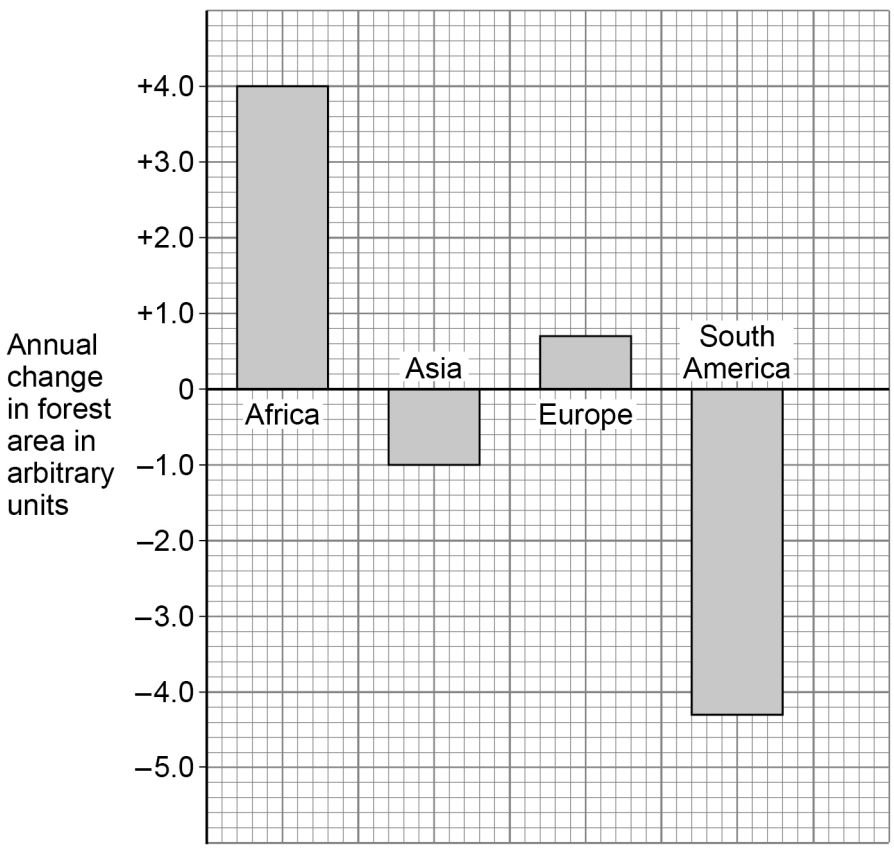
Question 2 continues on the next page

5.9.1.1 The proportions of different gases in the atmosphere

Question 07 · 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 _____

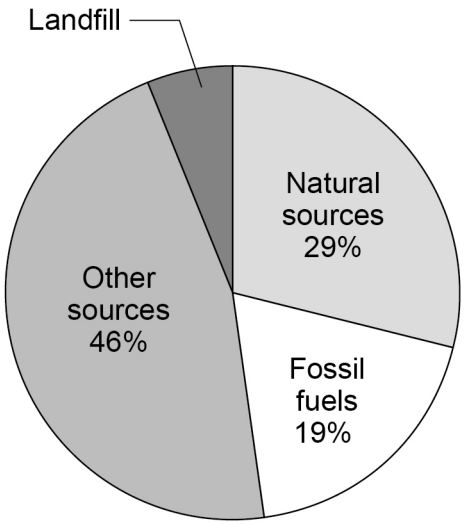
_____

5.9.1.1 The proportions of different gases in the atmosphere

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]

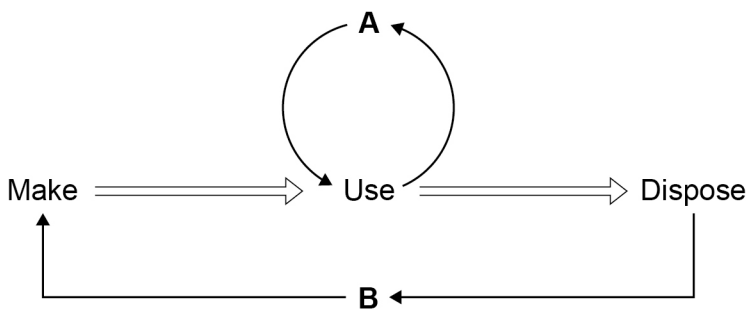
Percentage = _____ %

Question 2 continues on the next page

5.9.1.1 The proportions of different gases in the atmosphere

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

5.9.1.1 The proportions of different gases in the atmosphere

Question 08

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.

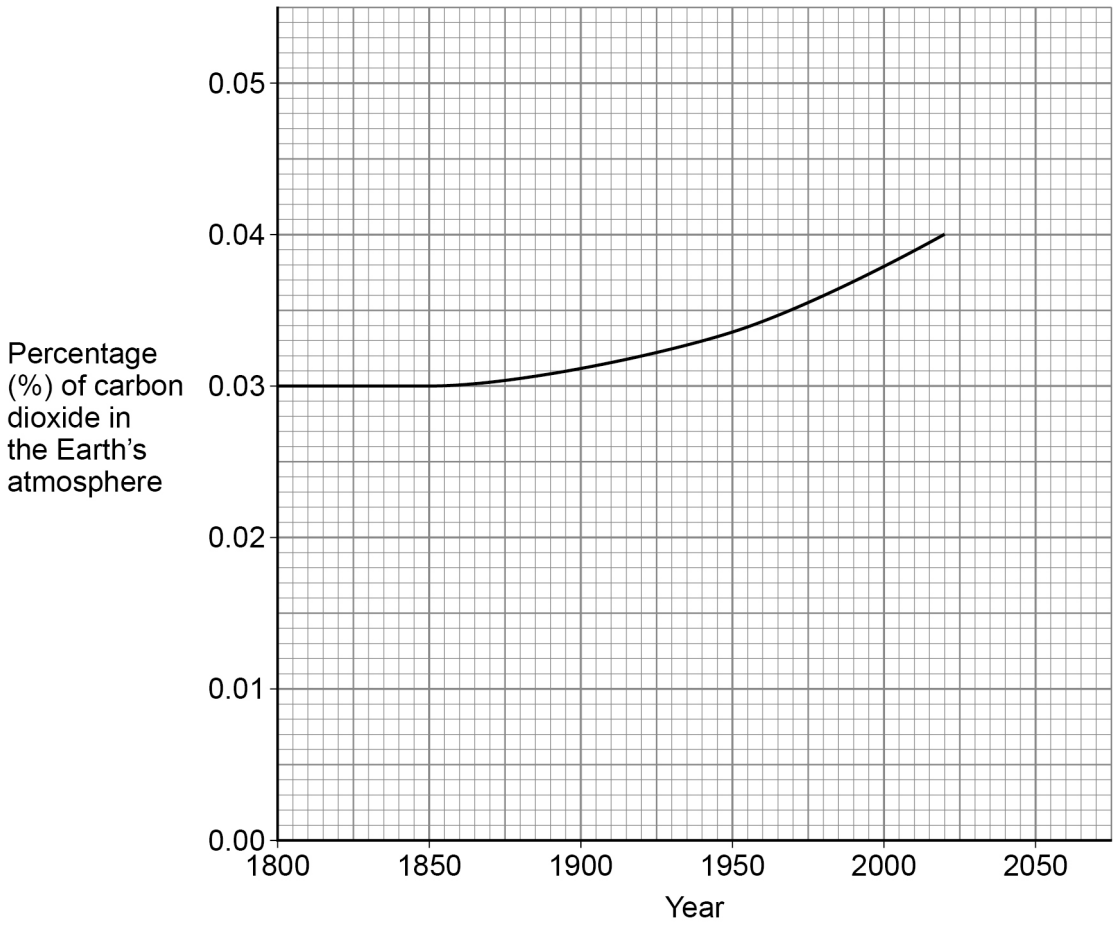
- Combustion of fuels ☐
- Deforestation ☐
- Dissolving in oceans ☐
- Photosynthesis ☐
- Respiration ☐

5.9.1.1 The proportions of different gases in the atmosphere

Question 08 · 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]

5.9.1.1 The proportions of different gases in the atmosphere

Question 08 · 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 ☐

5.9.1.1 The proportions of different gases in the atmosphere

Question 08 · 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

5.9.1.1 The proportions of different gases in the atmosphere

Question 09

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

5.9.1.1 The proportions of different gases in the atmosphere

Question 09 · 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

5.9.1.1 The proportions of different gases in the atmosphere

Question 09 · 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