AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.1.3

How oxygen increased

Past-paper questions

Tier	**Foundation**
Question groups	**10**
Available paper years	**2008–2025**

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:** _____

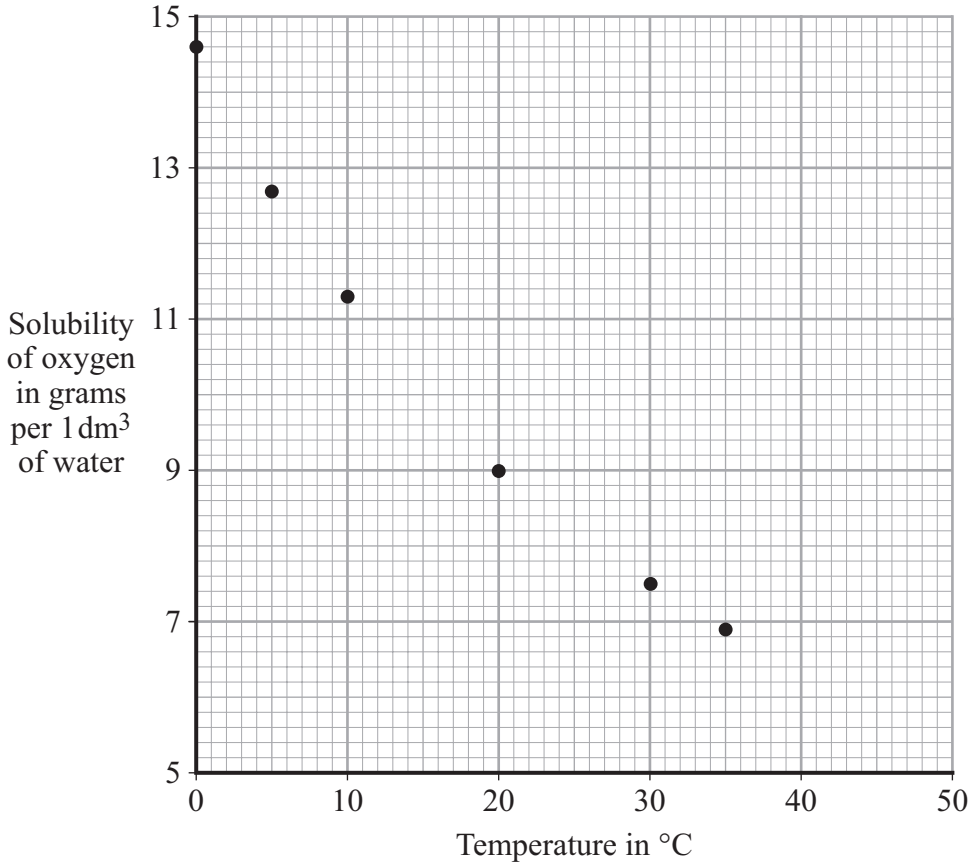
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.9.1.3 How oxygen increased

Question 01

January 2008 | CHY3F | Original Q6 | Legacy

6 The points on the graph show the mass of oxygen that dissolves in 1 dm^3 of water at different temperatures.



Use the graph to answer the following questions.

(a) (i) Draw a smooth curve through the points, extending your curve to 50 °C.

(1 mark)

(ii) Use your curve to estimate the mass of oxygen that dissolves in 1 dm^3 of water at 50 °C.

Mass = ... g

(1 mark)

4.9.1.3 How oxygen increased

Question 01 · continued

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(iii) What mass of oxygen gas comes out of 1 dm^3 of water when the temperature increases from 15 °C to 50 °C?

.....

.....

Mass = ... g

(2 marks)

(iv) A student claimed that they were more sure of the value at 15 °C than the value at 50 °C.

Do you agree? Explain the reason for your answer.

.....

.....

(1 mark)

Question 6 continues on the next page

4.9.1.3 How oxygen increased

Question 01 · continued

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(b) Read the following information and then answer the questions.

> Dissolved oxygen is essential for aquatic life. For example, trout need about 7 g/dm^3 of dissolved oxygen. They can live in concentrations down to about 5 g/dm^3 for short periods but are likely to die if the water temperature is above 26 °C.
>
> The amount of oxygen dissolved in water depends on many factors, including whether it is summer or winter, day or night. Factors such as photosynthesis and the action of wind add oxygen to water. Respiration of aquatic plants at night, decomposition of organic matter and higher temperatures remove oxygen.
>
> The management of a factory wants to put small amounts of waste hot water at 50 °C directly into a lake that contains trout. The local council has objected to this proposal and there is to be an Independent Public Enquiry.

(i) Suggest why it is important to have an Independent Public Enquiry into adding hot water to this lake.

.....

.....

(1 mark)

(ii) Suggest how the experience and status of the people giving evidence at the Public Enquiry could influence the final decision.

.....

.....

(1 mark)

4.9.1.3 How oxygen increased

Question 01 · continued

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(iii) At the Public Enquiry, the factory management and the council gave their opinions. Suggest what these opinions were by completing the sentences.

The factory management said that there was **no** risk to the trout because .....

.....

.....

The council said that there **was** a risk to the trout because .....

.....

.....

(2 marks)

9

4.9.1.3 How oxygen increased

Question 02

March 2008 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about gases found in the atmosphere.

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

A argon (noble gas)

B carbon dioxide

C nitrogen

D oxygen

1	It makes up the largest percentage of today's atmosphere.
2	It is used in electric discharge tubes.
3	It is released into the atmosphere when fossil fuels burn.
4	It is given out by plants during photosynthesis.

4.9.1.3 How oxygen increased

Question 03

June 2008 | CHY1BP | Original Q3 | Legacy

QUESTION THREE

The composition of the Earth's atmosphere today is very different from how it was billions of years ago.

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

A Carbon dioxide

B Nitrogen

C Oxygen

D Water vapour

1	the main gas in the present day atmosphere
2	the main gas in the atmosphere billions of years ago
3	the gas that makes up 20% of the present day atmosphere
4	the gas that on cooling, led to the formation of the present day oceans

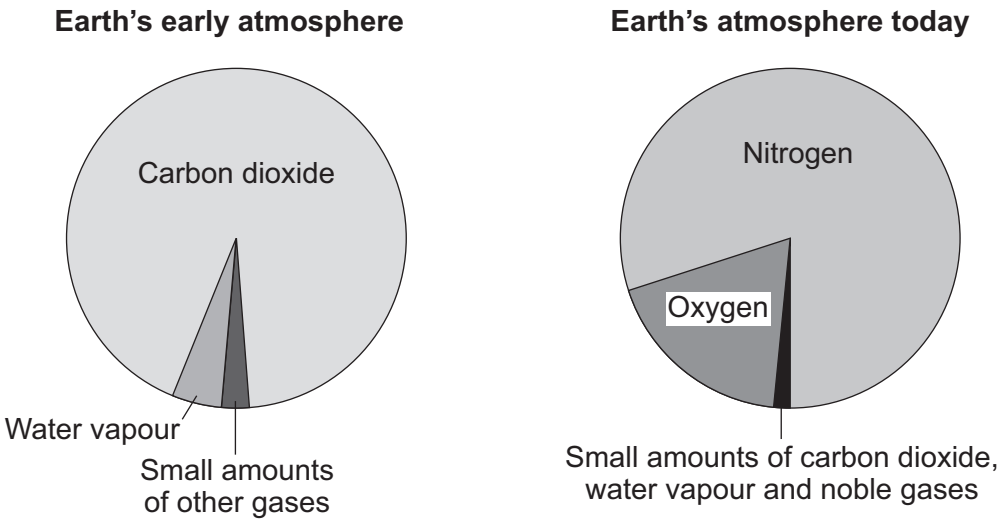
4.9.1.3 How oxygen increased

Question 04

June 2011 | CHY1BP | Original Q8 | Legacy

QUESTION EIGHT

The pie charts show the amounts of gases in the Earth's early atmosphere and in the Earth's atmosphere today.



8A Very small amounts of a hydrocarbon gas are thought to have been in the Earth's early atmosphere.

This gas is . . .

1 ammonia, NH_3

2 helium, He

3 methane, CH_4

4 oxygen, O_2

8B As the Earth's early atmosphere was forming, it contained water vapour.

Which row in the table shows where the water vapour came from **and** why the quantity in the atmosphere reduced?

	Water vapour came from	Water vapour reduced because
1	evaporation from the ground.	it condensed to form the oceans.
2	evaporation from the ground.	there was less rainfall.
3	volcanic activity.	it condensed to form the oceans.
4	volcanic activity.	there was less rainfall.

4.9.1.3 How oxygen increased

Question 04 · continued

8C Why was there no oxygen in the Earth's early atmosphere?

1 There was no carbon dioxide for the plants to use to make oxygen.

2 Living organisms had used up the oxygen.

3 There were no plants on Earth.

4 Oxygen is a very reactive gas.

8D The quantity of carbon dioxide in the Earth's atmosphere today is very different from the quantity that was in the Earth's early atmosphere.

One of the reasons why it is very different is that . . .

1 there are a lot of cars on our roads today.

2 it is locked up as carbon in fossil fuels.

3 most homes use fossil fuels for central heating.

4 plants produce carbon dioxide by photosynthesis.

4.9.1.3 How oxygen increased

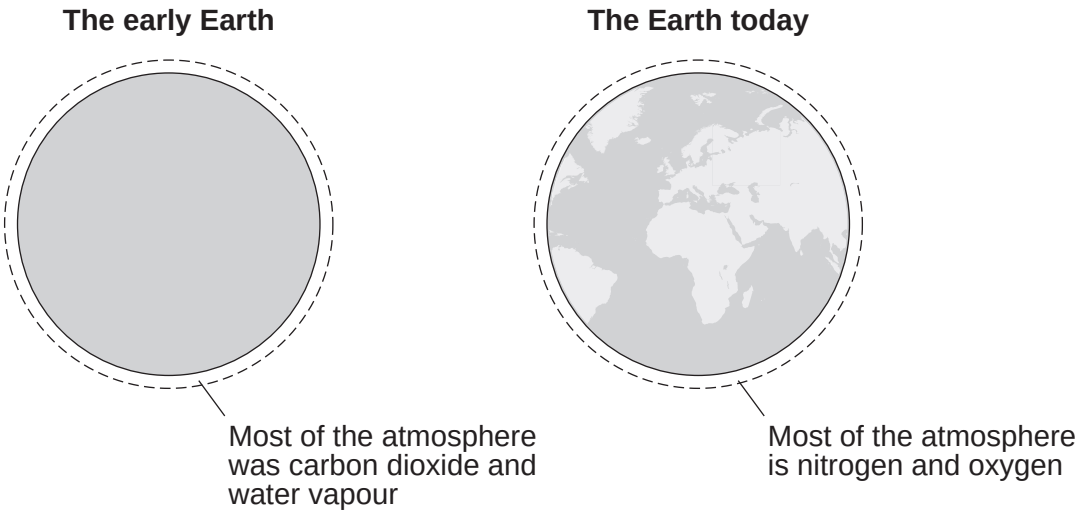
Question 05

June 2017 | CH1FP | Original Q1 | Legacy

1 This question is about gases in the Earth's atmosphere.

Figure 1 shows the atmospheres of the early Earth and of the Earth today.

Figure 1



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

[2 marks]

dissolved	**evaporated**
locked up	**released**

The amount of carbon dioxide in the early Earth's atmosphere decreased because

carbon dioxide was _____ in the oceans

and gradually became _____ in sedimentary rocks as carbonates.

1 (a) (ii) Plants and algae used carbon dioxide and water vapour in the early Earth's atmosphere to produce oxygen.

Give the name of this process.

[1 mark]

_____

4.9.1.3 How oxygen increased

Question 05 · continued

1 (b) The Earth's atmosphere today contains about 0.04% carbon dioxide.

1 (b) (i) Draw **one** line from each gas to the approximate percentage of gas in the Earth's atmosphere today.

[3 marks]

Gas	Approximate percentage of gas in the Earth's atmosphere today
	1
Argon	10
	20
Nitrogen	
	50
Oxygen	80
	90

1 (b) (ii) Give **one** reason why the amount of carbon dioxide in the Earth's atmosphere has increased in the last 50 years.

[1 mark]

_____

_____

7

4.9.1.3 How oxygen increased

Question 06

0 4 Titan is a moon of the planet Saturn.

Table 2 shows the percentages of some gases in the atmosphere of Titan and in the atmosphere of the Earth.

Table 2

Gas	Percentage of gas in atmosphere (%)	
	Titan	Earth
Nitrogen	98	78
Oxygen	Zero	21
Methane	1.4	0.0002
Argon	0.14	0.9
Carbon dioxide	0.0001	0.04

0 4 . 1 Which **two** gases are present in smaller percentages on the Earth than on Titan?

[1 mark]

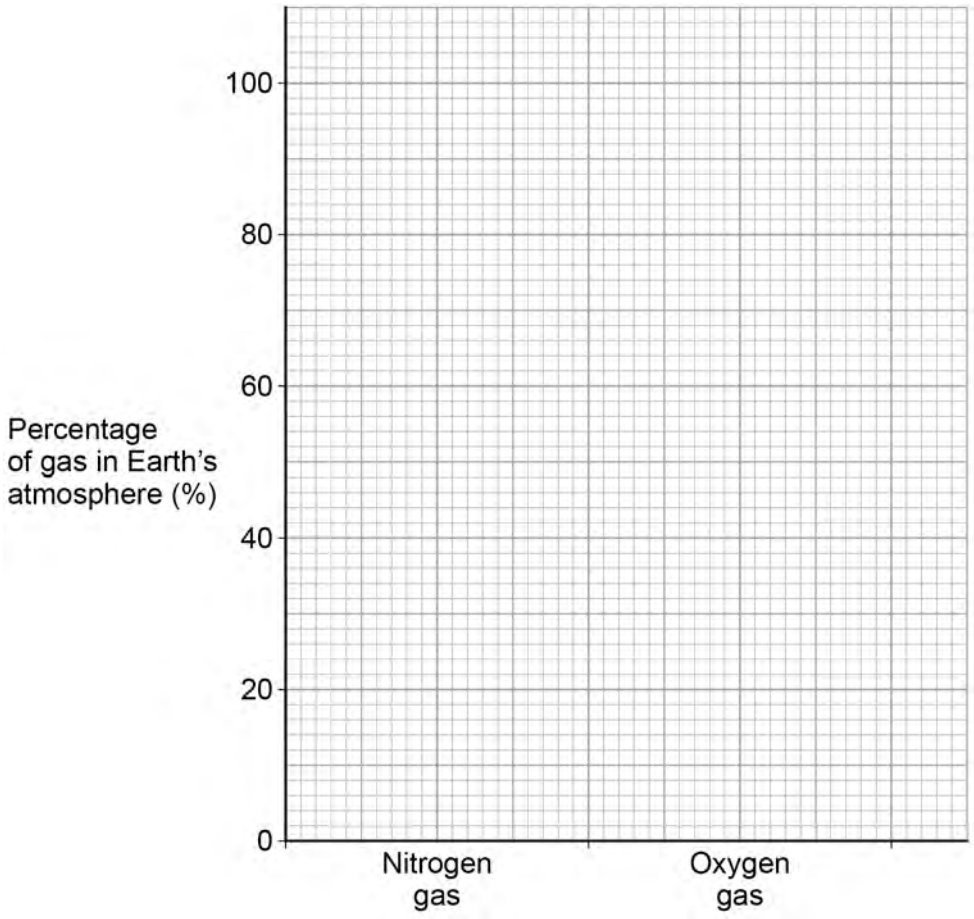
_____ and _____

Question 06 · continued

0 4 . 2 Complete the bar chart in **Figure 2** to show the percentages of nitrogen gas and oxygen gas in the Earth's atmosphere.

[2 marks]

Figure 2



0 4 . 3 Why are algae less likely to photosynthesise on Titan than Earth?

Use **Table 2**.

[1 mark]

Tick (✓) **one** box.

- Titan's atmosphere contains too little argon. ☐
- Titan's atmosphere contains too little carbon dioxide. ☐
- Titan's atmosphere contains too little methane. ☐
- Titan's atmosphere contains too little nitrogen. ☐

Question 06 · continued

0 4 . 4 Titan is warmer than the other moons of Saturn because of the greenhouse effect.

How do greenhouse gases trap energy from the sun?

[1 mark]

Tick (✓) **one** box.

All wavelengths of radiation are reflected back to the surface of Titan. ☐

Long wavelength radiation is reflected back to the surface of Titan. ☐

Short wavelength radiation is reflected back to the surface of Titan. ☐

As well as methane, the atmosphere of Titan contains small amounts of propene gas. Methane is an alkane and propene is an alkene.

0 4 . 5 Bromine water is an orange solution used to identify alkenes.

Draw **one** line from each gas to its effect on bromine water.

[2 marks]

Gas	Effect on bromine water
	Forms a blue solution
Methane	Forms a colourless solution
	Forms a green solution
Propene	Forms a white precipitate
	No effect

4.9.1.3 How oxygen increased

Question 06 · continued

0 4 . 6 Propene reacts with water (steam) to make propanol.

The ratio of the masses of propene and water that react is:

propene : water

7 : 3

Calculate the mass of propene that reacts with 21 g water.

[2 marks]

Mass = _____ g

9

Turn over for the next question

4.9.1.3 How oxygen increased

Question 07

November 2021 | 8462/2F | Original Q1

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

0 1 . 1 How long ago was the Earth formed?

[1 mark]

Tick (✓) **one** box.

- 4.6 billion years ago ☐
- 4.6 million years ago ☐
- 4.6 thousand years ago ☐

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

Table 1

Gas	Percentage of gas in atmosphere (%)	
	Mars	Earth
Carbon dioxide	95.97	0.04
Nitrogen	1.89	78.09
Oxygen	0.15	20.95
Other gases	1.99	**X**

0 1 . 2 Calculate the percentage **X** of other gases in the Earth's atmosphere.

Use **Table 1**.

[1 mark]

X = _____ %

4.9.1.3 How oxygen increased

Question 07 · continued

The atmosphere of the early Earth is thought to have been similar to the atmosphere of Mars today.

The percentages of nitrogen and of oxygen in the Earth's atmosphere today have changed from the percentages in the Earth's early atmosphere.

0 1 . 3 Draw **one** line from each gas to the change in the percentage of that gas.

Use **Table 1**.

[2 marks]

Gas	Change in percentage of gas
Nitrogen	Increased by about 4 times
	Increased by about 21%
Oxygen	Increased by about 40 times
	Increased by about 96%

0 1 . 4 The percentage of carbon dioxide in the Earth's early atmosphere decreased.

Which **two** processes caused this decrease?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide dissolving in sea water ☐
- Combustion of fossil fuels ☐
- Farming of animals ☐
- Formation of sedimentary rocks ☐
- Volcanoes releasing carbon dioxide ☐

4.9.1.3 How oxygen increased

Question 07 · continued

0 1 . 5 Photosynthesis also decreased the percentage of carbon dioxide in the Earth's early atmosphere.

Photosynthesis increased the percentage of another gas.

Complete the word equation for photosynthesis.

[2 marks]

_____ + water → glucose + _____

0 1 . 6 Complete the sentence.

[1 mark]

Scientists are not certain about the percentages of gases in the Earth's early atmosphere because there is a lack of _____.

9

4.9.1.3 How oxygen increased

Question 08

June 2023 | 8462/2F | Original Q1

0 1 This question is about oxygen.

Scientists think that there was little or no oxygen in the Earth's early atmosphere.

0 1 . 1 Which planet today has an atmosphere that is similar to the Earth's early atmosphere?

[1 mark]

Tick (✓) **one** box.

- Jupiter ☐
- Mars ☐
- Neptune ☐
- Saturn ☐

0 1 . 2 Which is the approximate percentage of oxygen in the Earth's atmosphere today?

[1 mark]

Tick (✓) **one** box.

- 20% ☐
- 50% ☐
- 80% ☐
- 100% ☐

Question 1 continues on the next page

4.9.1.3 How oxygen increased

Question 08 · continued

0 1 . 3 Which **two** of the following increased the percentage of oxygen in the Earth's atmosphere?

[2 marks]

Tick (✓) **two** boxes.

- Active volcanoes emitted gases ☐
- Algae and plants evolved ☐
- Animals evolved ☐
- Carbonate sediments formed in oceans ☐
- Photosynthesis took place ☐

4.9.1.3 How oxygen increased

Question 08 · continued

0 1 . 4 Some scientists think that 1100 million years ago the Earth's atmosphere contained:

- 16% oxygen
- 4% carbon dioxide.

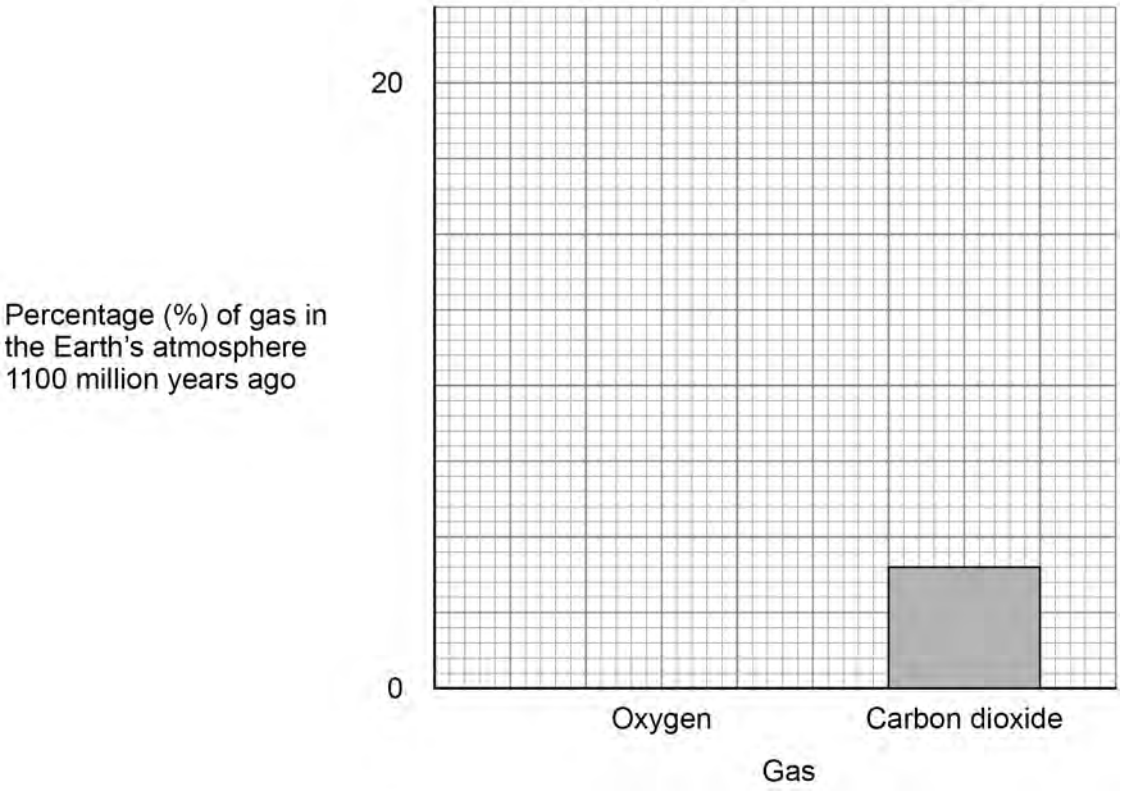
Complete **Figure 1**.

You should:

- complete the *y*-axis scale
- plot the percentage of oxygen in the Earth's atmosphere 1100 million years ago.

[2 marks]

Figure 1



Question 1 continues on the next page

4.9.1.3 How oxygen increased

Question 08 · continued

Oxygen is produced when manganese dioxide is added to hydrogen peroxide solution.

The equation for the reaction is:

hydrogen peroxide → water + oxygen

A student investigated the effect of changing the temperature on the decomposition of hydrogen peroxide.

This is the method used.

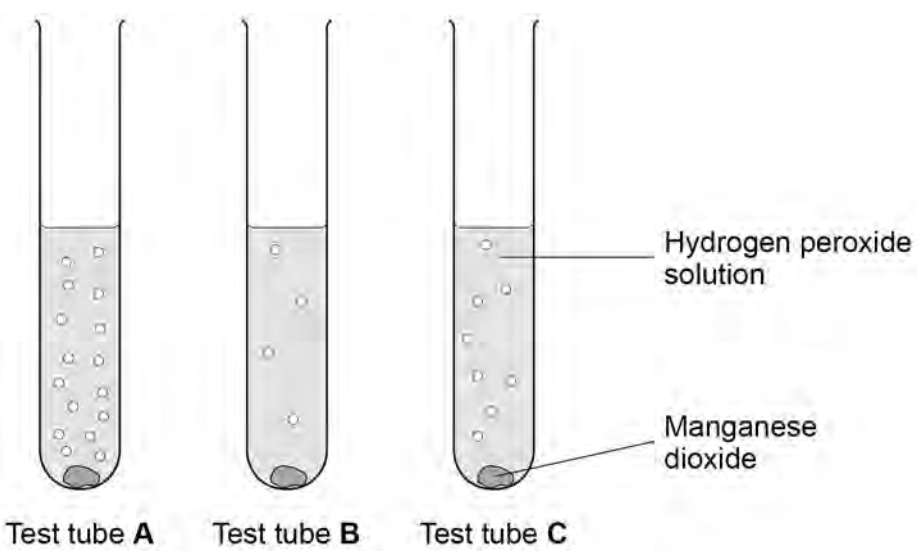
1. Add 5 cm^3 of hydrogen peroxide solution to three test tubes labelled **A**, **B** and **C**.

2. Place each test tube in a water bath at a different temperature.

3. Add 0.2 g of manganese dioxide to each test tube.

Figure 2 shows the results.

Figure 2



4.9.1.3 How oxygen increased

Question 08 · continued

0 1 . 5 Which test tube contained hydrogen peroxide solution at the highest temperature?

[1 mark]

Tick (✓) **one** box.

Test tube **A** ☐

Test tube **B** ☐

Test tube **C** ☐

0 1 . 6 The student tested the gas produced.

What is used to prove that the gas is oxygen?

[1 mark]

Tick (✓) **one** box.

A glowing splint ☐

Bromine water ☐

Damp litmus paper ☐

0 1 . 7 Manganese dioxide does not appear in the chemical equation for this reaction.

Which is a correct statement about manganese dioxide in this reaction?

[1 mark]

Tick (✓) **one** box.

Manganese dioxide increases the activation energy in this reaction. ☐

Manganese dioxide is a catalyst in this reaction. ☐

Manganese dioxide is used up during this reaction. ☐

Manganese dioxide reduces the rate of this reaction. ☐

9

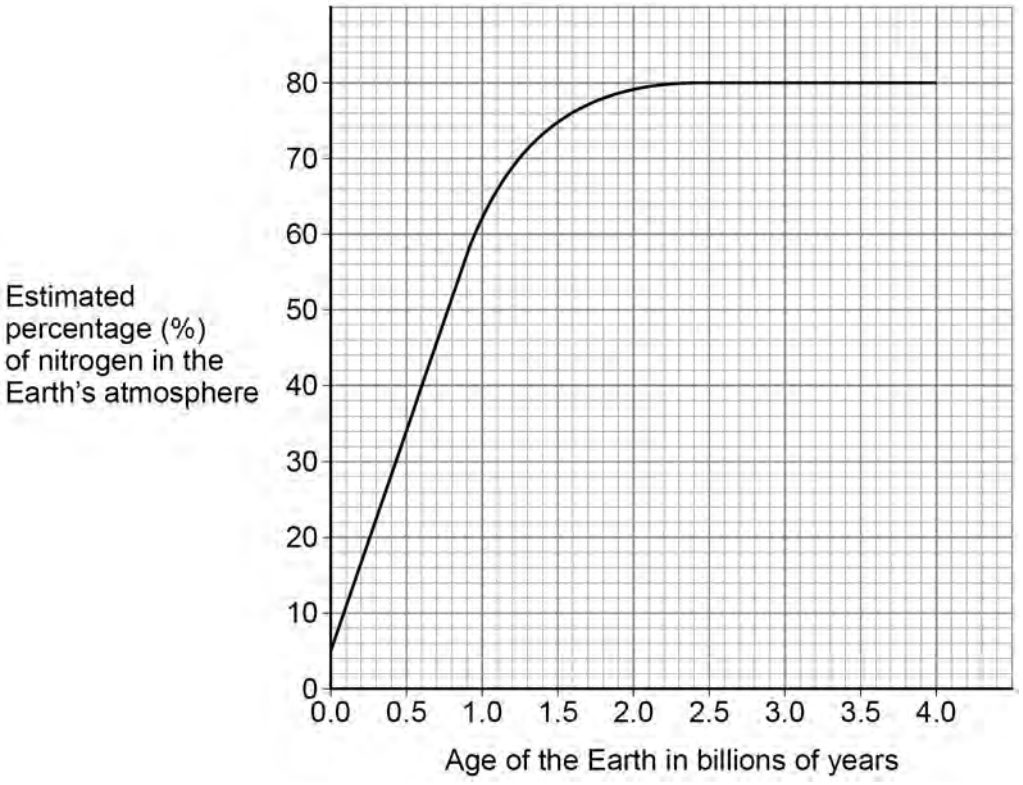
4.9.1.3 How oxygen increased

Question 09

0 4 This question is about the Earth's atmosphere and naturally occurring polymers.

0 4 . 1 **Figure 5** shows how the estimated percentage of nitrogen in the Earth's atmosphere has changed since the Earth was formed.

Figure 5



Describe the trends shown by the graph.

Use data from **Figure 5**.

[3 marks]

Question 4 continues on the next page

Question 09 · continued

The percentage of oxygen in the Earth's atmosphere has increased since the Earth was formed.

This is because of photosynthesis.

The word equation for the photosynthesis reaction is:

carbon dioxide + water → glucose + oxygen

0 4 . 2 What happened to the percentage of carbon dioxide in the atmosphere when photosynthesis began?

[1 mark]

Tick (✓) **one** box.

- The percentage of carbon dioxide decreased. ☐
- The percentage of carbon dioxide stayed the same. ☐
- The percentage of carbon dioxide increased. ☐

0 4 . 3 The photosynthesis reaction takes in energy from the surroundings.

Complete the sentence.

Choose the answer from the box.

[1 mark]

carbon dioxide	**light**	**water**

The source of the energy used in photosynthesis is _____.

4.9.1.3 How oxygen increased

Question 09 · continued

0 4 . 4 Which **two** produce oxygen by photosynthesis?

[2 marks]

Tick (✓) **two** boxes.

- Algae ☐
- Animals ☐
- Plants ☐
- Viruses ☐
- Yeast ☐

0 4 . 5 The glucose produced during photosynthesis can form naturally occurring polymers.

Which **two** are naturally occurring polymers that can be produced from glucose?

[2 marks]

Tick (✓) **two** boxes.

- Cellulose ☐
- DNA ☐
- Poly(propene) ☐
- Protein ☐
- Starch ☐

Question 4 continues on the next page

Question 09 · continued

DNA molecules contain two polymer chains.

A DNA molecule has a relative formula mass (M_r) of approximately 140 000 000 000

0 4 . 6 What is the approximate relative formula mass (M_r) of the DNA molecule in standard form?

[1 mark]

Tick (✓) **one** box.

- 1.4×10^9 ☐
- 1.4×10^{10} ☐
- 1.4×10^{11} ☐
- 1.4×10^{12} ☐

0 4 . 7 What is the approximate relative formula mass (M_r) of each polymer chain in the DNA molecule?

[1 mark]

Tick (✓) **one** box.

- 70 000 000 000 ☐
- 140 000 000 000 ☐
- 280 000 000 000 ☐
- 560 000 000 000 ☐

0 4 . 8 Complete the sentence.

[1 mark]

The shape of a DNA molecule is a double _____ .

4.9.1.3 How oxygen increased

Question 09 · continued

0 4 . 9 How many different nucleotides are present in a molecule of DNA?

[1 mark]

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

13

Turn over for the next question

4.9.1.3 How oxygen increased

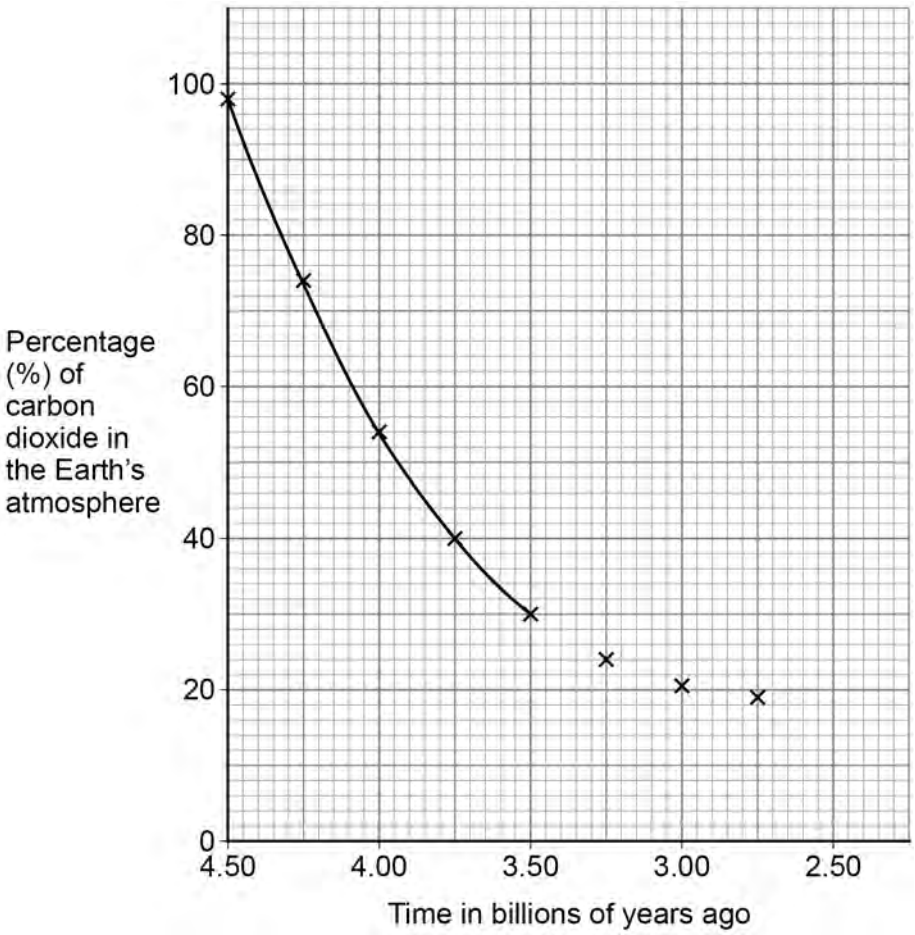
Question 10

June 2025 | 8462/2F | Original Q6

0 6 The Earth's atmosphere has changed over time.

Figure 5 shows the percentage of carbon dioxide in the Earth's atmosphere between 4.5 billion and 2.75 billion years ago.

Figure 5



0 6 . 1 Complete **Figure 5**.

You should extend the line of best fit to the plotted point at 2.75 billions of years ago.

[1 mark]

4.9.1.3 How oxygen increased

Question 10 · continued

0 6 . 2 What was the percentage (%) of carbon dioxide in the Earth's atmosphere 3.75 billions of years ago?

Use **Figure 5**.

[1 mark]

_____ %

0 6 . 3 The percentage of carbon dioxide changed between 4.5 and 3.0 billion years ago.

Which was a cause of this change?

Use **Figure 5**.

[1 mark]

Tick (✓) **one** box.

Carbon dioxide was dissolved in oceans. ☐

Carbon dioxide was produced during combustion of fossil fuels. ☐

Carbon dioxide was released during volcanic activity. ☐

Question 6 continues on the next page

Question 10 · continued

Table 2 shows information about the percentage of nitrogen present in the Earth's atmosphere.

Table 2

Time in billions of years ago	Percentage (%) of nitrogen
4.5	4
4.0	34
3.5	62
3.0	75
2.5	78

0 6 . 4 The percentage of nitrogen changed between 4.5 and 2.5 billion years ago.

Which was a cause of this change?

Use **Table 2**.

[1 mark]

Tick (✓) **one** box.

Nitrogen was dissolved in oceans. ☐

Nitrogen was produced during combustion of fossil fuels. ☐

Nitrogen was released during volcanic activity. ☐

4.9.1.3 How oxygen increased

Question 10 · continued

0 6 . 5 When did the percentage of nitrogen in the Earth's atmosphere become similar to the percentage of nitrogen in the Earth's atmosphere today?

Use **Table 2**.

[1 mark]

Tick (✓) **one** box.

- 2.5 billion years ago ☐
- 3.0 billion years ago ☐
- 3.5 billion years ago ☐
- 4.0 billion years ago ☐
- 4.5 billion years ago ☐

0 6 . 6 Which **two** gases may also have been present in the Earth's early atmosphere?

[2 marks]

Tick (✓) **two** boxes.

- Ammonia ☐
- Chlorine ☐
- Helium ☐
- Hydrogen ☐
- Methane ☐

0 6 . 7 Name the process that started to produce oxygen in the Earth's atmosphere 2.7 billion years ago.

[1 mark]

_____

8