AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.1.2

The Earth's early atmosphere

Past-paper questions

Tier	**Foundation**
Question groups	**37**
Available paper years	**2007–2025**

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:** _____

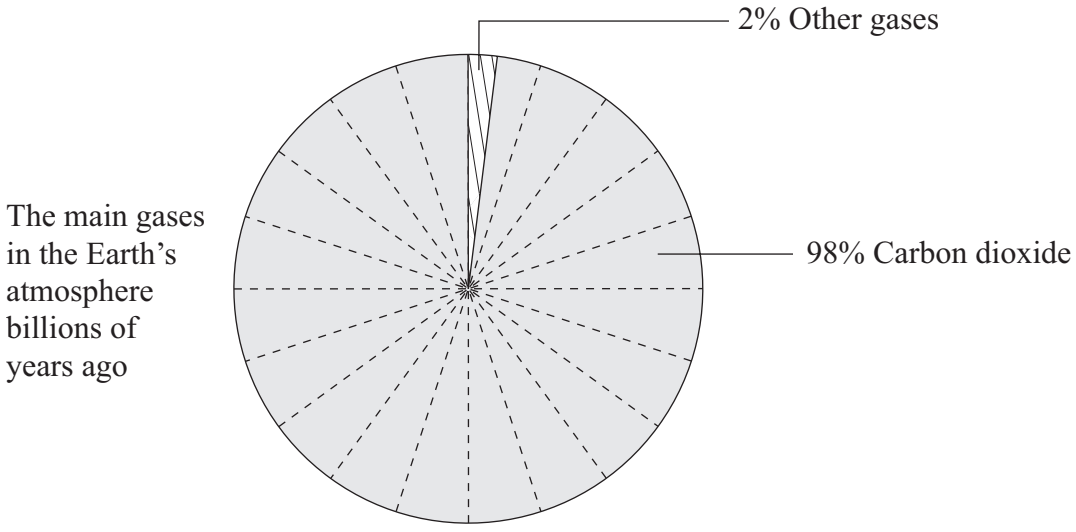
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.9.1.2 The Earth's early atmosphere

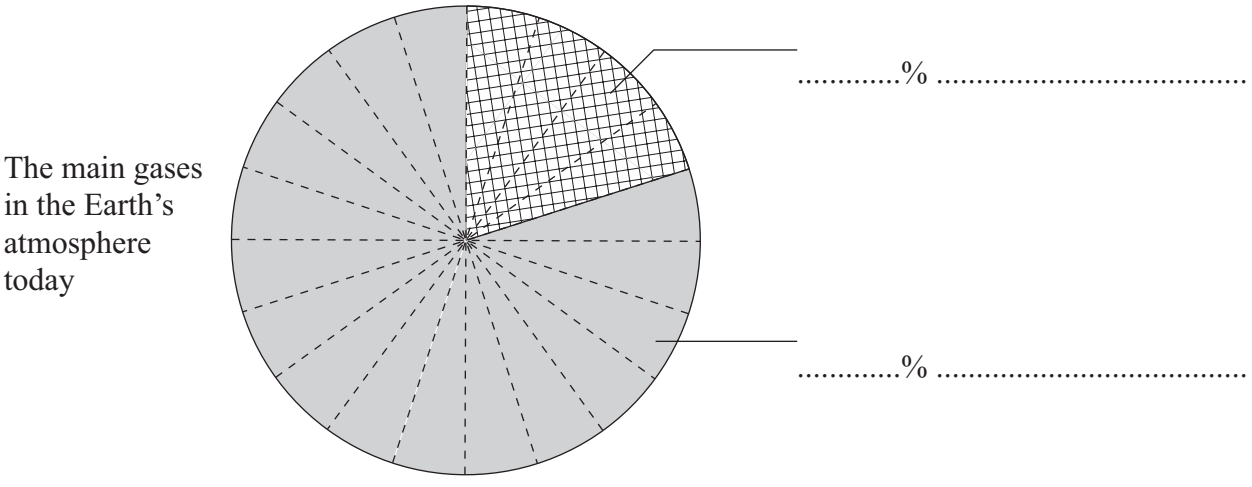
Question 01

January 2007 | CHY1F | Original Q7 | Legacy

7 Life on Earth would not exist without the atmosphere.
Billions of years ago the composition of the Earth's atmosphere was very different from the composition today.



(a) Label the pie chart below to show the percentages and names of the two main gases in the Earth's atmosphere today.



(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 01 · continued

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(b) There is evidence that the composition of the Earth's atmosphere is still changing. One possible reason is that many power stations generate electricity by burning fossil fuels such as coal, oil or natural gas. Sulfur dioxide, SO_2, is produced when coal burns in air.

(i) What environmental problem does sulfur dioxide cause?

.....

.....

(1 mark)

(ii) How could this environmental problem be reduced in coal-fired power stations?

.....

.....

(1 mark)

(iii) Gas-fired power stations burn methane, CH_4, in air.

Complete the word equation for this reaction.

methane + ... → carbon dioxide + ...

(2 marks)

(c) Excess carbon dioxide should be prevented from entering the atmosphere.

Explain why.

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(2 marks)

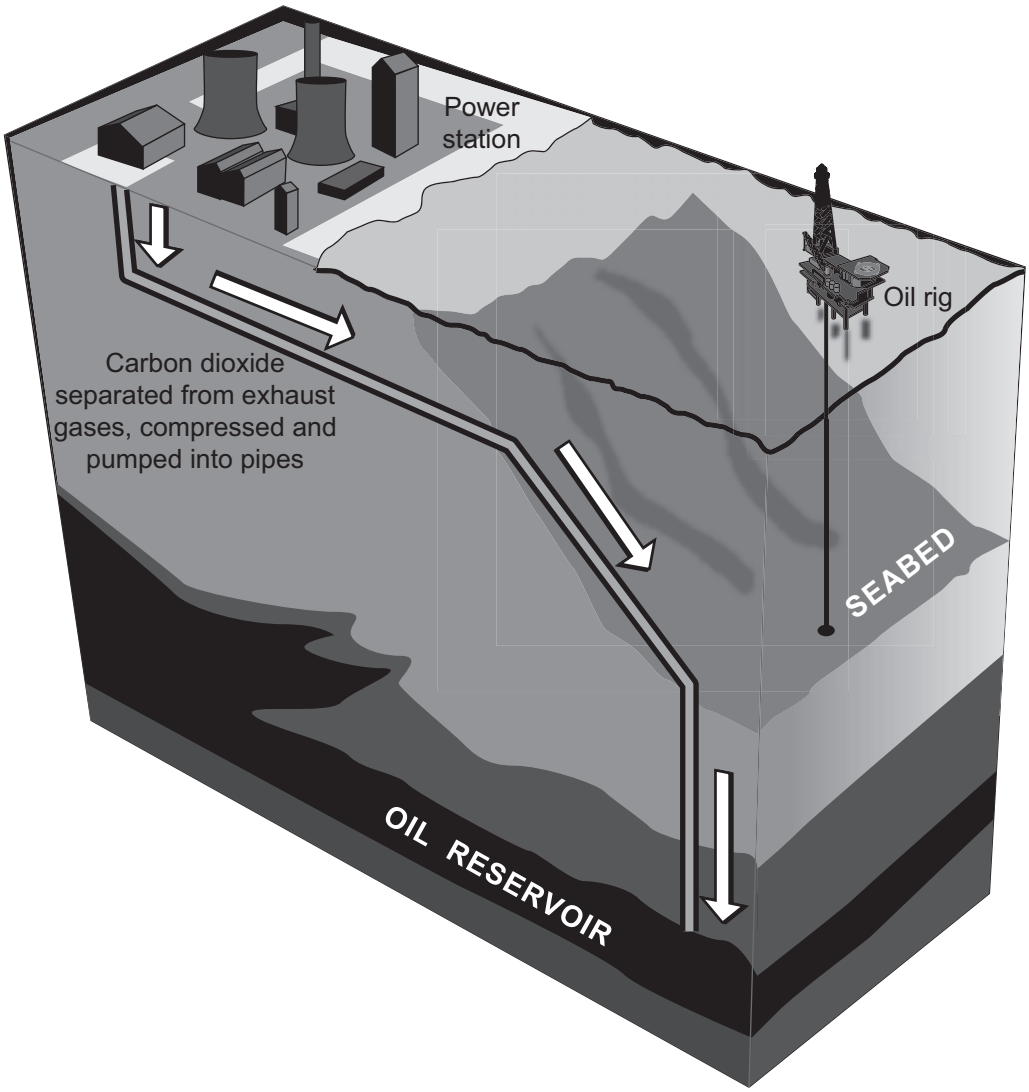
Question 7 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 01 · continued

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(d) Carbon dioxide is produced when fossil fuels burn in power stations. The diagram represents one idea to prevent excess carbon dioxide from entering the atmosphere.



Use the diagram to explain how carbon dioxide can be prevented from entering the atmosphere.

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(2 marks)

10

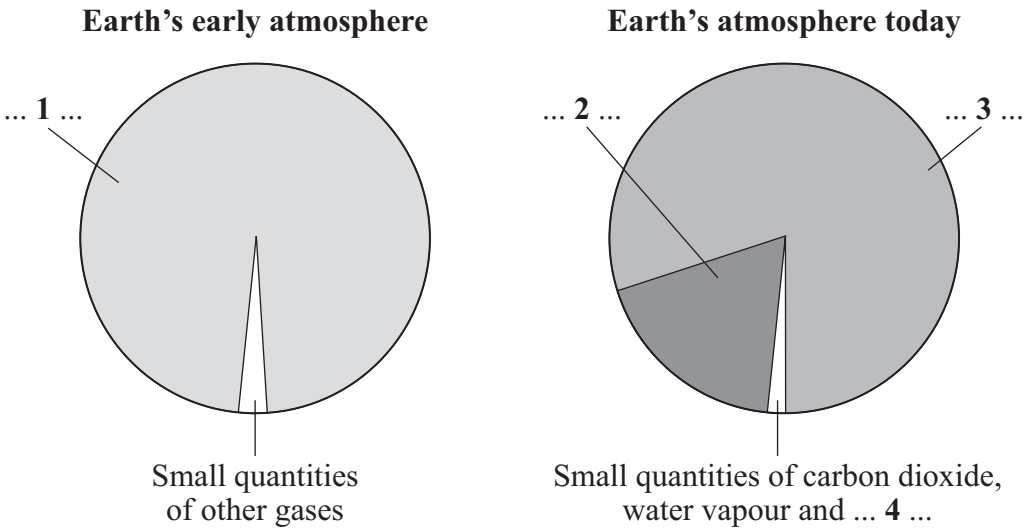
4.9.1.2 The Earth's early atmosphere

Question 02

March 2007 | CHY1B | Original Q2 | Legacy

QUESTION TWO

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



Match gases, **A**, **B**, **C** and **D**, with the labels **1–4** on the pie charts.

A carbon dioxide

B nitrogen

C noble gases

D oxygen

4.9.1.2 The Earth's early atmosphere

Question 03

March 2007 | CHY1B | Original Q5 | Legacy

QUESTION FIVE

This question is about four processes.

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

A analysis

B combustion

C condensation

D convection

Tectonic plates are moved by . . . **1** . . . in the mantle.

Additives in food can be identified by chemical . . . **2** . . . .

Oceans were formed by . . . **3** . . . of the water vapour in the atmosphere.

The amount of carbon dioxide in the atmosphere has been increased by . . . **4** . . . of fossil fuels.

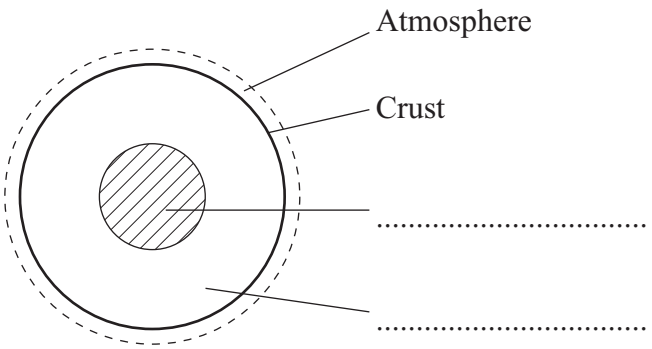
4.9.1.2 The Earth's early atmosphere

Question 04

June 2007 | CHY1F | Original Q5 | Legacy

5 The Earth is shaped like a ball and is surrounded by an atmosphere.

(a) The diagram shows the layered structure of the Earth.



Choose words from the box to complete the labels on the diagram.

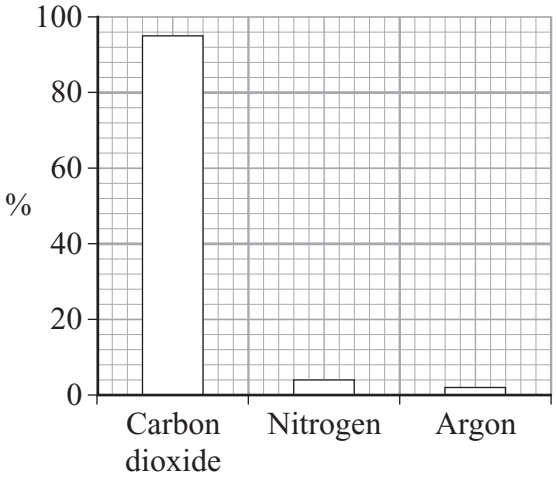
core	**mantle**	**plate**

(2 marks)

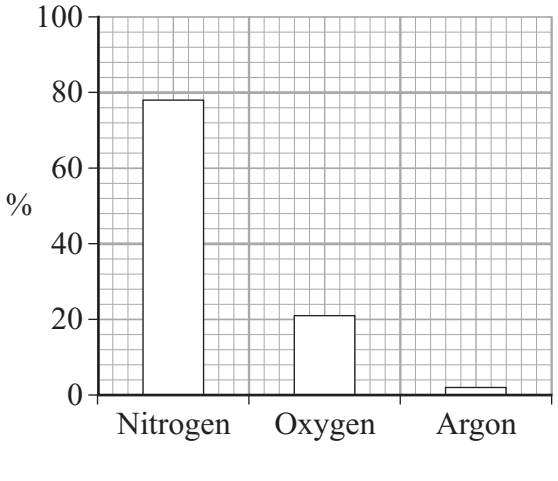
(b) Some theories suggest that the Earth's early atmosphere was like the atmosphere of Mars today.

The bar charts show the three most common gases in each atmosphere today.

The atmosphere of Mars today



The atmosphere of Earth today



4.9.1.2 The Earth's early atmosphere

Question 04 · continued

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(i) Use the bar charts to complete the sentence by writing in the correct gases.

In the atmosphere of Mars today there is mainly ..... and no ..... . *(2 marks)*

(ii) Use the bar charts to complete the sentence by writing in the correct number.

These theories suggest that there was about ..... % nitrogen in the Earth's early atmosphere. *(1 mark)*

(iii) The atmosphere of the Earth today has much more nitrogen than in the early atmosphere. Denitrifying bacteria released most of this nitrogen into the atmosphere.

There are other differences between the Earth's early atmosphere and the atmosphere of the Earth today.

Use the bar charts to describe and explain **two** of these other differences.

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.....

.....

(3 marks)

8

4.9.1.2 The Earth's early atmosphere

Question 05

November 2007 | CHY1B | Original Q4 | Legacy

QUESTION FOUR

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

In the Earth's early atmosphere	In the Earth's atmosphere today
Carbon dioxide Small amounts of: ammonia, NH_3 methane, CH_4 Water vapour	Nitrogen Oxygen Small amounts of: carbon dioxide noble gases Water vapour

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

A ammonia

B helium

C methane

D oxygen

	What we can say about the gas
1	It is a hydrocarbon.
2	It is a noble gas.
3	It is a compound of nitrogen and hydrogen.
4	It is produced in the atmosphere by the activity of plants.

4.9.1.2 The Earth's early atmosphere

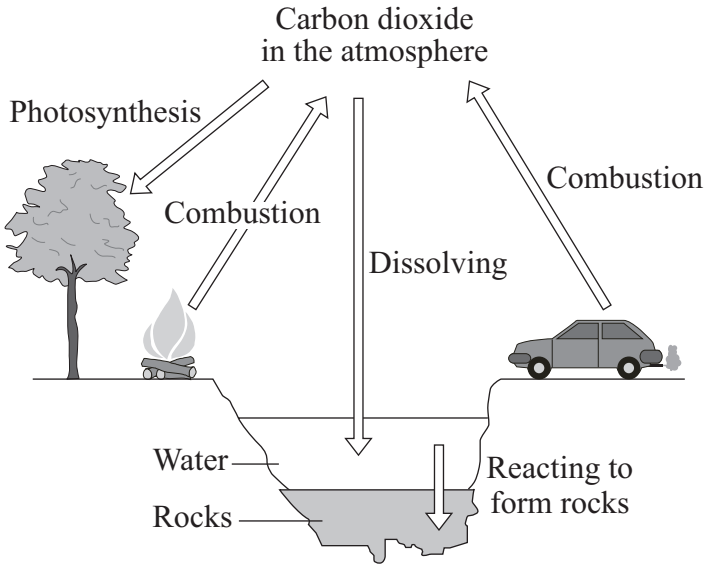
Question 06

March 2008 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

This question is about the balance of carbon dioxide in the atmosphere.

The diagram below shows some of the processes involved in the atmosphere.



The total UK carbon dioxide emissions (million tonnes) from vehicles between 1990 and 2002 are listed in the table.

Year	1990	1995	1996	1997	1998	1999	2000	2001	2002
Carbon dioxide emissions in million tonnes	58.5	68.9	75.2	79.7	84.3	84.5	88.3	86.3	86.0

Source: National Statistics website: *www.statistics.gov.uk*
Greenhouse gas emissions from the UK transport industry.
Reproduced under the terms of the Click-Use Licence.

9A The data for total UK carbon dioxide emissions from vehicles could be obtained by . . .

1 measuring the carbon dioxide in the atmosphere.

2 calculating the amount of carbon dioxide produced from the amount of fuel used by vehicles.

3 counting the number of vehicles on the road.

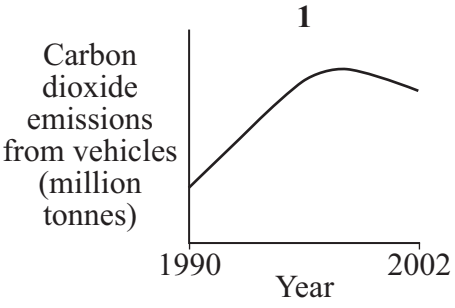
4 measuring the amount of carbon dioxide in the air near a busy motorway.

4.9.1.2 The Earth's early atmosphere

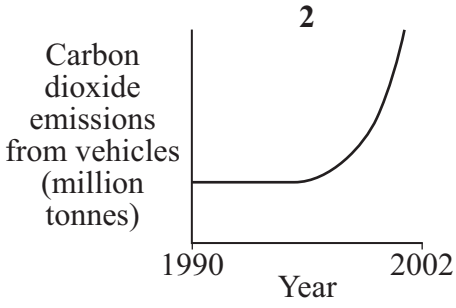
Question 06 · continued March 2008 | CHY1BP | Original Q9 | Legacy

9B A graph plotted using the data 'Year' (*x*-axis) against 'Carbon dioxide emissions from vehicles' (*y*-axis) would look like which one of the following?

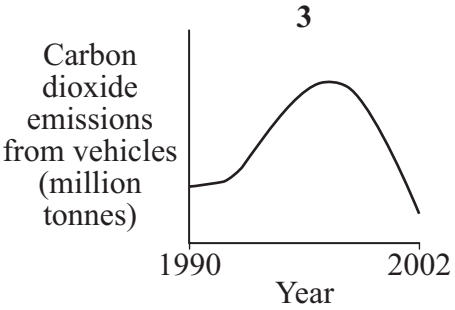
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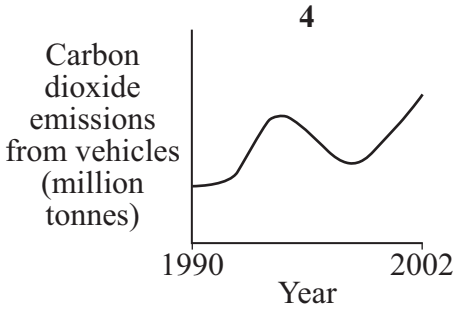
2



3



4



9C The increase in the amount of carbon dioxide in the air over the past 40 years is thought to be due mainly to . . .

1 increased growth of plants.

2 increased burning of fossil fuels.

3 the formation of carbonate rocks.

4 the release of carbon dioxide from oceans due to global warming.

9D The amount of carbon dioxide in the atmosphere could be reduced by . . .

1 taking more flights in aeroplanes.

2 cutting down trees in your garden.

3 walking to work instead of using a car.

4 driving a car with a larger engine.

END OF TEST

4.9.1.2 The Earth's early atmosphere

Question 07

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

4.9.1.2 The Earth's early atmosphere

Question 08

June 2008 | CHY1BP | Original Q6 | Legacy

QUESTION SIX

This question is about unsaturated hydrocarbons.

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

A catalysis

B polymerisation

C combustion

D thermal decomposition

Heating large hydrocarbon molecules so that they break down into smaller molecules, such as ethene, is an example of . . . **1** . . . .

Ethanol is formed when ethene reacts with steam. The reaction is speeded up using phosphoric acid. This reaction is an example of . . . **2** . . . .

Individual ethene molecules can be made to link together to form very long chains in a process called . . . **3** . . . .

Ethene reacts with oxygen to produce carbon dioxide and water. This reaction is an example of . . . **4** . . . .

4.9.1.2 The Earth's early atmosphere

Question 09

November 2008 | CHY1BP | Original Q5 | Legacy

QUESTION FIVE

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

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

A carbon dioxide

B helium

C nitrogen

D oxygen

1	It is in Group 0 of the periodic table.
2	It makes up about 80% of the atmosphere.
3	It is found in today's atmosphere in much smaller amounts than in Earth's early atmosphere.
4	It is used when fossil fuels burn.

4.9.1.2 The Earth's early atmosphere

Question 10

March 2009 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about gases.

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

A oxygen

B noble gas

C air

D water vapour

1	It condensed to form the Earth's oceans.
2	It is a mixture.
3	It makes up about 20% of the Earth's atmosphere.
4	It is used in discharge tubes.

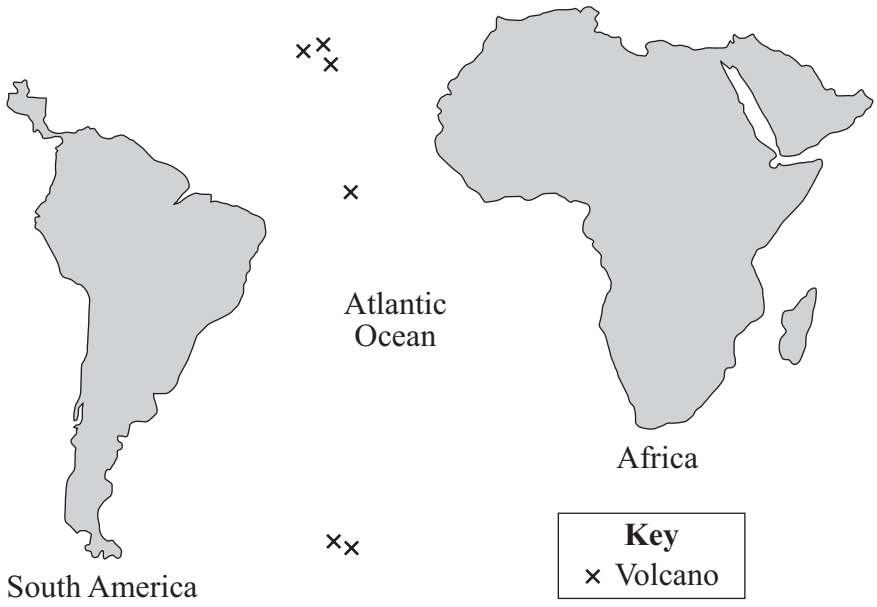
4.9.1.2 The Earth's early atmosphere

Question 11

March 2009 | CHY1BP | Original Q6 | Legacy

QUESTION SIX

The diagram shows the positions of South America and Africa.



Early in the 20th century, a scientist called Alfred Wegener put forward a theory that South America and Africa had once been joined together, but since then had separated.

6A What name is given to this separation of the continents?

1 crustal shrinking

2 continental expansion

3 continental drift

4 crustal cracking

4.9.1.2 The Earth's early atmosphere

Question 11 · continued March 2009 | CHY1BP | Original Q6 | Legacy

6B Many scientists did **not** accept Wegener's theory because . . .

1 they thought that continents only moved towards each other.

2 they thought that continents moved too slowly.

3 they had no way of explaining how the continents could move.

4 they believed that the Earth was expanding.

6C Later in the 20th century, more scientists accepted Wegener's theory.

What new evidence made them change their ideas?

1 the existence of tectonic plates

2 the positions of volcanoes

3 the shapes of the continents

4 the sizes of the continents

6D Volcanic eruptions occur in the places shown on the diagram.

This is most likely to be because at these places . . .

1 the Earth's crust is very thick.

2 the Earth's crust is shrinking.

3 there is a boundary between tectonic plates.

4 earthquakes happen only rarely.

4.9.1.2 The Earth's early atmosphere

Question 12

June 2009 | CHY1F | Original Q4 | Legacy

4 Billions of years ago, the Earth's early atmosphere was probably like the atmosphere of Venus today.

The table shows a comparison of the atmospheres of the Earth and Venus today.

	Percentage composition of atmosphere	
Name of gas	**Earth today**	**Venus today**
Nitrogen	78	3.5
Oxygen	21	a trace
Argon	0.97	a trace
Carbon dioxide	0.03	96.5
Average surface temperature	20 °C	460 °C

4 (a) Use the names of gases from the table to complete the sentences.

4 (a) (i) In the Earth's atmosphere today, the main gas is ..... .

(1 mark)

4 (a) (ii) In the Earth's atmosphere billions of years ago, the main gas was

..... .

(1 mark)

4 (b) (i) Scientists do **not** know the accurate composition of the Earth's early atmosphere. Suggest why.

.....

.....

(1 mark)

4 (b) (ii) Use information from the table to answer this question.

Water vapour is present in the atmospheres of the Earth and Venus today.
The Earth's surface is mainly covered by water.

Suggest why there is no water on the surface of Venus.

.....

.....

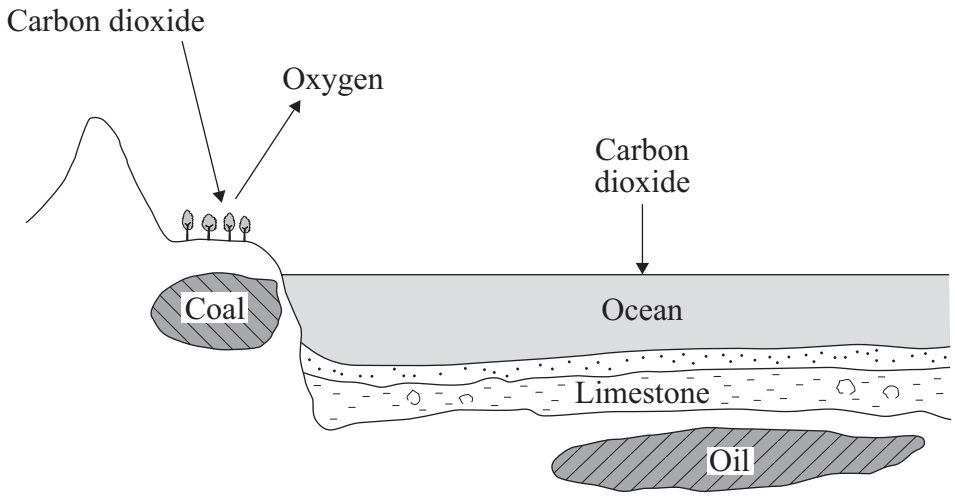
(1 mark)

4.9.1.2 The Earth's early atmosphere

Question 12 · continued

for mark

4 (c) The diagram shows how carbon dioxide is removed from the Earth's atmosphere.



Describe what happened to the carbon dioxide in the Earth's early atmosphere.
Use the diagram to help you.

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.....

(3 marks)

7

4.9.1.2 The Earth's early atmosphere

Question 13

November 2009 | CHY1BP | Original Q2 | Legacy

QUESTION TWO

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

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

A oxygen

B nitrogen

C carbon dioxide

D helium

The most abundant gas in the Earth's atmosphere is . . . **1** . . . .

The gas used to fill party balloons because it is less dense than air is . . . **2** . . . .

The burning of fossil fuels uses . . . **3** . . . gas from the air, and releases . . . **4** . . . gas into the air.

Turn over for the next question

4.9.1.2 The Earth's early atmosphere

Question 14

January 2019 | CHY1F | Original Q3 | Legacy

3 In 1980 Mount St Helens suddenly exploded. This volcanic eruption was so violent that it blew off the top of the mountain. Ash particles and volcanic gases spread throughout the Earth's atmosphere.



3 (a) Mount St Helens is on a boundary between two of the Earth's tectonic plates.

Draw a ring around the correct word to complete the sentences.

3 (a) (i) The Earth's tectonic plates are made up of the upper part of the mantle

and the | atmosphere. | core. | crust.

(1 mark)

3 (a) (ii) The movement of the Earth's tectonic plates is caused by convection currents within the mantle. These convection currents are driven by heat released by

natural | combustion | radioactive | shrinking | processes.

(1 mark)

4.9.1.2 The Earth's early atmosphere

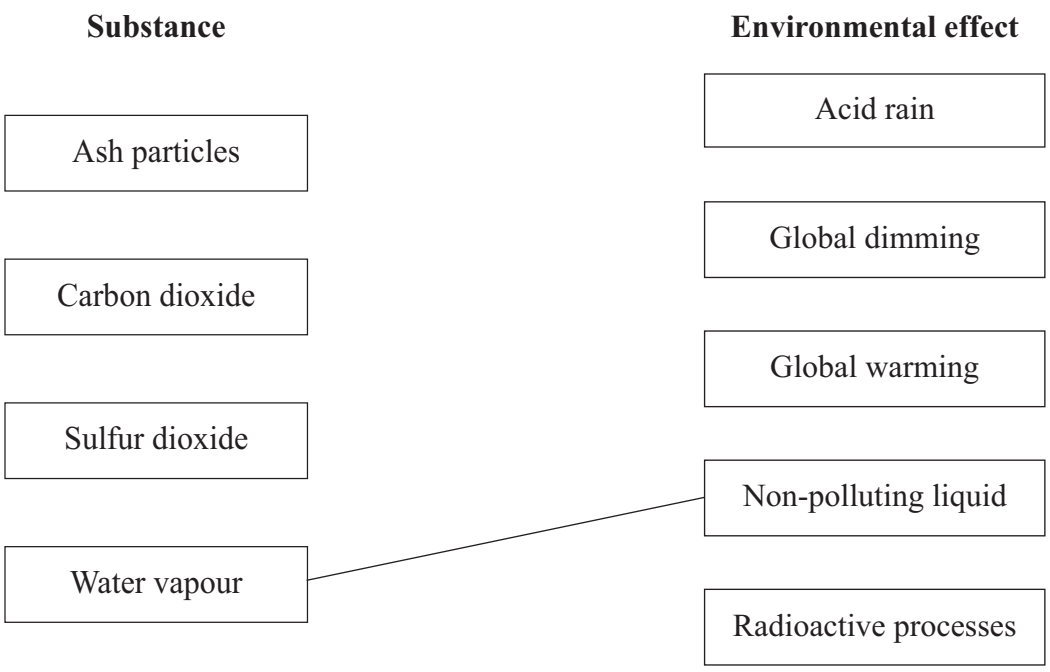
Question 14 · continued

for mark

3 (b) The volcano released large amounts of ash particles, carbon dioxide, sulfur dioxide and water vapour.

Draw **one** straight line from each substance to an environmental effect that it causes.

One has been done for you.



(3 marks)

3 (c) Why do volcanic eruptions and earthquakes happen?

.....

.....

(1 mark)

6

4.9.1.2 The Earth's early atmosphere

Question 15

March 2010 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about gases.

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

A oxygen

B nitrogen

C carbon dioxide

D helium

1	It makes up about 20% of the Earth's atmosphere today.
2	It is locked up as carbonates in sedimentary rocks.
3	It is found in Group 0 of the periodic table.
4	It makes up about 80% of the Earth's atmosphere today.

4.9.1.2 The Earth's early atmosphere

Question 16

March 2010 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

Until about 150 years ago, many scientists thought that the mountain ranges and valleys on the Earth had hardly changed since the Earth was formed.

One theory about how new mountain ranges may have formed involves the following events.
They are **not** in the correct order.

W – As the core shrinks, it makes the crust wrinkle; the tops of the wrinkles become the mountains.
X – The outer layer of molten rock cooled to form the solid Earth's crust.
Y – The Earth began as a huge ball of molten rock.
Z – The molten core continues to cool and it shrinks as it cools.

7A The best sequence for these events is . . .

1 **Y**, **Z**, **W**, **X**.

2 **Y**, **X**, **Z**, **W**.

3 **Y**, **W**, **X**, **Z**.

4 **Y**, **X**, **W**, **Z**.

7B One reason that this theory is **not** now accepted is because we know that . . .

1 the Earth's crust is divided into plates.

2 earthquakes produce mountain ranges.

3 all mountain ranges are formed by active volcanoes.

4 wrinkles in the Earth's crust can only form low hills.

7C Scientists now think that mountain ranges are formed . . .

1 by the Earth's crust expanding as it heats up.

2 by earthquakes in the mantle.

3 by large-scale movements of the Earth's crust.

4 by weathering and erosion of old mountain ranges.

4.9.1.2 The Earth's early atmosphere

Question 16 · continued March 2010 | CHY1BP | Original Q7 | Legacy

7D It is now accepted that the interior of the Earth remains hot because of . . .

1 friction between the moving tectonic plates.

2 volcanic activity at the plate boundaries.

3 friction between the core and the mantle.

4 natural radioactive processes.

Turn over for the next question

4.9.1.2 The Earth's early atmosphere

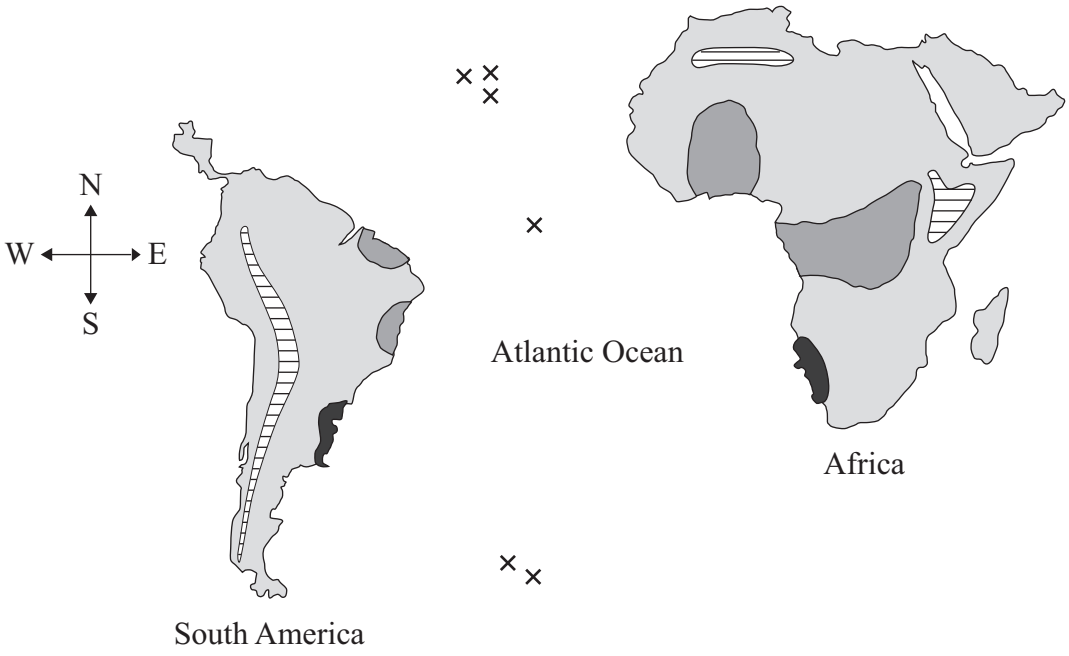
Question 17

March 2010 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

The diagram shows the positions of the continents of South America and Africa today.

Some of the rock formations are also shown.



9A The shape of the east coast of South America suggests that it would fit into the west coast of Africa.

This could indicate that . . .

1 Africa is slowly sliding past South America.

2 sea levels in the Atlantic Ocean are gradually rising.

3 the two land masses are slowly moving together.

4 Africa and South America were once joined.

4.9.1.2 The Earth's early atmosphere

Question 17 · continued March 2010 | CHY1BP | Original Q9 | Legacy

9B Early in the twentieth century, an accepted theory was that millions of years ago there had been a land bridge connecting South America and Africa.

What evidence is there on the diagram that could have given rise to this theory?

1 There are mountain ranges on both continents.

2 There are ancient rocks on both continents.

3 South America and Africa are quite close together.

4 There are similar fossils in the rocks on the two continents.

9C South America and Africa are on different tectonic plates.

From the evidence on the diagram, where is the boundary between these tectonic plates?

1 along the east coast of South America

2 from north to south through the middle of the Atlantic Ocean

3 from east to west across the Atlantic Ocean

4 along the west coast of Africa

9D The Atlantic Ocean is about 5000 km wide. It is estimated that it has been widening by about 2 cm every year since it first formed.

The time taken for the Atlantic Ocean to reach its present width is about . . .

1 1000 years.

2 25 000 years.

3 250 million years.

4 1000 million years.

END OF TEST

4.9.1.2 The Earth's early atmosphere

Question 18

June 2010 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

The table shows some information about four of the gases, **A**, **B**, **C** and **D**, in the Earth's atmosphere.

	Gas	Percentage (%) in the atmosphere	Melting point in °C	Boiling point in °C	Density in g per litre
A	Nitrogen	78	−210	−196	1.25
B	Oxygen	20	−218	−183	1.43
C	Carbon dioxide	0.04	−57	−78	1.98
D	Argon	1	−189	−186	1.78

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

The gas with the highest density is . . . **1** . . . .

The gas that makes up the largest percentage of the atmosphere is . . . **2** . . . .

The gas with the lowest melting point is . . . **3** . . . .

The gas with the smallest difference between its melting point and its boiling point is . . . **4** . . . .

4.9.1.2 The Earth's early atmosphere

Question 19

June 2010 | CHY1BP | Original Q2 | Legacy

QUESTION TWO

This question is about the Earth and its structure.

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

A mantle

B core

C atmosphere

D crust

Since the Earth was formed, the percentages of the gases in the . . . **1** . . . have changed.

At the centre of the Earth is the . . . **2** . . . .

The middle layer of the Earth where convection currents form is the . . . **3** . . . .

It was once thought that mountain ranges formed because the . . . **4** . . . was shrinking.

4.9.1.2 The Earth's early atmosphere

Question 20

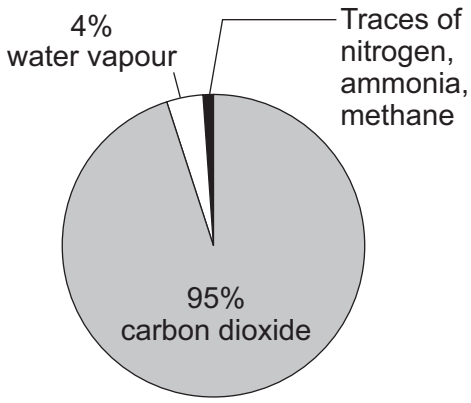
June 2010 | CHY1F | Original Q6 | Legacy

6 (a) Scientists have suggested that:

- the Earth formed as a molten ball of rock and minerals
- the rock and minerals cooled slowly
- the surface of the Earth was covered by volcanoes
- the volcanoes released gases that formed the Earth's early atmosphere.

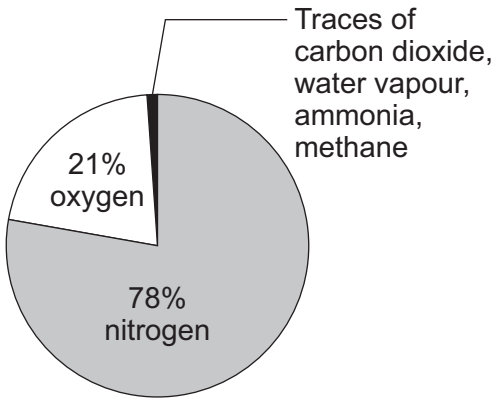
The pie charts show the approximate percentages of gases in the Earth's early atmosphere and in the Earth's atmosphere today.

Earth's early atmosphere



Average surface temperature above 400 °C

Earth's atmosphere today



Average surface temperature 20 °C

6 (a) (i) Explain what has happened to most of the water vapour in the Earth's early atmosphere.

.....

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.....

.....

(2 marks)

6 (a) (ii) Give **two** reasons why the percentage of carbon dioxide in the Earth's early atmosphere decreased.

1 .....

.....

2 .....

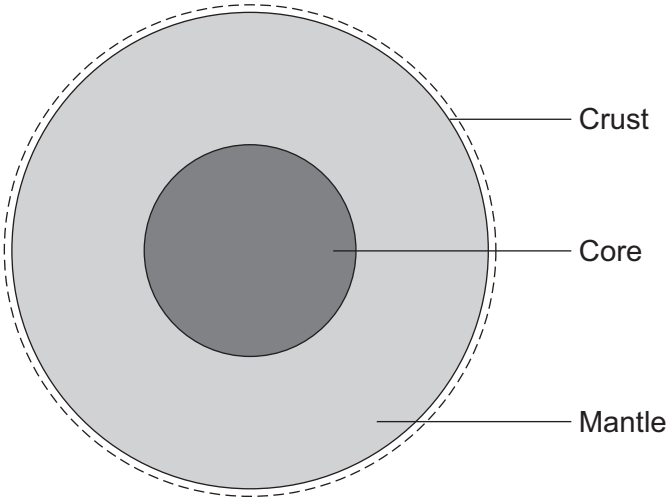
.....

(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 20 · continued

6 (b) Scientists have suggested that the Earth consists of a core, mantle and crust.



A 'traditional' theory is that the core is made of iron and nickel.

A 'controversial' theory is that the core is like a nuclear reactor made of the radioactive elements uranium and plutonium.

6 (b) (i) Why can scientists **not** prove which theory about the core is correct?

.....

.....

(1 mark)

6 (b) (ii) How can the 'controversial' theory be used to explain why the Earth's tectonic plates move?

.....

.....

.....

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.....

.....

(3 marks)

8

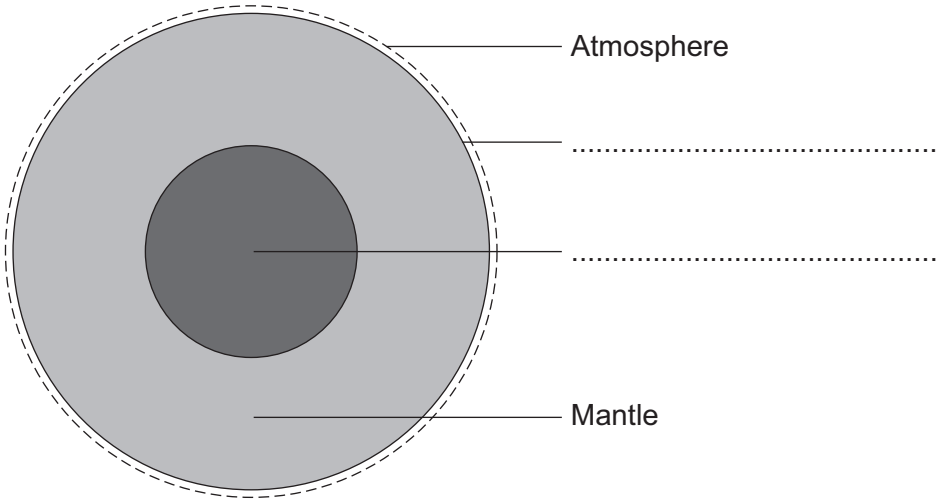
4.9.1.2 The Earth's early atmosphere

Question 21

3 The Earth has a layered structure and is surrounded by an atmosphere.

3 (a) The diagram shows the layers of the Earth.

Complete the labels on the diagram.



(2 marks)

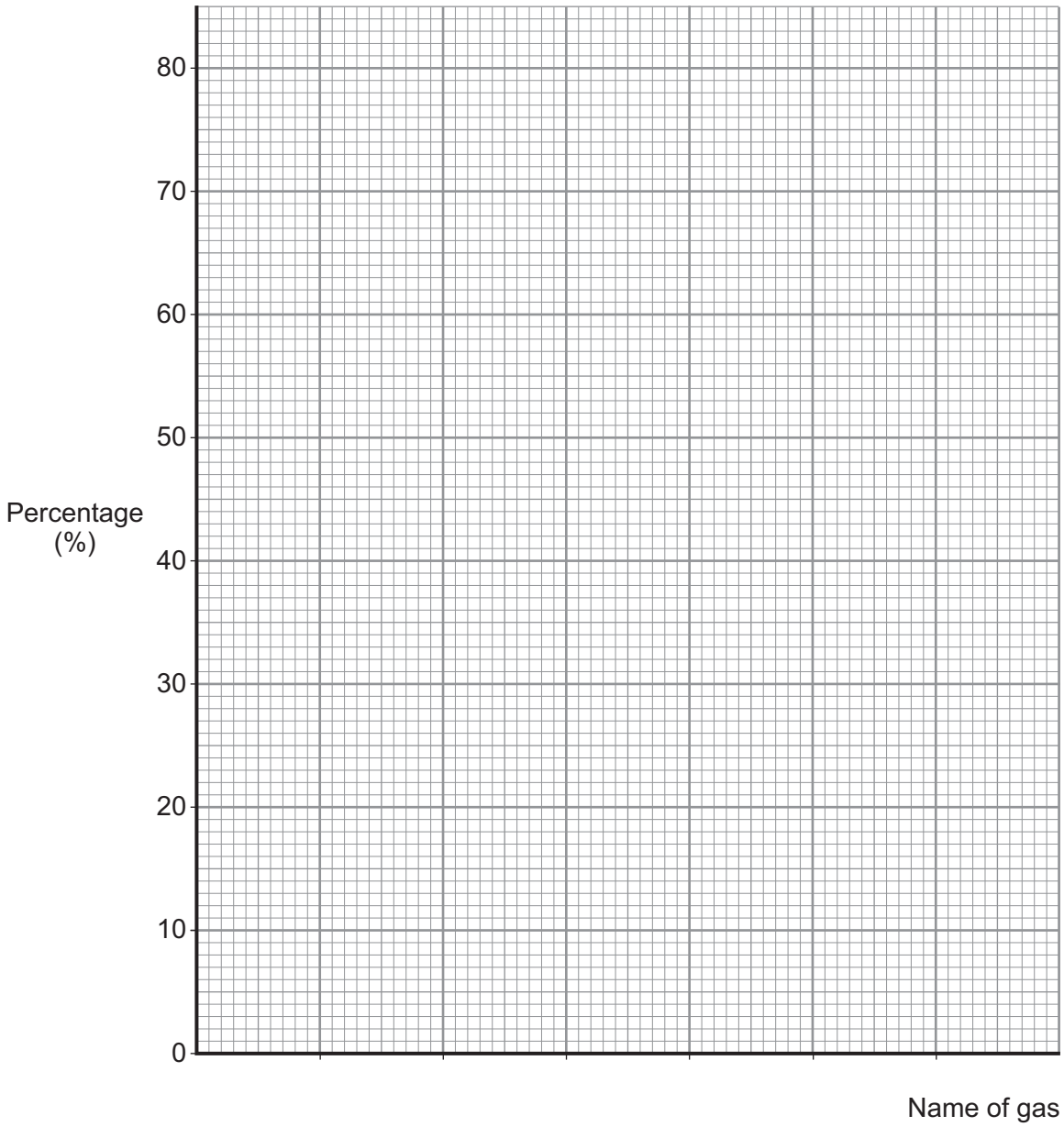
3 (b) The data in the table shows the percentages of the gases in the Earth's atmosphere.

Name of gas	Percentage (%) of gas
Nitrogen	78
Oxygen	21
Other gases	1

4.9.1.2 The Earth's early atmosphere

Question 21 · continued

Present the data in the table on the grid below.



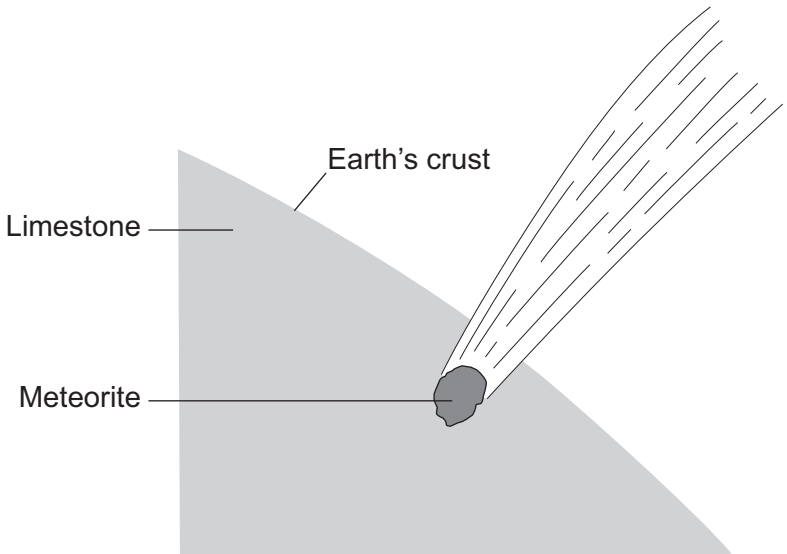
(3 marks)

Question 3 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 21 · continued

3 (c) Millions of years ago a large meteorite hit the Earth.
The meteorite heated limestone in the Earth's crust to a very high temperature.
The heat caused calcium carbonate in the limestone to release large amounts of carbon dioxide.



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

3 (c) (i) Carbon dioxide was released because the calcium carbonate was

decomposed.
evaporated.
reduced.

(1 mark)

3 (c) (ii) More carbon dioxide in the Earth's atmosphere causes

acid rain.
global dimming.
global warming.

(1 mark)

7

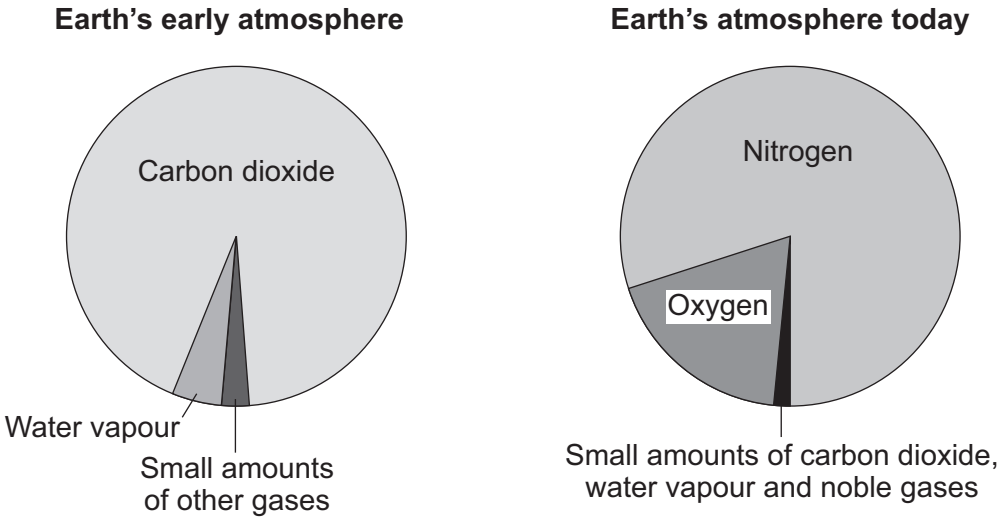
4.9.1.2 The Earth's early atmosphere

Question 22

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.

4.9.1.2 The Earth's early atmosphere

Question 22 · continued June 2011 | CHY1BP | Original Q8 | Legacy

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.

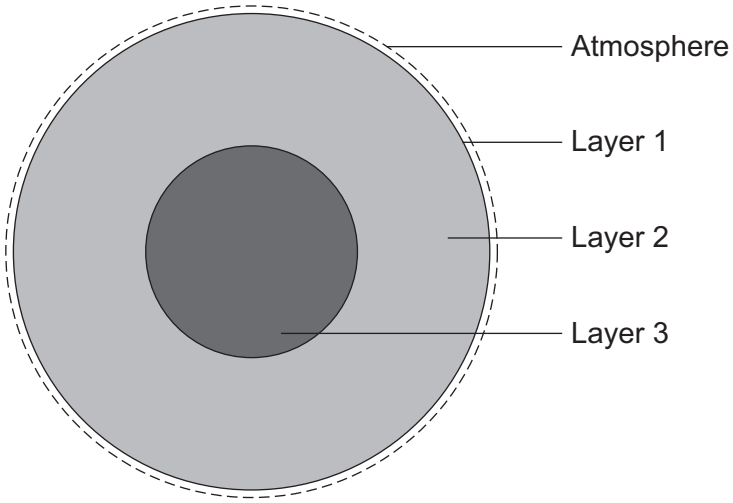
4 plants produce carbon dioxide by photosynthesis.

4.9.1.2 The Earth's early atmosphere

Question 23

June 2011 | CHY1F | Original Q1 | Legacy

1 The Earth is made up of several layers.



1 (a) Draw **one** straight line from each layer to its correct name.

Layer 1	core
Layer 2	crust
Layer 3	mantle
	nucleus

(3 marks)

4.9.1.2 The Earth's early atmosphere

Question 23 · continued

1 (b) The table shows the main gases in the Earth's atmosphere.

Gas	Percentage (%) in the atmosphere
Nitrogen	78.0
Oxygen	21.0
Argon	
Carbon dioxide	0.03

Use information in the table to help you to complete the sentences.

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

The percentage of argon in the Earth's atmosphere is [0.97 / 9.7 / 97.0] %.

(1 mark)

1 (b) (ii) Complete the sentence.

The gas in the Earth's atmosphere that

is a compound is ..... .

(1 mark)

5

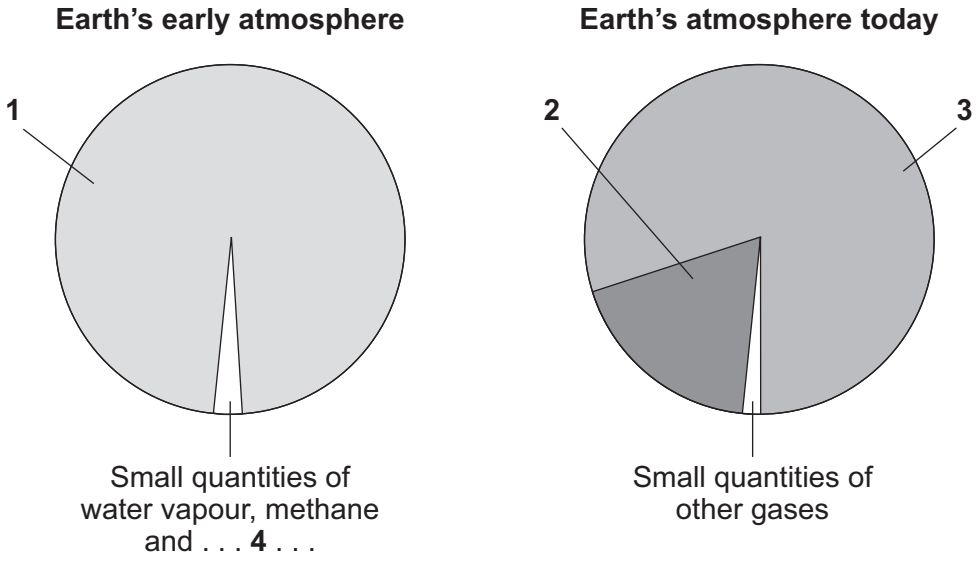
4.9.1.2 The Earth's early atmosphere

Question 24

November 2011 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

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



Match gases, **A**, **B**, **C** and **D**, with the labels **1–4** on the pie charts.

A ammonia

B carbon dioxide

C nitrogen

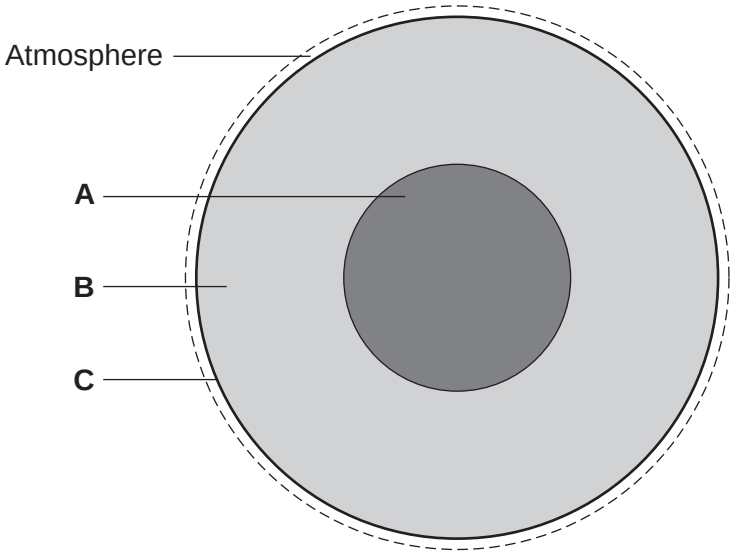
D oxygen

4.9.1.2 The Earth's early atmosphere

Question 25

June 2012 | CH1FP | Original Q2 | Legacy

2 This is a diagram of the layered structure of the Earth.



Earth

2 (a) Draw a line from each layer to the correct name of the layer.

Layer	Name
Layer **A**	core
Layer **B**	crust
Layer **C**	mantle
	nucleus

(3 marks)

4.9.1.2 The Earth's early atmosphere

Question 25 · continued

2 (b) The Earth's early atmosphere was 96% carbon dioxide.
The atmosphere of the Earth today is 0.04% carbon dioxide.

The percentage of carbon dioxide in the Earth's atmosphere has changed.

Give **two** reasons why.

You should consider:

- the formation of surface water (oceans)
- the formation of sedimentary rocks (limestone).

.....

.....

.....

.....

(2 marks)

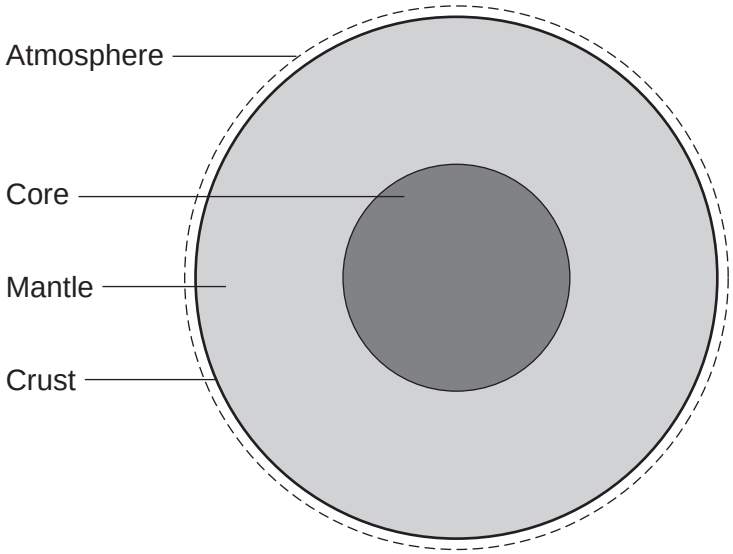
5

4.9.1.2 The Earth's early atmosphere

Question 26

January 2013 | CH1FP | Original Q2 | Legacy

2 The diagram shows the layers in and around the Earth.



2 (a) Use the diagram above to help you to answer this question.

Draw **one** line from each statement to its correct layer.

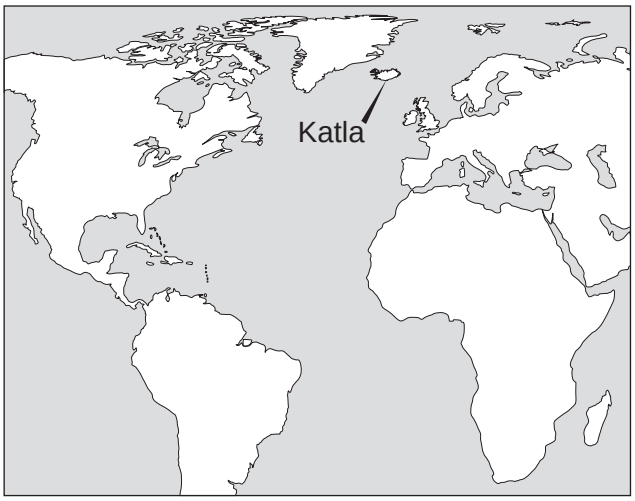
Statement	Layer
There are mountain ranges.	atmosphere
There are convection currents that cause earthquakes.	core
There is a mixture of gases.	crust
	mantle

(3 marks)

4.9.1.2 The Earth's early atmosphere

Question 26 · continued

2 (b) Iceland has many volcanoes.
Scientists are monitoring a volcano in Iceland, called Katla.



There has been an increase in the number of small earthquakes (tremors) around Katla.

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

Iceland has volcanoes because it

- has low temperatures.
- is an island.
- is on a tectonic plate boundary.

(1 mark)

2 (b) (ii) People do not know when Katla will next erupt.

Tick (✓) the correct reason why.

Reason	Tick (✓)
Small earthquakes (tremors) near the volcano are happening more often.	
The last two eruptions happened a long time ago in October 1918 and in May 1860.	
Scientists cannot accurately predict when volcanic eruptions will occur.	

(1 mark)

Question 2 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 26 · continued

2 (c) Previous eruptions of Katla produced large amounts of solid ash particles and sulfur dioxide.

Use the correct answer to complete each sentence.

acid rain	**earthquakes**	**global dimming**	**global warming**

An environmental impact caused by solid ash particles is ..... .

An environmental impact caused by sulfur dioxide is ..... .

(2 marks)

7

4.9.1.2 The Earth's early atmosphere

Question 27

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

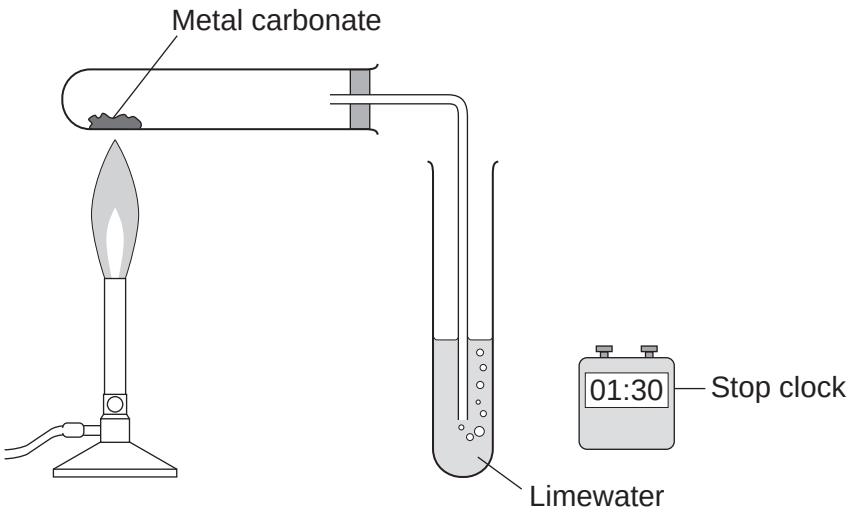
(1 mark)

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.

4.9.1.2 The Earth's early atmosphere

Question 27 · 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)

6

4.9.1.2 The Earth's early atmosphere

Question 28

June 2014 | CH1FP | Original Q2 | Legacy

2 Some theories suggest that the Earth's early atmosphere was the same as Mars' atmosphere today.

Table 1 shows the percentage of four gases in the atmosphere of Mars today and the atmosphere of Earth today.

Table 1

Gases	The atmosphere of	
	Mars today	**Earth today**
Carbon dioxide	95.00%	0.04%
Nitrogen	3.50%	78.00%
Argon	1.00%	0.96%
Oxygen	0.50%	21.00%

2 (a) Which **one** of the gases in **Table 1** is a noble gas?

[1 mark]

.....

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

2 (b) (i) Noble gases are in Group

0

1

7

[1 mark]

2 (b) (ii) Noble gases are

slightly reactive.

unreactive.

very reactive.

[1 mark]

4.9.1.2 The Earth's early atmosphere

Question 28 · continued

2 (c) The percentage of carbon dioxide in the Earth's early atmosphere was 95.00%.
It is 0.04% in the Earth's atmosphere today.

2 (c) (i) Calculate the decrease in the percentage of carbon dioxide in the Earth's atmosphere.
[1 mark]

.....

.....

Decrease in percentage = ...%

2 (c) (ii) Give **two** reasons for this decrease.
[2 marks]

.....

.....

.....

.....

6

4.9.1.2 The Earth's early atmosphere

Question 29

June 2015 | CH1FP | Original Q6 | Legacy

6 This question is about life, the Earth and its atmosphere.

6 (a) There are many theories about how life was formed on Earth.

Suggest **one** reason why there are many theories.

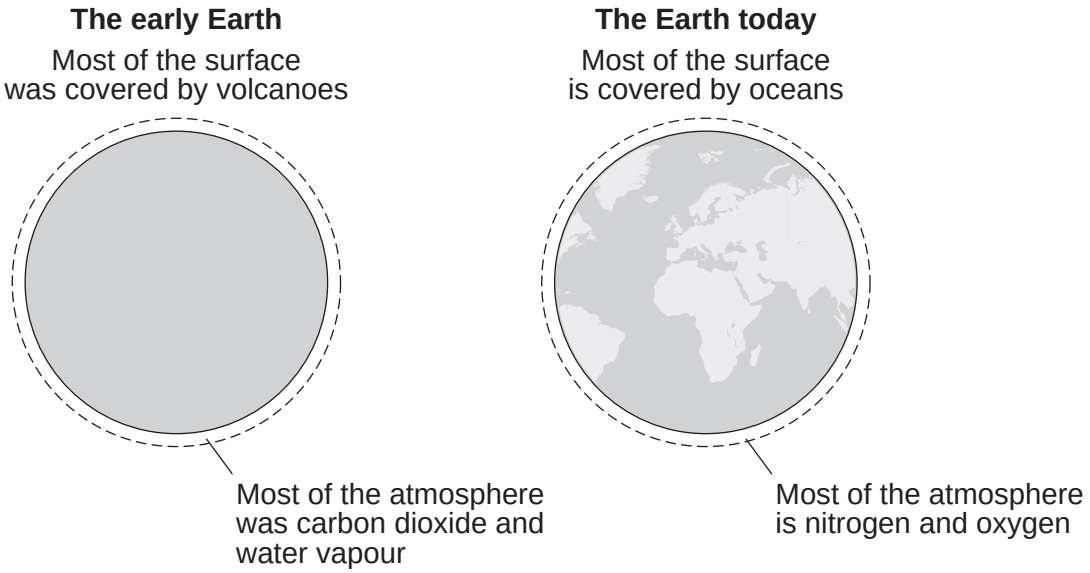
[1 mark]

.....

.....

6 (b) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

This Earth and its atmosphere today are not like the early Earth and its atmosphere.



Describe and explain how the surface of the early Earth and its atmosphere have changed to form the surface of the Earth and its atmosphere today.

[6 marks]

.....

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.....

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.....

.....

4.9.1.2 The Earth's early atmosphere

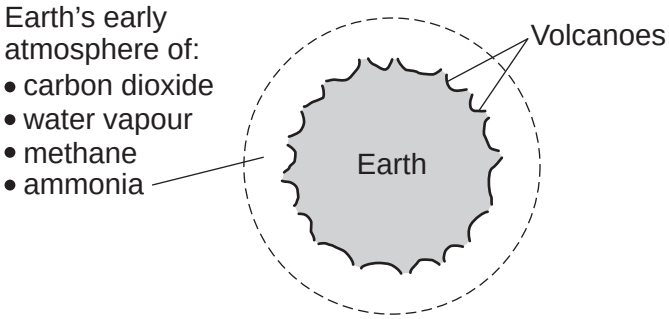
Question 30

June 2016 | CH1FP | Original Q2 | Legacy

2 This question is about the Earth and its atmosphere.

2 (a) **Figure 4** shows the Earth and its atmosphere billions of years ago.

Figure 4



2 (a) (i) The boiling point of water is 100 °C.

Suggest **one** reason why there was no liquid water on the Earth's surface billions of years ago.

[1 mark]

_____

_____

2 (a) (ii) Complete the sentence.

[1 mark]

On the Earth today, volcanic eruptions happen at the boundaries between

tectonic _____ .

Question 2 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 30 · continued

2 (b) The Earth's atmosphere today contains nitrogen, oxygen, argon, carbon dioxide and other gases.

2 (b) (i) Draw **one** line from each substance to a description of the substance.

[3 marks]

Substance	Description of the substance
air	compound
carbon dioxide	element
argon	hydrocarbon
	metal
	mixture

2 (b) (ii) Which gas in the Earth's atmosphere is used when hydrocarbons burn?

[1 mark]

Tick (✓) **one** box.

- carbon dioxide ☐
- nitrogen ☐
- oxygen ☐

2 (b) (iii) What percentage of the Earth's atmosphere is nitrogen?

[1 mark]

Tick (✓) **one** box.

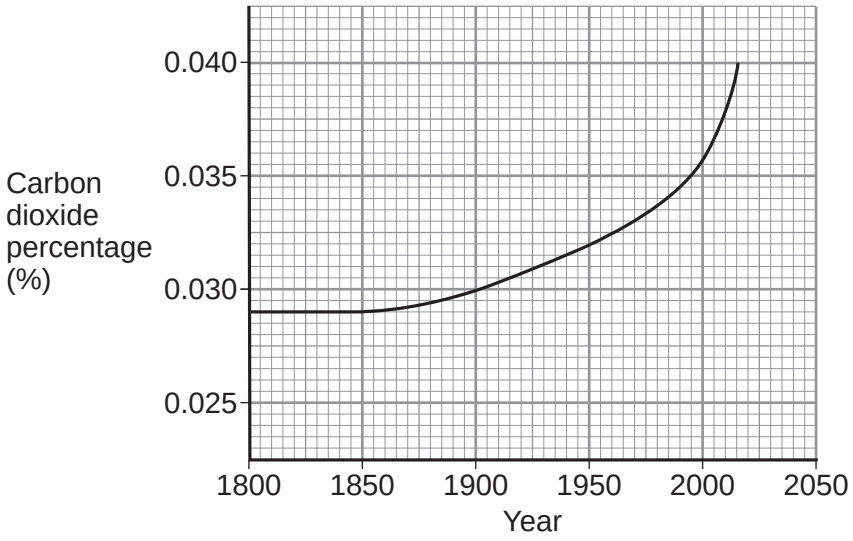
- about 40% ☐
- about 60% ☐
- about 80% ☐

4.9.1.2 The Earth's early atmosphere

Question 30 · continued

2 (c) **Figure 5** shows the carbon dioxide percentage (%) in the Earth's atmosphere since the year 1800.

Figure 5



2 (c) (i) What was the carbon dioxide percentage in 1900?

[1 mark]

_____ %

2 (c) (ii) Describe, in detail, how the carbon dioxide percentage changed from 1900 to 2015.

[2 marks]

_____

_____

_____

_____

2 (c) (iii) Suggest **two** reasons for the change in the carbon dioxide percentage from 1900 to 2015.

[2 marks]

1 _____

_____

2 _____

_____

12

4.9.1.2 The Earth's early atmosphere

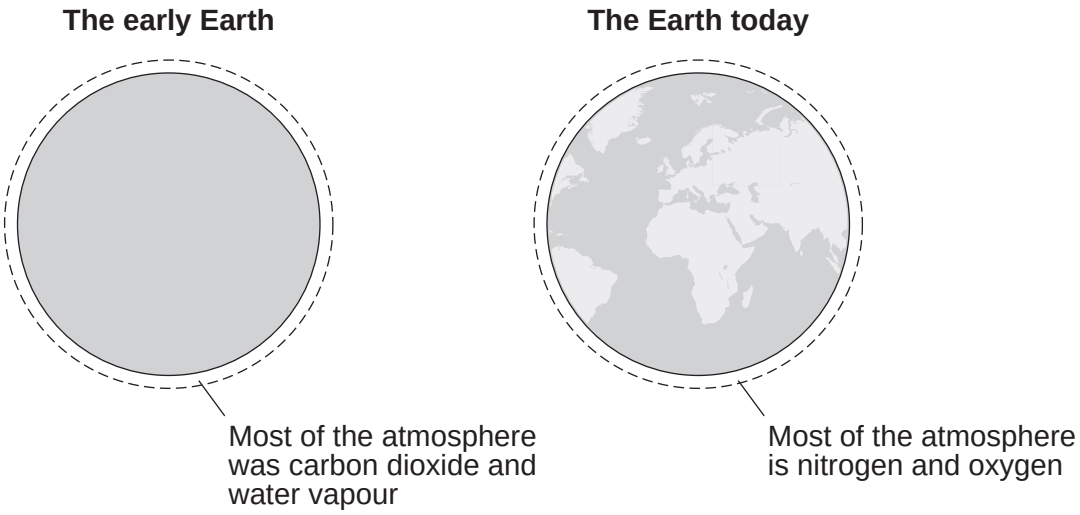
Question 31

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]

_____

4.9.1.2 The Earth's early atmosphere

Question 31 · 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

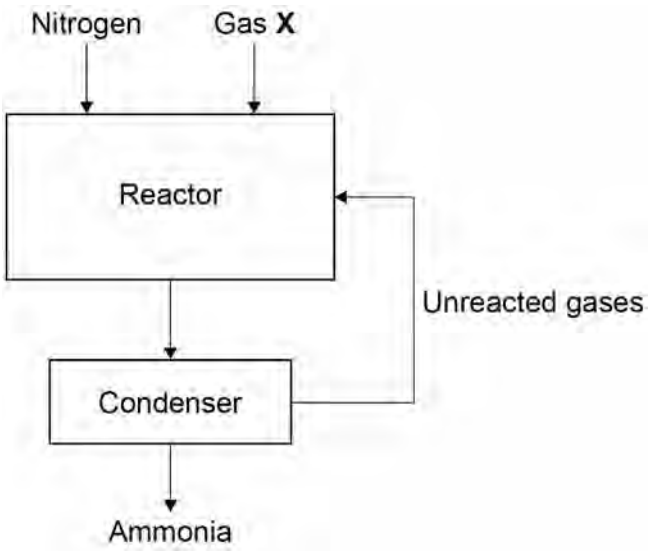
4.9.1.2 The Earth's early atmosphere

Question 32 June 2018 | 8462/2F | Original Q10

1 0 This question is about gases.

Figure 10 shows how nitrogen is used in the Haber Process to produce ammonia.

Figure 10



1 0 . 1 Gas **X** in **Figure 10** is obtained from methane.

Name gas **X**.

[1 mark]

_____

1 0 . 2 Give the approximate temperature and pressure used in the reactor.

[2 marks]

Temperature _____

Pressure _____

1 0 . 3 The mixture of gases from the reactor cools in the condenser.

Suggest why ammonia condenses but the other gases do not.

[1 mark]

_____

_____

4.9.1.2 The Earth's early atmosphere

Question 32 · continued

The Earth's early atmosphere was different to Earth's atmosphere today.

Scientists think that the Earth's early atmosphere was like the atmosphere found on Venus today.

Table 7 shows the amounts of carbon dioxide and oxygen in the atmospheres of Venus and Earth today.

Table 7

Gas	Percentage (%) in Venus' atmosphere today	Percentage (%) in Earth's atmosphere today
Carbon dioxide	96.50	0.04
Oxygen	0.00	20.95

1 0 . 4 The percentages of carbon dioxide and oxygen have changed from Earth's early atmosphere to Earth's atmosphere today.

Explain the processes that led to these changes.

[6 marks]

4.9.1.2 The Earth's early atmosphere

Question 32 · continued

June 2018 | 8462/2F | Original Q10

1 0 . 5 Why are scientists **not** certain about the percentage of each gas in the Earth's early atmosphere?

[1 mark]

4.9.1.2 The Earth's early atmosphere

Question 33

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 = _____ %

4.9.1.2 The Earth's early atmosphere

Question 33 · 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 ☐

4.9.1.2 The Earth's early atmosphere

Question 33 · 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

4.9.1.2 The Earth's early atmosphere

Question 34

0 3 This question is about the Earth's atmosphere.

Table 5 shows:

- the estimated percentages of gases in the Earth's early atmosphere
- the percentages of gases in the Earth's atmosphere today.

Table 5

Gas	Estimated percentage (%) in the Earth's early atmosphere	Percentage (%) in the Earth's atmosphere today
Nitrogen	1.8	**X**
Oxygen	0.2	20.95
Carbon dioxide	96.0	0.04
Other gases	2.0	0.92

0 3 . 1 Calculate value **X** in **Table 5**.

[1 mark]

X = _____ %

0 3 . 2 Which **two** other gases may have been in the Earth's early atmosphere?

[2 marks]

Tick (✓) **two** boxes.

- Ammonia ☐
- Coal ☐
- Limestone ☐
- Methane ☐
- Poly(ethene) ☐

4.9.1.2 The Earth's early atmosphere

Question 34 · continued

Algae and plants increased the percentage of oxygen in the Earth's atmosphere.

The same process in algae and plants decreased the percentage of carbon dioxide in the Earth's atmosphere.

0 3 . 3 Which process in algae and plants increased the percentage of oxygen in the Earth's atmosphere?

[1 mark]

Tick (✓) **one** box.

- Fermentation ☐
- Photosynthesis ☐
- Rusting ☐
- Sedimentation ☐

0 3 . 4 Which **two** other processes decreased the percentage of carbon dioxide in the Earth's atmosphere?

[2 marks]

Tick (✓) **two** boxes.

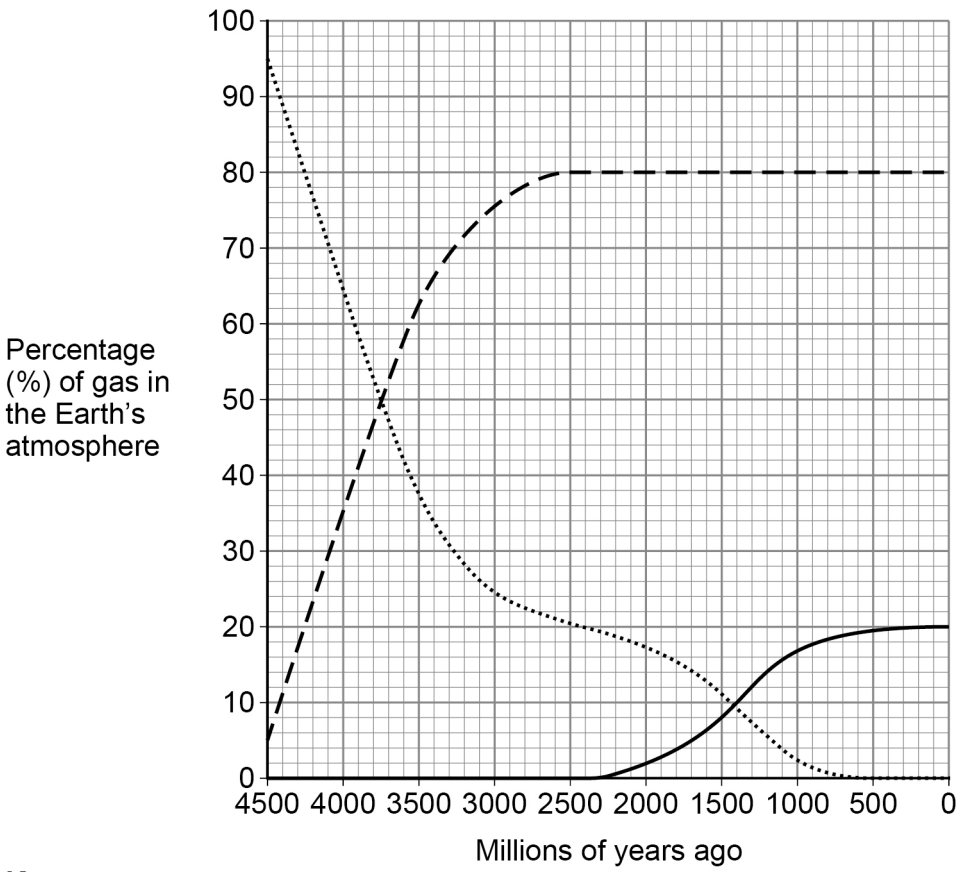
- Burning fossil fuels ☐
- Dissolving carbon dioxide in oceans ☐
- Eruption of volcanoes ☐
- Evolution of animals ☐
- Formation of sedimentary rocks ☐

4.9.1.2 The Earth's early atmosphere

Question 34 · continued

Figure 3 shows how the percentages of gases in the Earth's atmosphere may have changed since the atmosphere was formed.

Figure 3



0 3 . 5 When was the percentage of oxygen in the Earth's atmosphere 8%?

Use **Figure 3**.

[1 mark]

_____ millions of years ago

0 3 . 6 When did the percentage of nitrogen in the Earth's atmosphere become constant?

Use **Figure 3**.

[1 mark]

_____ millions of years ago

4.9.1.2 The Earth's early atmosphere

Question 34 · continued

June 2022 | 8462/2F | Original Q3

0 3 . 7 Crude oil was formed from an ancient biomass as the Earth's atmosphere evolved.

What did this ancient biomass mainly consist of?

[1 mark]

Tick (✓) **one** box.

- Limestone ☐
- Plankton ☐
- Sand ☐

0 3 . 8 Most of the percentages of the gases in **Figure 3** are estimated values.

Why have scientists used estimated values for the percentages of the gases in **Figure 3**?

[1 mark]

_____

_____

10

4.9.1.2 The Earth's early atmosphere

Question 35

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

4.9.1.2 The Earth's early atmosphere

Question 35 · 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 ☐

4.9.1.2 The Earth's early atmosphere

Question 35 · continued

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

- 16% oxygen
- 4% carbon dioxide.

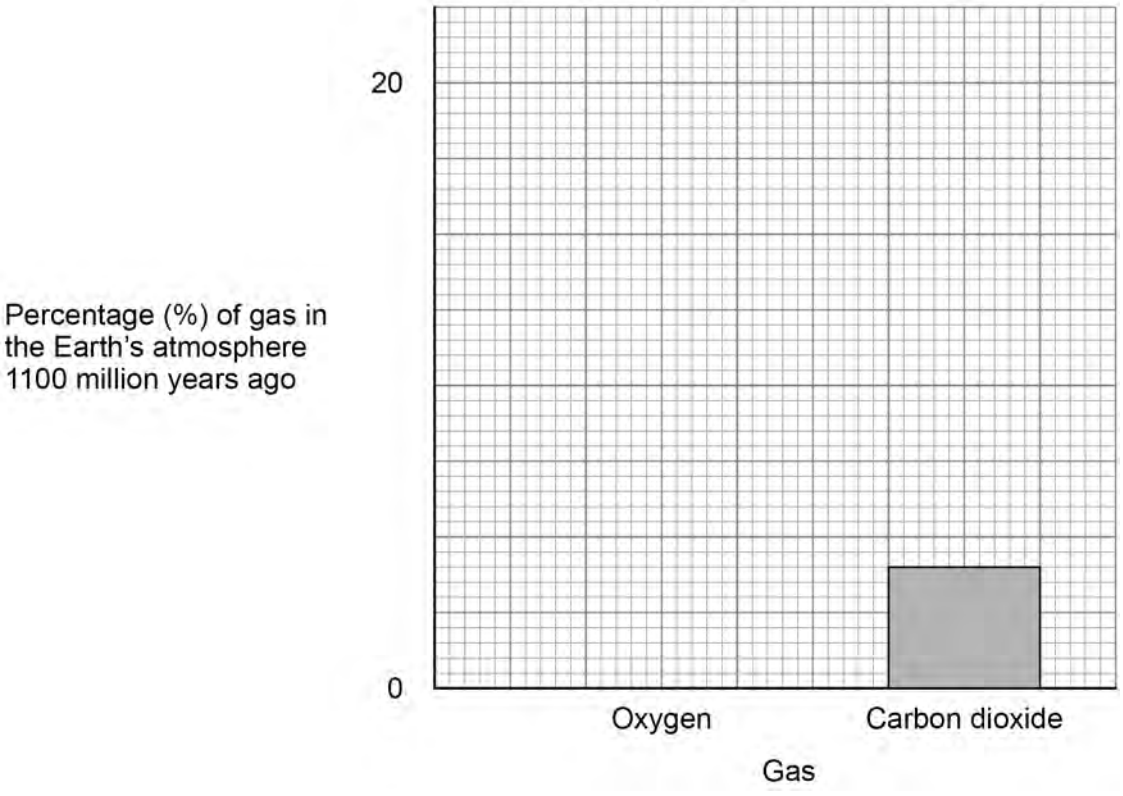
Complete **Figure 1**.

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

Question 35 · 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.

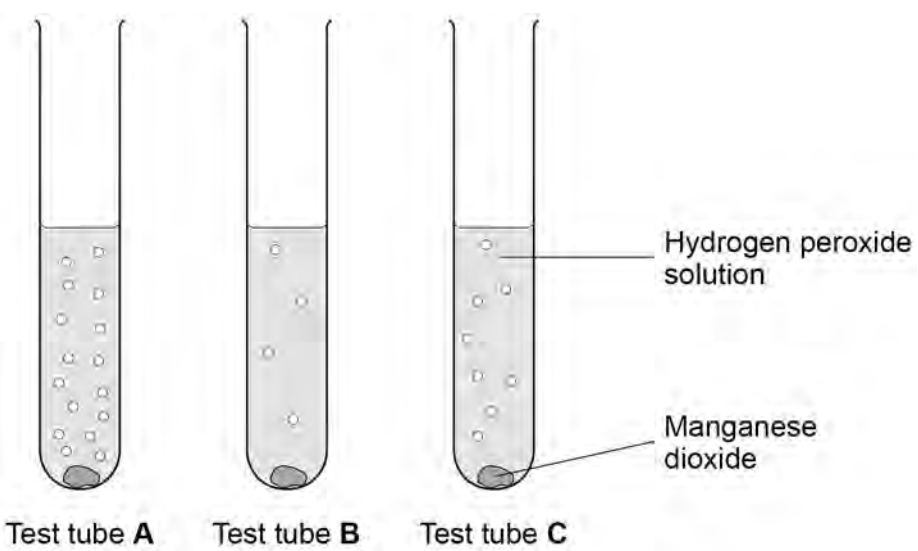
1. Add 5 cm^3 of hydrogen peroxide solution to three test tubes labelled **A**, **B** and **C**.

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



4.9.1.2 The Earth's early atmosphere

Question 35 · 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. ☐

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4.9.1.2 The Earth's early atmosphere

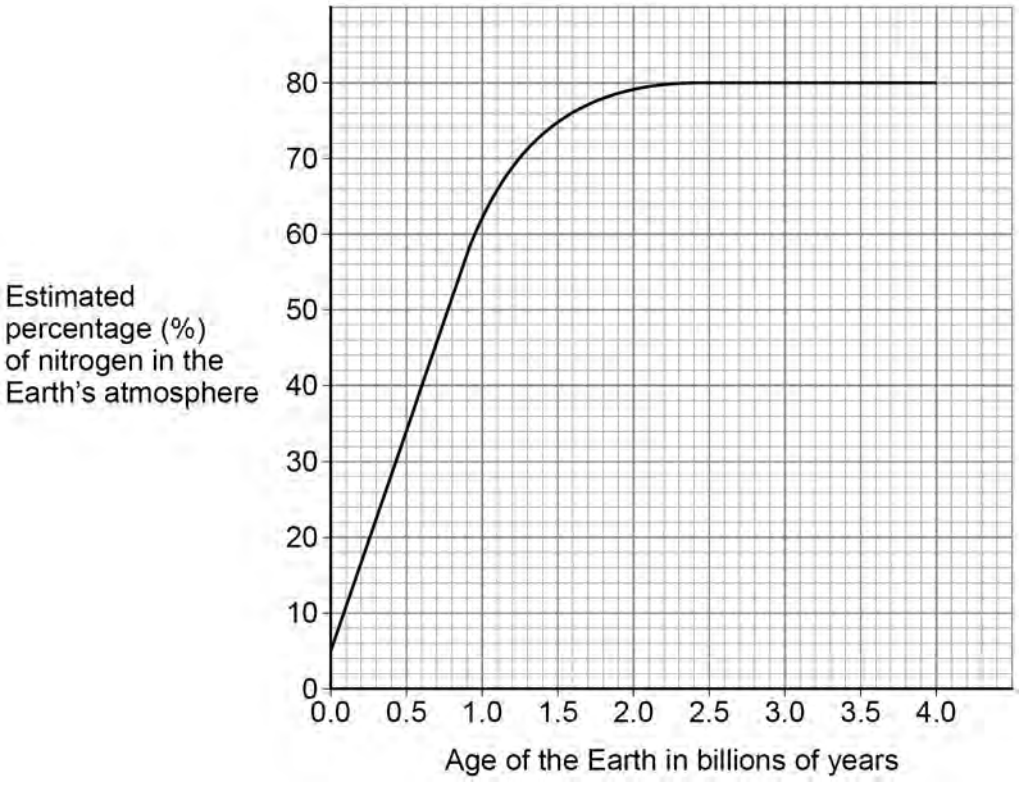
Question 36

June 2024 | 8462/2F | Original Q4

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

4.9.1.2 The Earth's early atmosphere

Question 36 · 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 _____.

4.9.1.2 The Earth's early atmosphere

Question 36 · 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 36 · 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 _____ .

4.9.1.2 The Earth's early atmosphere

Question 36 · continued

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

[1 mark]

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

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Turn over for the next question

4.9.1.2 The Earth's early atmosphere

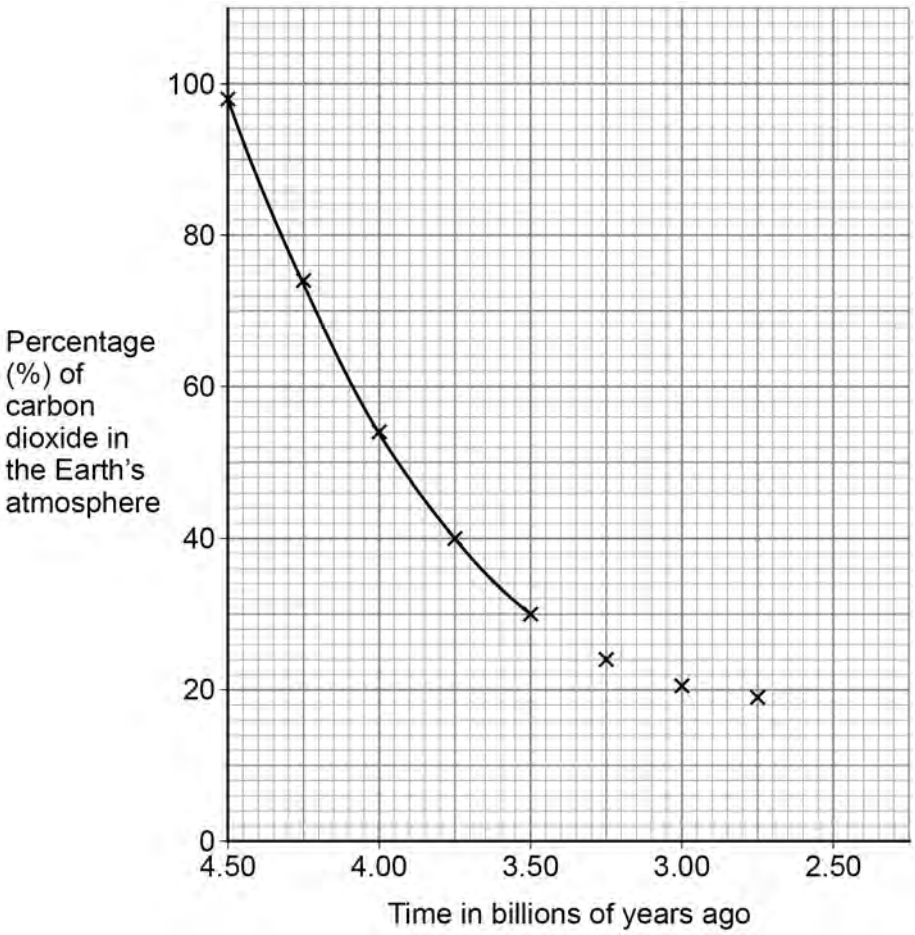
Question 37

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]

4.9.1.2 The Earth's early atmosphere

Question 37 · 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

4.9.1.2 The Earth's early atmosphere

Question 37 · 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. ☐

4.9.1.2 The Earth's early atmosphere

Question 37 · 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]

_____

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