AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.1.2

The Earth's early atmosphere

Past-paper questions

Tier	**Higher**
Question groups	**39**
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:** _____

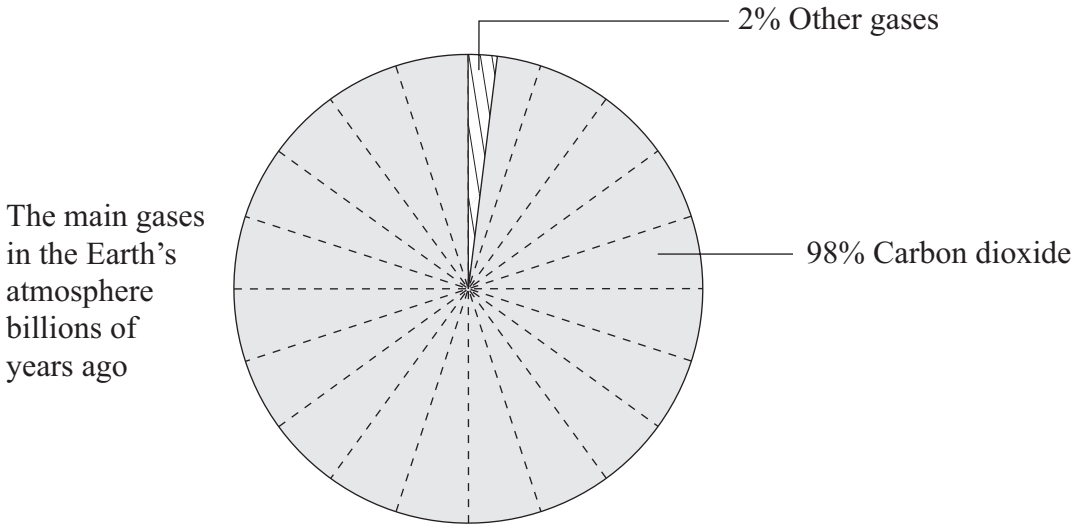
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.9.1.2 The Earth's early atmosphere

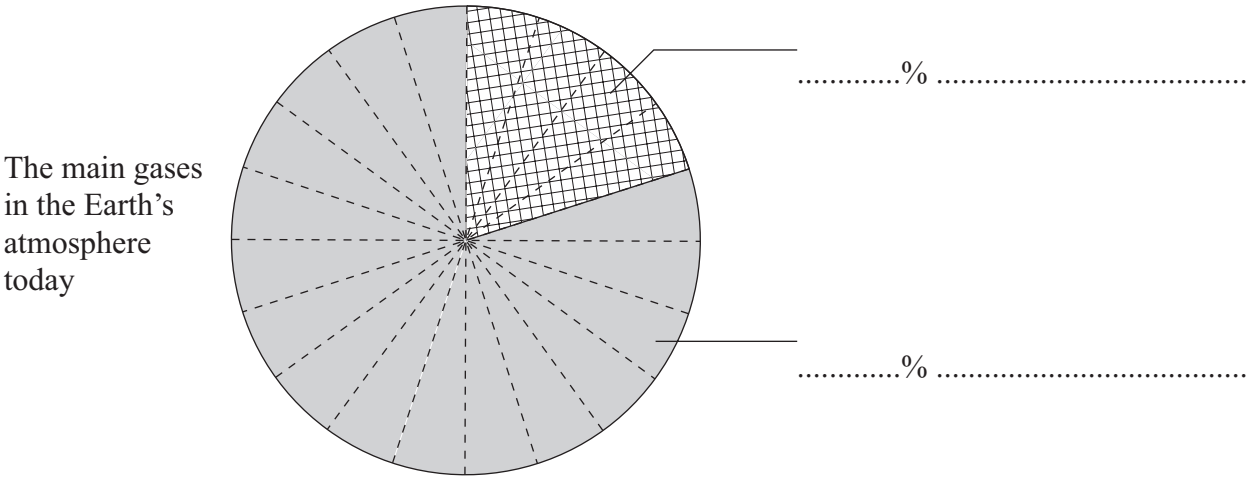
Question 01

January 2007 | CHY1H | Original Q2 | Legacy

2 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?

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(1 mark)

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

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(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)

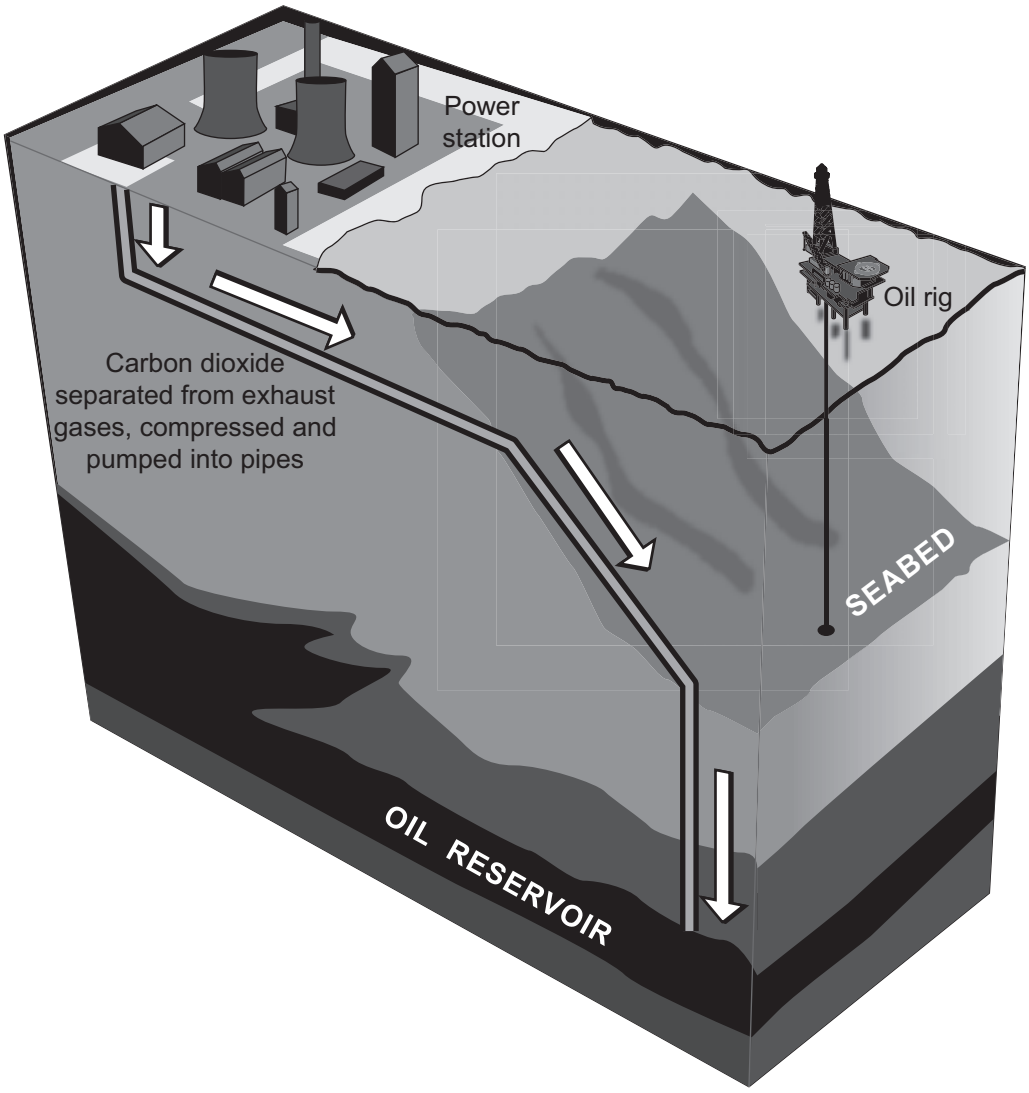
Question 2 continues on the next page

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

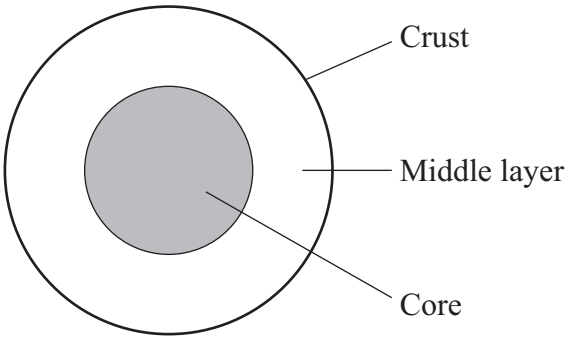
4.9.1.2 The Earth's early atmosphere

Question 02

March 2007 | CHY1B | Original Q5 | Legacy

QUESTION FIVE

The diagram shows the layered structure of the Earth.



5A The middle layer is called the . . .

1 atmosphere.

2 lava.

3 magma.

4 mantle.

5B The material in the middle layer is moving slowly.

The movement is caused by . . .

1 the rotation of the Earth.

2 the drifting tectonic plates.

3 the cooling of the Earth.

4 heat from natural radioactive processes.

5C Mountains on the Earth's surface are caused by large-scale movements of the Earth's crust but scientists used to believe that they were caused by . . .

1 the movement of low density rocks above those that were more dense.

2 the activity of volcanoes.

3 shrinking of the crust after it was formed.

4 weathering and erosion.

4.9.1.2 The Earth's early atmosphere

Question 02 · continued

5D Much of the carbon dioxide that was present in Earth's early atmosphere is now locked up in . . .

1 fossil fuels and sedimentary carbonate rocks.

2 volcanic rocks and fossil fuels.

3 metal ores and sedimentary carbonate rocks.

4 landfill sites and volcanic rocks.

Turn over for the next question

4.9.1.2 The Earth's early atmosphere

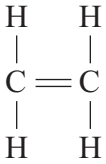
Question 03

June 2007 | CHY1B | Original Q2 | Legacy

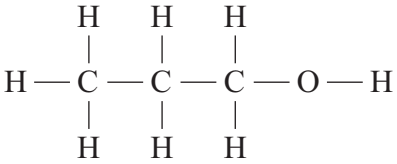
QUESTION TWO

This question is about the formulae for four compounds.

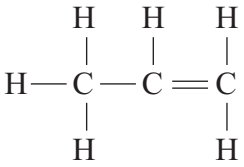
Match formulae, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.



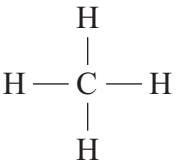
A



B



C



D

	Description
1	It is an unsaturated hydrocarbon with three carbon atoms in each molecule.
2	It is the monomer from which poly(ethene) is made.
3	It is the alkane that was present in Earth's early atmosphere.
4	It is not a hydrocarbon.

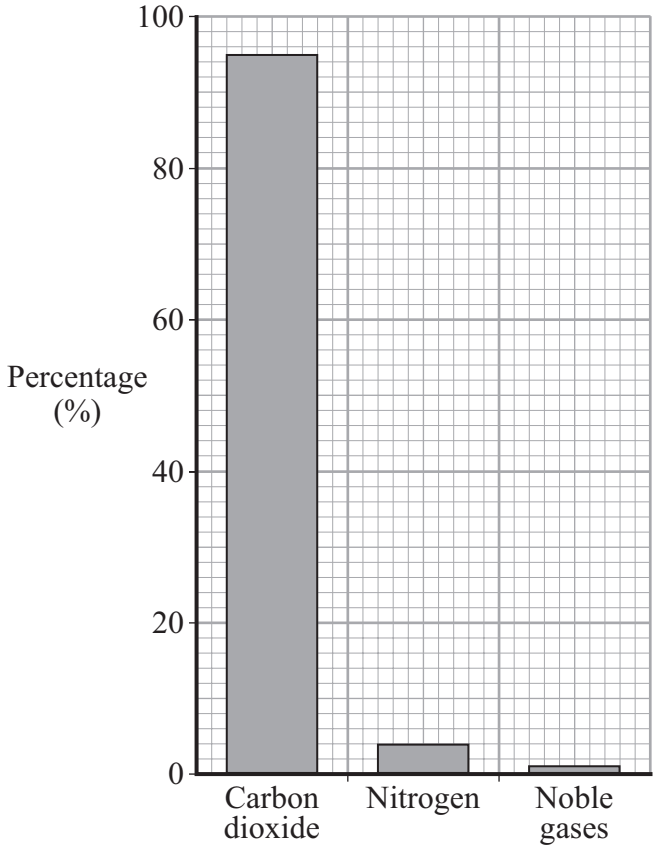
4.9.1.2 The Earth's early atmosphere

Question 04

June 2007 | CHY1B | Original Q5 | Legacy

QUESTION FIVE

The bar chart shows the composition of a sample of the atmosphere on Mars.



5A Earth's early atmosphere also contained a high percentage of carbon dioxide.

Scientists think that most of the carbon dioxide . . .

1 came out of solution from the oceans.

2 was released from volcanoes.

3 was given off as carbonate rocks decomposed.

4 was released as fossil fuels formed.

5B One way in which Earth's atmosphere today is different from that on Mars is that the Earth's atmosphere.. . .

1 contains less nitrogen.

2 contains more carbon dioxide.

3 does not contain noble gases.

4 contains more water vapour.

4.9.1.2 The Earth's early atmosphere

Question 04 · continued

5C The first plants are thought to have appeared on Earth about 2 billion years ago.

What effect did the plants have on the Earth's atmosphere?

1 They increased the percentage of carbon dioxide.

2 They decreased the percentage of nitrogen.

3 They increased the percentage of oxygen.

4 They increased the percentage of ammonia.

5D Filament lamps are normally filled with a noble gas.

The metal filament in a lamp would quickly burn away if the bulb was filled with air because air contains . . .

1 carbon dioxide.

2 nitrogen.

3 oxygen.

4 ammonia.

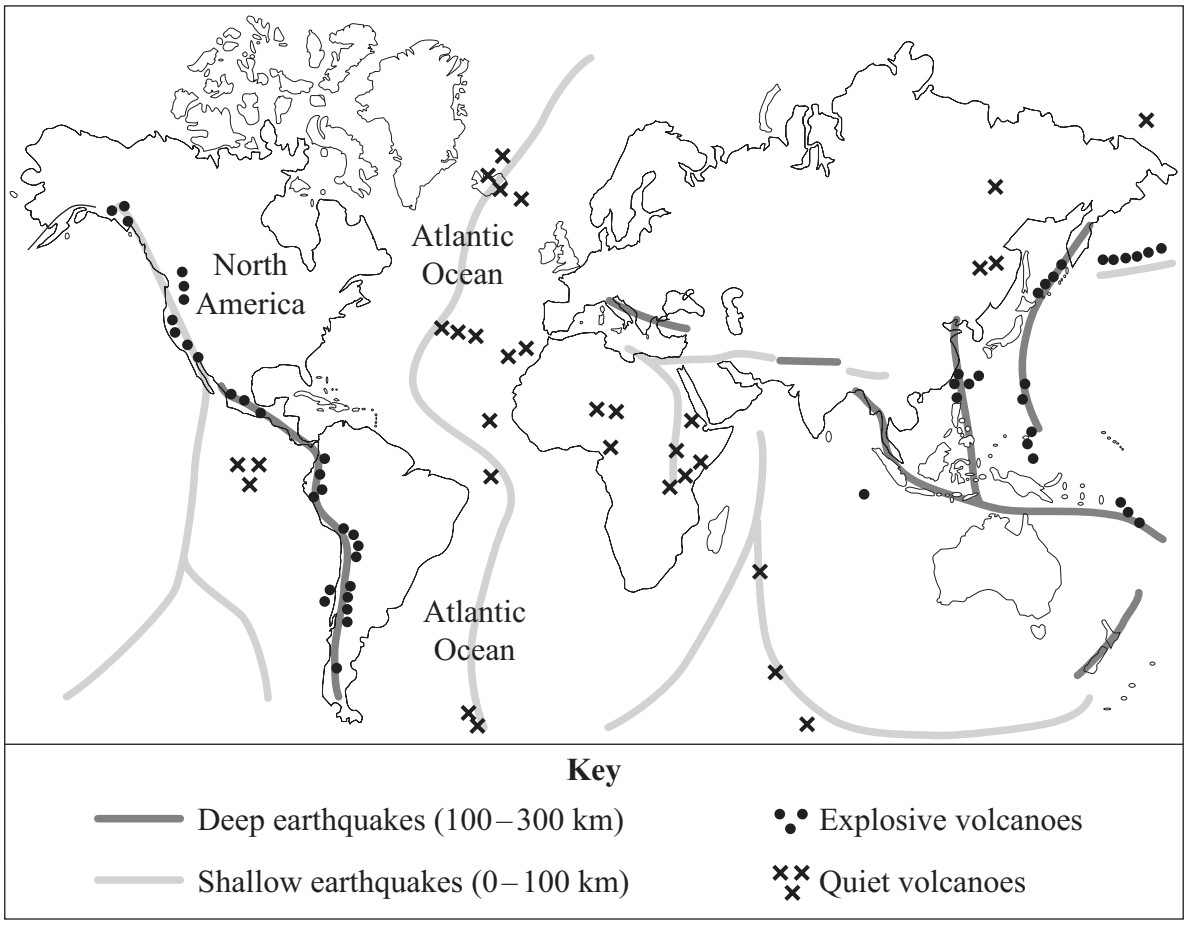
4.9.1.2 The Earth's early atmosphere

Question 05

June 2007 | CHY1B | Original Q8 | Legacy

QUESTION EIGHT

The map shows the main areas on Earth where earthquakes and volcanoes occur.



8A What pattern is most clear?

1 Earthquakes and volcanoes always occur in the same areas.

2 Earthquakes and volcanoes always occur at the same time.

3 Explosive volcanoes often occur in the same areas as deep earthquakes.

4 Quiet volcanoes occur only on land masses.

8B There is considerable earthquake activity in the middle of the Atlantic Ocean because . . .

1 there are very deep ocean trenches in this area.

2 it is the boundary between two tectonic plates.

3 it is a zone of explosive volcanic activity.

4 the Earth's crust is very thick under the oceans.

4.9.1.2 The Earth's early atmosphere

Question 05 · continued

8C In the past, there have been earthquakes associated with the San Andreas fault in North America. Scientists would like to be able to predict when another earthquake will affect this heavily populated area.

They cannot do this accurately because . . .

1 all the evidence has been destroyed.

2 it is too dangerous to work in the earthquake zone.

3 there are too few scientists to cover the length of the fault.

4 movements along the fault occur at random intervals.

8D Explosive volcanoes can be more dangerous than quiet ones. Recent research has shown that magma underneath these volcanoes contains droplets of water waiting to be released as vapour. Water escapes as the magma escapes from the Earth and the pressure on it decreases. Scientists believe that they can test lumps of ejected lava to calculate how much water the magma contains.

A high water content indicates a potential explosion because . . .

1 the magma is at a high temperature.

2 the magma is under high pressure.

3 the magma is very fluid.

4 the magma is cooling very quickly.

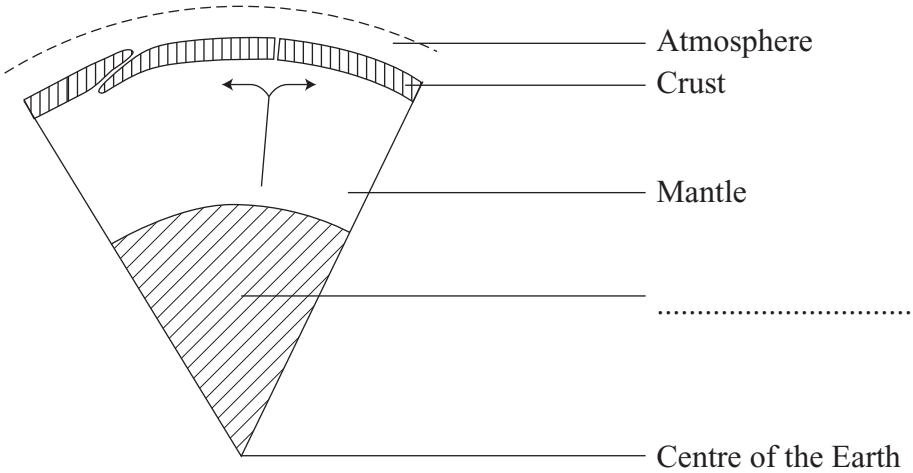
4.9.1.2 The Earth's early atmosphere

Question 06

June 2007 | CHY1H | Original Q3 | Legacy

3 The Earth is shaped like a sphere and is surrounded by an atmosphere.

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



Not to scale

(i) Complete the diagram by writing in the missing label. *(1 mark)*

(ii) Earthquakes within the Earth's crust can be sudden and disastrous. Scientists cannot accurately predict when earthquakes will occur.

Explain why.

To obtain full marks you must support your answer with a description of what causes earthquakes.

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(4 marks)

4.9.1.2 The Earth's early atmosphere

Question 06 · continued

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

Gases	The atmosphere of Mars today	The atmosphere of Earth today
Carbon dioxide %	95	0.03
Nitrogen %	3	
Argon %	1.5	0.97
Oxygen %	0.5	21

(i) Complete the table by writing in the percentage of nitrogen in the atmosphere of Earth today. *(1 mark)*

(ii) Use the information in the table to describe the changes that have happened to **two** of the gases in the Earth's atmosphere.

Explain what has caused these changes.

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(4 marks)

10

4.9.1.2 The Earth's early atmosphere

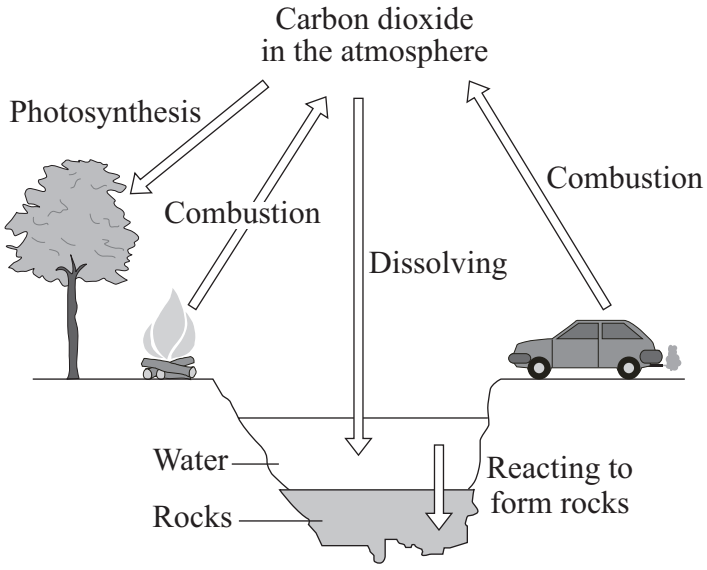
Question 07

March 2008 | CHY1BP | Original Q4 | Legacy

QUESTION FOUR

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 transport between 1990 and 2002 are listed in the table below.

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.

4A 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.

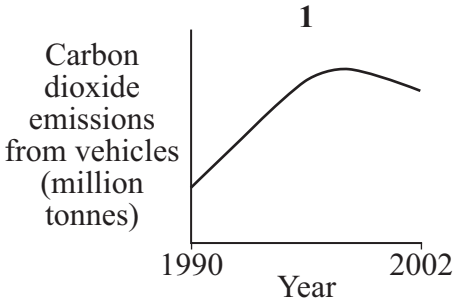
4 measuring the amount of carbon dioxide in the air near a busy motorway.

4.9.1.2 The Earth's early atmosphere

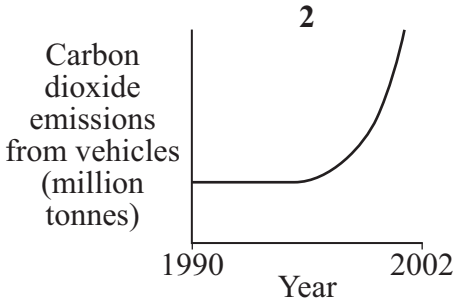
Question 07 · continued March 2008 | CHY1BP | Original Q4 | Legacy

4B 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?

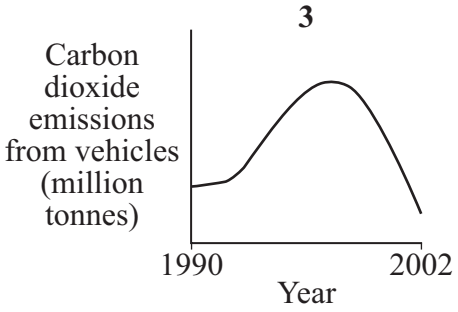
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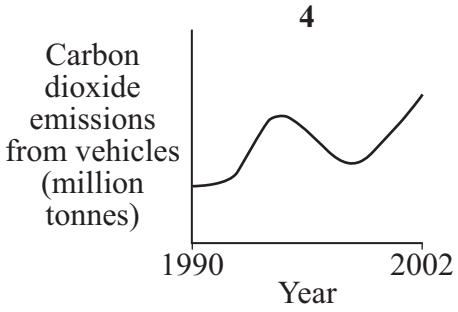
2



3



4



4C 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.

4D 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.

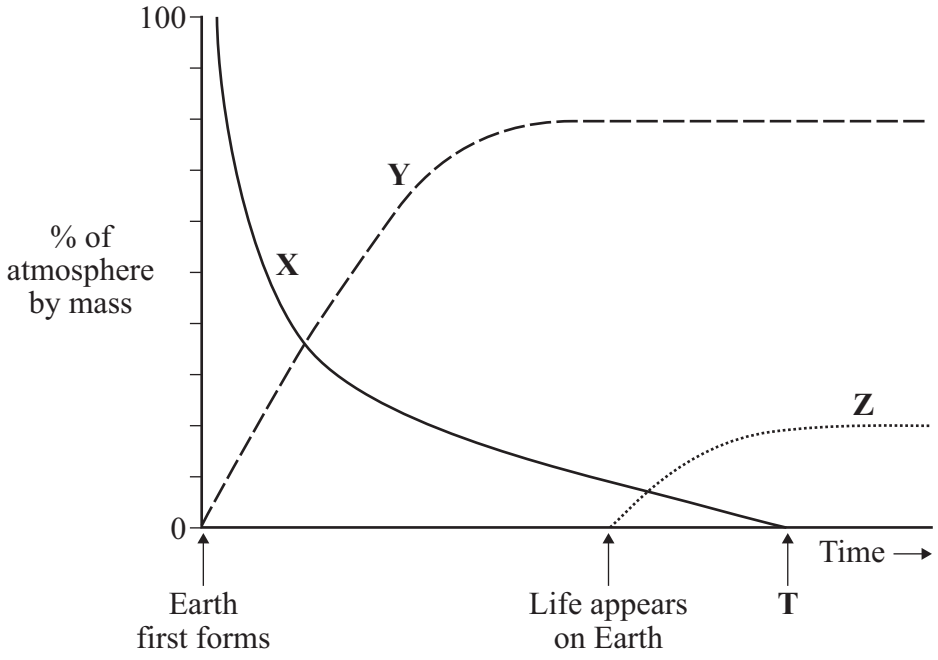
4.9.1.2 The Earth's early atmosphere

Question 08

March 2008 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

The diagram below shows how the levels of nitrogen, oxygen and carbon dioxide in the Earth's atmosphere have changed with time.



7A What is the ratio, by mass, of gas **Z** to gas **Y** at time **T**?

1 1:4

2 1:5

3 4:1

4 5:1

7B Which one of the following correctly matches the lines on the graph?

1 **X** is carbon dioxide, **Y** is nitrogen and **Z** is oxygen

2 **X** is oxygen, **Y** is nitrogen and **Z** is carbon dioxide

3 **X** is nitrogen, **Y** is oxygen and **Z** is carbon dioxide

4 **X** is carbon dioxide, **Y** is oxygen and **Z** is nitrogen

4.9.1.2 The Earth's early atmosphere

Question 08 · continued March 2008 | CHY1BP | Original Q7 | Legacy

7C During the last 200 million years, . . .

1 the burning of fossil fuels has decreased the proportion of oxygen in the Earth's atmosphere.

2 intense volcanic activity has substantially changed the atmosphere of the Earth.

3 the percentage of carbon dioxide in the Earth's atmosphere has decreased considerably.

4 the proportion of nitrogen in the Earth's atmosphere has remained fairly constant.

7D It is thought that there is no oxygen in the atmosphere of the planet Venus.

This is because . . .

1 animals used it up in respiration.

2 it is locked up in sedimentary rocks.

3 it is locked up in fossil fuels.

4 there are no plants to produce it by photosynthesis.

4.9.1.2 The Earth's early atmosphere

Question 09

June 2008 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

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 10 June 2008 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

9A There was little or no nitrogen in Earth's early atmosphere, but a gaseous compound of nitrogen was present in small amounts.

This gaseous compound is . . .

1 ammonia.

2 carbon dioxide.

3 methane.

4 sulfur dioxide.

In 1892, Lord Rayleigh compared nitrogen from the air with very pure nitrogen obtained from nitrogen compounds. The density of the nitrogen was:

nitrogen from the air	= 1.2572 grams per litre
nitrogen from nitrogen compounds	= 1.2511 grams per litre.

Rayleigh and Sir William Ramsay proved that atmospheric nitrogen was not pure but contained five other gases, which together made up about 1% of the Earth's atmosphere. The gases were argon (0.94%) and traces of helium, neon, krypton and xenon.

The five gases are similar in that they show no chemical reactions but have different physical properties, eg density, melting point, boiling point.

9B The main reason why scientists did **not** find these five gases in the atmosphere at an earlier date was that . . .

1 they have a very low density.

2 they are present in only small quantities.

3 they are unreactive.

4 they are colourless.

9C One way of separating the five gases from each other is by . . .

1 passing a mixture of the gases over heated carbon.

2 allowing them to settle, according to density, in a glass vessel.

3 fractional distillation of the mixture.

4 passing a mixture of the gases over a nickel catalyst.

4.9.1.2 The Earth's early atmosphere

9D From the information given in the question, it is safe to predict that . . .

1 nitrogen makes up about 78% of the atmosphere.

2 argon has a density greater than the density of nitrogen.

3 neon, krypton and xenon have a density lower than the density of nitrogen.

4 nitrogen from nitrogen compounds must contain a very light gas such as hydrogen.

END OF TEST

4.9.1.2 The Earth's early atmosphere

Question 11

June 2008 | CHY1H | Original Q7 | Legacy

7 Scientists study the atmosphere on planets and moons in the Solar System to understand how the Earth's atmosphere has changed.

7 (a) Millions of years ago the Earth's atmosphere was probably just like that of Mars today.

The table shows data about the atmospheres of Mars and Earth as they are now.

Mars		Earth	
nitrogen	3 %	nitrogen	78 %
oxygen	trace	oxygen	21 %
water	trace	water	trace
carbon dioxide	95 %	carbon dioxide	trace
Average surface temperature –23 °C		Average surface temperature 15 °C	

Suggest what has caused the main gases in the Earth's atmosphere of millions of years ago to change to the present-day atmosphere.

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(2 marks)

7 (b) Titan is the largest moon of the planet Saturn. It has an atmosphere that, like the Earth's, contains mainly nitrogen. Methane is the other main gas.

Main gases in Titan's atmosphere	Percentage (%)	Boiling point in °C
Nitrogen	95	–196
Methane	5	–164
Average surface temperature –178 °C		

When it rains on Titan, it rains methane! Explain why.

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(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 11 · continued

for mark

7 (c) Ultraviolet radiation from the Sun produces simple alkenes, such as ethene and propene, from methane in Titan's atmosphere.

7 (c) (i) Draw the structure of propene, C_3H_6, to show the covalent bonds.

(1 mark)

7 (c) (ii) Explain how propene molecules form a polymer. You should name the polymer formed.

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(3 marks)

8

4.9.1.2 The Earth's early atmosphere

Question 12

November 2008 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

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

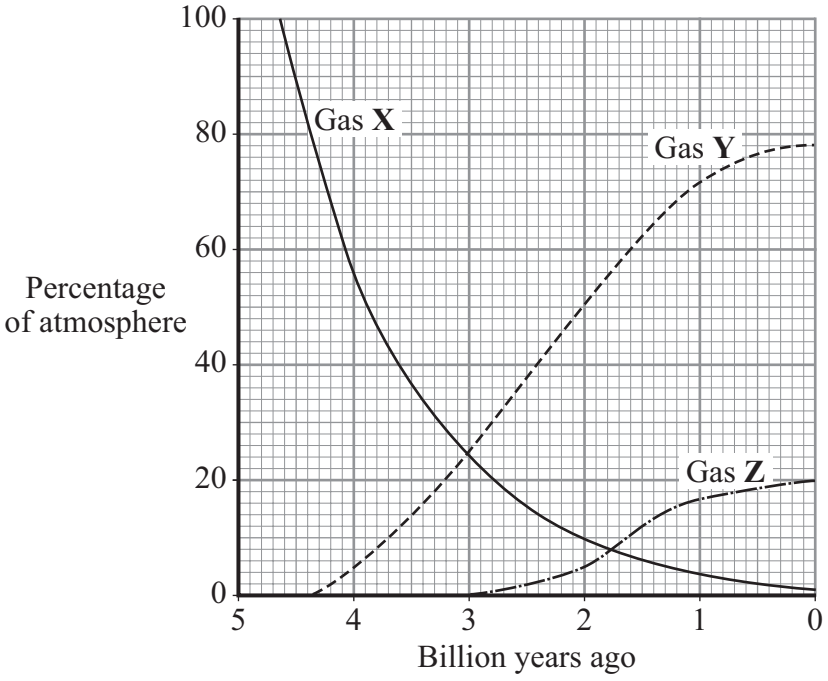
Question 13

June 2009 | CHY1BP | Original Q8 | Legacy

QUESTION EIGHT

Gases **X**, **Y** and **Z** are found in the Earth's atmosphere today.

The graph shows how the percentages of these gases in the atmosphere have changed over the last five billion years.



8A Which row in the table correctly describes the gases **X**, **Y** and **Z**?

	Gas X	Gas Y	Gas Z
1	Carbon dioxide	Nitrogen	Oxygen
2	Oxygen	Nitrogen	Carbon dioxide
3	Nitrogen	Carbon dioxide	Oxygen
4	Carbon dioxide	Oxygen	Nitrogen

4.9.1.2 The Earth's early atmosphere

Question 13 · continued June 2009 | CHY1BP | Original Q8 | Legacy

8B The Earth's atmosphere today contains the noble gas argon, which is by far the most abundant noble gas.

Argon is used in filament light bulbs because . . .

1 it has a low density.

2 it glows red when hot.

3 it can be obtained from the air by filtration.

4 it is chemically unreactive.

The table below shows the amounts of carbon dioxide in the Earth's atmosphere since 1750.

Year	1750	1800	1850	1900	1950	2000
Percentage (%) of carbon dioxide by volume	0.0270	0.0282	0.0288	0.0297	0.0310	0.0368

8C A graph of percentage (%) of carbon dioxide on the *y*-axis against time on the *x*-axis from 1750 to 2000 would show . . .

1 direct proportionality after 1800.

2 many anomalous values.

3 random scatter.

4 stronger positive correlation after 1850 than before.

8D The values given in the table show . . .

1 sensitivity because the values are close together.

2 reliability because the values are calculated by modern techniques.

3 precision because the values are given to 4 decimal places.

4 accuracy because famous scientists have calculated the values.

4.9.1.2 The Earth's early atmosphere

Question 14

3 There are many ideas about the formation of the Earth and its atmosphere from a molten ball of rock and minerals.

3 (a) One idea is that the Earth's early atmosphere and average surface temperature were probably like that of Venus today.

The table shows information about 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

There is a variable amount of water vapour in both atmospheres.

3 (a) (i) How was the Earth's early atmosphere formed?

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.....

(1 mark)

3 (a) (ii) The Earth's average surface temperature decreased over time. At what temperature would oceans have started to form?

Temperature = ... °C

(1 mark)

3 (a) (iii) Describe how the evolution of plants changed the Earth's atmosphere.

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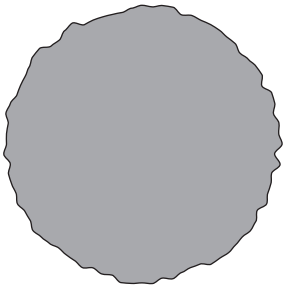
(2 marks)

4.9.1.2 The Earth's early atmosphere

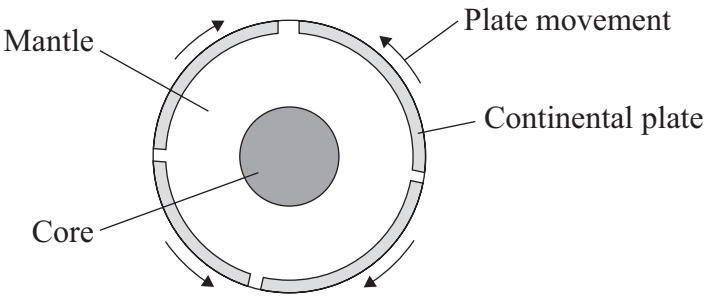
Question 14 · continued

for mark

3 (b) Another idea was that the Earth's mountains and continents formed in fixed positions as the molten ball of rock and minerals cooled and wrinkled.



Wegener, in 1915, had the idea that the Earth's crust and the upper part of the mantle had cracked into plates that were able to move. His idea meant that the mountains and continents were not in fixed positions.



3 (b) (i) Give **one** piece of evidence that led to Wegener's idea being accepted.

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(1 mark)

3 (b) (ii) Describe what causes the Earth's tectonic plates to move.

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(3 marks)

8

4.9.1.2 The Earth's early atmosphere

Question 15

November 2009 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

Some scientists think that the Earth's early atmosphere was mainly carbon dioxide, water vapour and nitrogen, with no oxygen.

Some scientists think that the early atmosphere also contained carbon monoxide, hydrogen, methane and ammonia.

Other scientists think that the atmosphere has always contained some oxygen.

Evidence comes from geological records starting over 4 billion years ago, the composition of gases from volcanoes, observations of conditions on other planets, and the composition of the atmosphere today.

The table shows some information about the atmospheres of the planets, Venus, Earth and Mars today.

	Venus	Earth	Mars
Carbon dioxide, % by mass	98.0	0.036	95.0
Oxygen, % by mass	0.0	21.0	0.25
Nitrogen, % by mass	2.0	78.0	2.4
Water vapour, % by mass	0.05	0.20	0.10
Mass of atmosphere in tonnes	5.2×10^{17}	5.2×10^{15}	2.4×10^{10}

9A Scientists do **not** agree about the Earth's early atmosphere because . . .

1 there is too much evidence available.

2 the information can be interpreted in different ways.

3 the data is inaccurate.

4 geological records do not go back far enough.

9B Which of the following supports the idea that there was oxygen in the Earth's early atmosphere?

1 Calcium sulfate ($CaSO_4$) is found in rocks formed 3.5 billion years ago.

2 Many of the oldest rocks contain iron sulfide, FeS.

3 The atmosphere now contains more than 20% oxygen.

4 Some of the gases in the early atmosphere came from volcanoes.

4.9.1.2 The Earth's early atmosphere

9C Which one of these is an **incorrect** reason for the small percentage of carbon dioxide in the Earth's atmosphere today?

1 Some carbon dioxide has dissolved in the oceans.

2 Carbon dioxide has been used in chemical reactions to form sedimentary rocks.

3 Some carbon dioxide has been locked up in fossil fuels.

4 There has always been only a small amount of carbon dioxide in the atmosphere.

9D Which one of the following statements is true?

1 Venus has the smallest mass of water vapour in its atmosphere.

2 Earth has a greater mass of water vapour in its atmosphere than Venus or Mars.

3 Venus has a greater mass of nitrogen in its atmosphere than Earth or Mars.

4 Mars has a greater mass of carbon dioxide in its atmosphere than the Earth.

END OF TEST

4.9.1.2 The Earth's early atmosphere

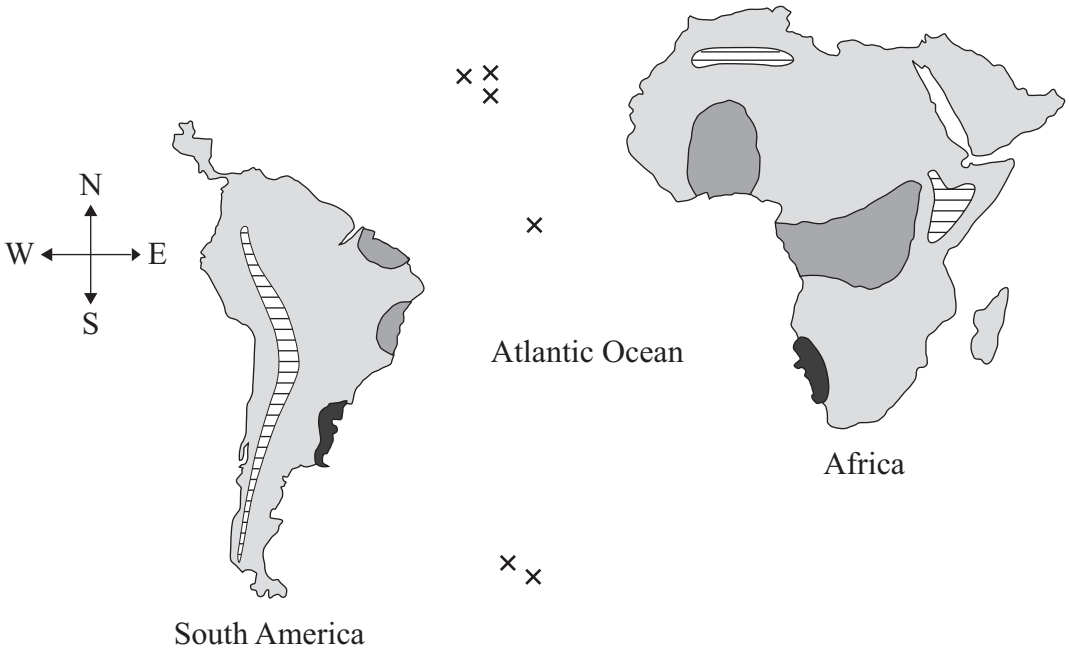
Question 16

March 2010 | CHY1BP | Original Q4 | Legacy

QUESTION FOUR

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

Some of the rock formations are also shown.



4A 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 16 · continued March 2010 | CHY1BP | Original Q4 | Legacy

4B 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.

4C 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

4D 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.

4.9.1.2 The Earth's early atmosphere

Question 17

March 2010 | CHY1BP | Original Q8 | Legacy

QUESTION EIGHT

All the gases in the Earth's atmosphere can be separated by this method:

- remove the carbon dioxide
- cool the air down to a very low temperature so that it liquefies
- allow the liquefied gases to warm up
- collect the gases as they boil off at different temperatures.

The table below gives some information about the gases in the Earth's atmosphere.

Gas	Melting point in °C	Boiling point in °C	Abundance in %
Oxygen	−223	−183	21
Nitrogen	−209	−196	78
Carbon dioxide	−57	−57	0.03
Helium	−272	−269	Less than 0.1
Neon	−248	−246	Less than 0.1
Argon	−189	−186	0.9
Krypton	−157	−153	Less than 0.1
Xenon	−112	−108	Less than 0.1

8A In this method of separation, carbon dioxide is always removed from the air before it is liquefied because . . .

1 it would react with the other gases present.

2 it would solidify during cooling and block up the pipes.

3 it is a greenhouse gas and would warm up the apparatus.

4 it is a heavy gas and would not separate properly from the mixture.

4.9.1.2 The Earth's early atmosphere

Question 17 · continued March 2010 | CHY1BP | Original Q8 | Legacy

8B How many of the gases listed in the table (excluding carbon dioxide), would be liquid at –150 °C?

1 None

2 1

3 2

4 3

8C Argon is the cheapest of the noble gases to produce because . . .

1 there is high demand for it for use in light bulbs.

2 it is the most abundant of the noble gases.

3 it is the gas that vaporises most easily and so requires the least energy to remove it.

4 it is an unreactive gas so it can easily be separated from the other gases in the air.

8D Earth's early atmosphere contained a high percentage (%) of carbon dioxide.

One reason for the reduction of the percentage of carbon dioxide is that carbon dioxide . . .

1 has dissolved in the oceans.

2 has been reduced to carbon monoxide.

3 has decomposed to form carbon and oxygen.

4 has been released by plants.

4.9.1.2 The Earth's early atmosphere

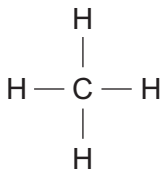
Question 18

June 2010 | CHY1BP | Original Q2 | Legacy

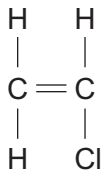
QUESTION TWO

This question is about the formulae of four carbon compounds, **A**, **B**, **C** and **D**.

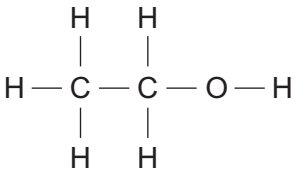
A



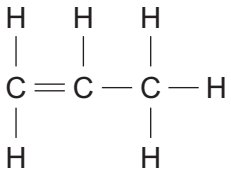
B



C



D



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

1	It is an unsaturated hydrocarbon.
2	It is the alkane that was present in Earth's early atmosphere.
3	It is made by reacting ethene with steam.
4	It is the monomer from which the polymer, poly(chloroethene) is made.

4.9.1.2 The Earth's early atmosphere

Question 19

June 2010 | CHY1BP | Original Q5 | Legacy

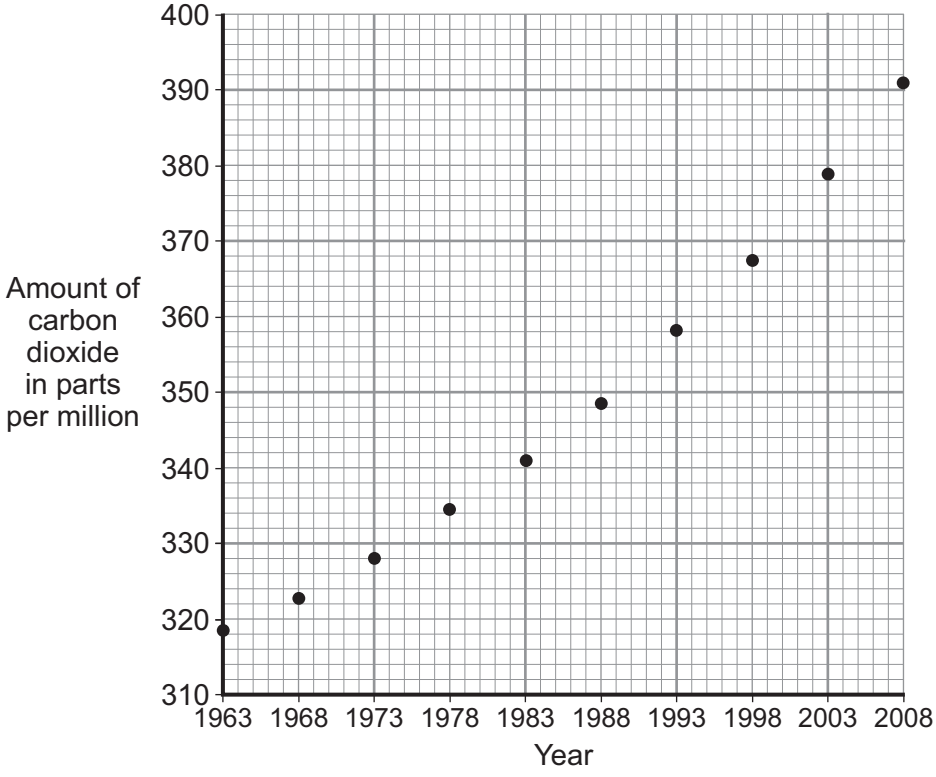
QUESTION FIVE

Scientists have been measuring the amount of carbon dioxide in the atmosphere high above a remote island in the Pacific Ocean.

The table shows some data that they collected over 45 years.

The data is plotted on the graph.

Year	1963	1968	1973	1978	1983	1988	1993	1998	2003	2008
Amount of carbon dioxide in parts per million	318.9	323.1	328.0	334.2	340.9	348.9	358.1	367.7	378.8	391.0



5A What is the best way of showing the trend in the amount of carbon dioxide on the graph?

1 Draw a series of straight lines linking one point to the next.

2 Add points between those already plotted to estimate the missing years.

3 Draw a bar chart.

4 Draw a smooth curve as close as possible to the points.

4.9.1.2 The Earth's early atmosphere

Question 19 · continued

5B What does the data show about the amounts of carbon dioxide above the island?

1 The amount of carbon dioxide has increased at an increasing rate since 1963.

2 Recent efforts to slow the increase in the amount of carbon dioxide have been successful.

3 Amounts of carbon dioxide before 1963 were lower than 300 parts per million.

4 The amount of carbon dioxide has increased because there are now more cars on the island.

5C Is there enough data to support the theory that global carbon dioxide levels have increased over the period studied?

1 No, because the scientists would need to measure the amount of carbon dioxide every year to be certain.

2 Yes, because it is obvious that the amount of carbon dioxide is the same all over the world.

3 No, because data from many different sites worldwide would be needed to make sure.

4 Yes, because the amount of carbon dioxide went up every time a measurement was made.

5D Scientists have compared the amount of carbon dioxide in the atmosphere today with the amount they estimate there was during the first billion years of the Earth's existence.

They think that . . .

1 there is more carbon dioxide today because of the burning of fossil fuels.

2 there is less carbon dioxide today because a lot became trapped in carbonate rocks.

3 the amount of carbon dioxide has remained much the same until very recently.

4 there was no carbon dioxide to begin with because there were no humans to burn fuels.

4.9.1.2 The Earth's early atmosphere

Question 20

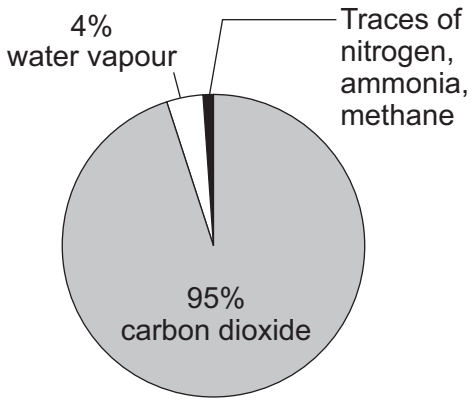
June 2010 | CHY1H | Original Q2 | Legacy

2 (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.

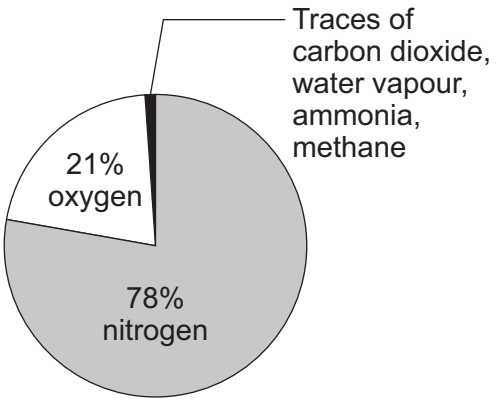
The pie charts show the approximate percentages of gases in the Earth's early atmosphere and in the Earth's atmosphere today.

Earth's early atmosphere



Average surface temperature above 400 °C

Earth's atmosphere today



Average surface temperature 20 °C

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

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(2 marks)

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

1 .....

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2 .....

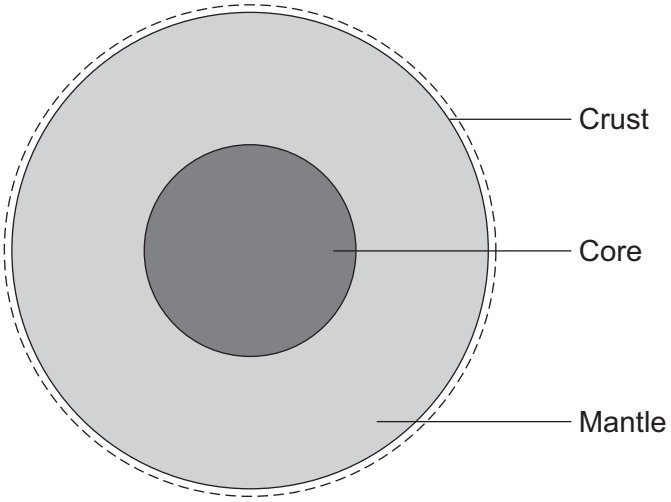
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(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 20 · continued

2 (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.

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

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(1 mark)

2 (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

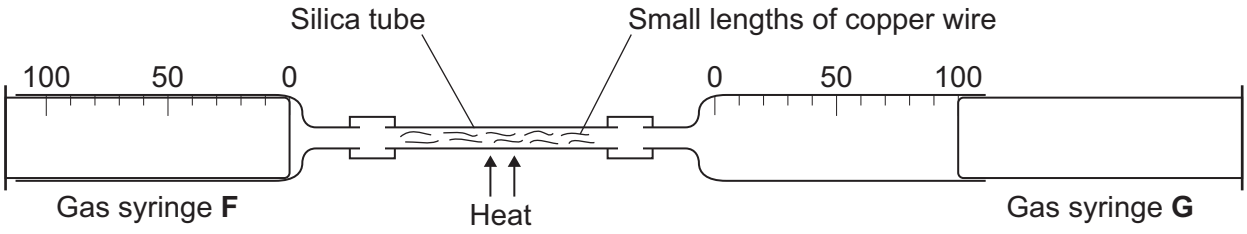
Question 21

November 2010 | CHY1BP | Original Q8 | Legacy

QUESTION EIGHT

Some students used this equipment to find the answer to the question:

What percentage (%) of the air is oxygen?



The students heated the copper wire inside the silica tube. The syringes were used to push air backwards and forwards between the two syringes, until the volume of gases in the syringes stopped changing.

The equation for the reaction is:

$$\underset{\text{(Pink)}}{2Cu} + O_2 \longrightarrow \underset{\text{(Black)}}{2CuO}$$

They pushed all the gas that remained into gas syringe **G**. When the gas had cooled to room temperature, they measured its final volume.

8A The equipment was cooled to room temperature before the final volume was measured . . .

1 to make sure that there were no other variables affecting the measurements.

2 to make sure that all of the oxygen in the sample was used up.

3 to make the measurements more precise.

4 to stop any further reaction.

8B The most accurate answer to the question 'What percentage (%) of the air is oxygen?' would be obtained . . .

1 by weighing the amount of solid product that remained at the end of the experiment.

2 by repeating the experiment using different diameters of copper wire.

3 when all the copper in the silica tube had turned black by the end of the experiment.

4 when there was still some pink copper left in the silica tube at the end of the experiment.

4.9.1.2 The Earth's early atmosphere

Question 21 · continued

8C In the students' first experiment, the final volume they recorded was 82 cm^3. When the students repeated the experiment with a new 100 cm^3 sample of air, the final volume was 72 cm^3.

The difference in final volume was because . . .

1 there was a leak from the apparatus.

2 the students did not put enough new copper in the tube in the repeat experiment.

3 there was more oxygen in the second sample.

4 the students did not heat the copper for long enough in the repeat experiment.

8D If the experiment could be carried out with an air sample similar to that of the Earth's early atmosphere, we would expect . . .

1 a larger decrease in the volume of the air sample.

2 an increase in the volume of the air sample.

3 no change in the volume of the air sample.

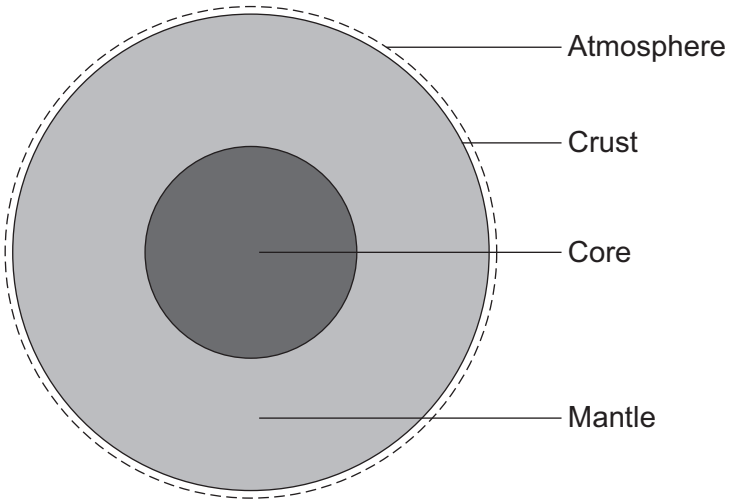
4 more copper wire would be needed to use all the oxygen in the air sample.

4.9.1.2 The Earth's early atmosphere

Question 22

January 2011 | CHY1H | Original Q3 | Legacy

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



3 (a) Scientists believe that the Earth's atmosphere was formed by volcanoes releasing gases.
This early atmosphere was about 95 % carbon dioxide.
The composition of the Earth's atmosphere is always changing.

3 (a) (i) The Earth's atmosphere today contains about 0.035 % carbon dioxide.

What happened to most of the carbon dioxide that was in the Earth's early atmosphere?

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(2 marks)

3 (a) (ii) About 60 million years ago a large meteorite hit the Earth.
This meteorite heated limestone in the Earth's crust causing the release of large amounts of carbon dioxide.

Explain how carbon dioxide is released from limestone.

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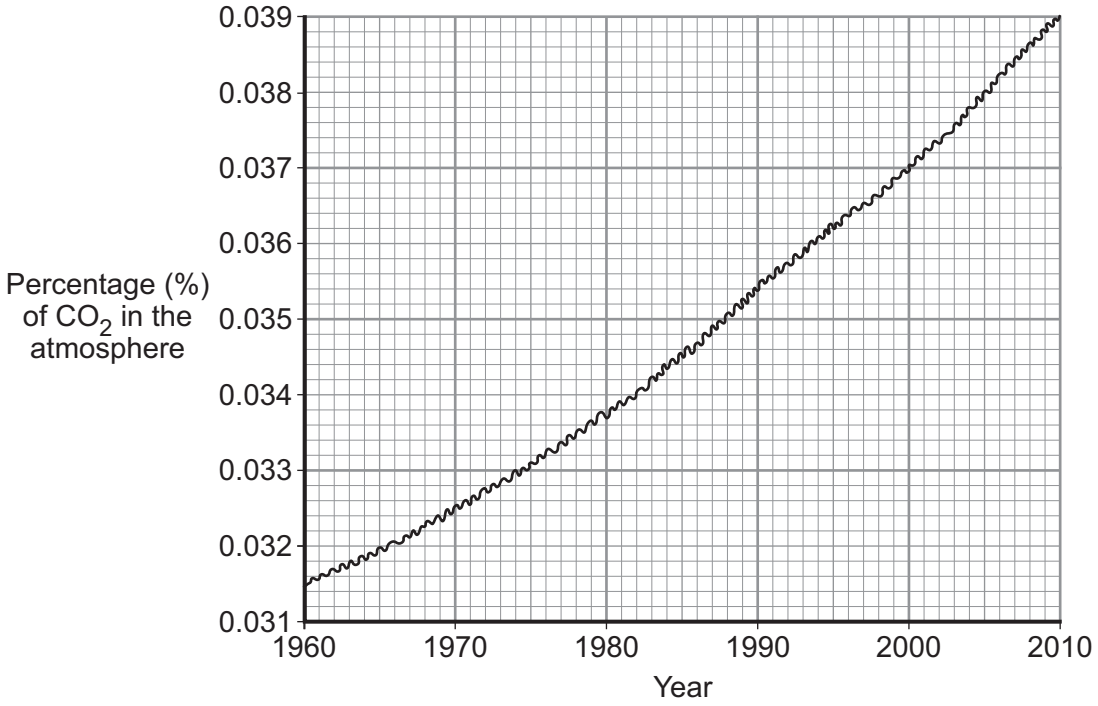
.....

(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 22 · continued

3 (b) The graph shows the percentage of carbon dioxide in the Earth's atmosphere over the last 50 years.



Explain, as fully as you can, why we should be concerned about the information displayed on this graph.

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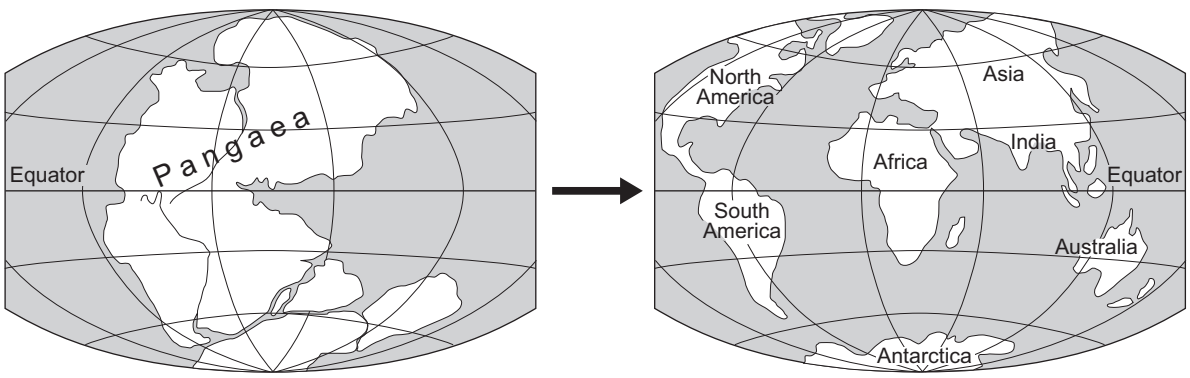
(3 marks)

Question 3 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 22 · continued

3 (c) Scientists believe that all the continents of the Earth were once joined together. The huge 'supercontinent' was called Pangaea.



200 million years ago **Today**

In 1915, Alfred Wegener had an idea that the change shown in the diagram was caused by *continental drift*. Most scientists could not accept his idea.

3 (c) (i) Suggest why most scientists in 1915 could not accept Wegener's idea of *continental drift*.

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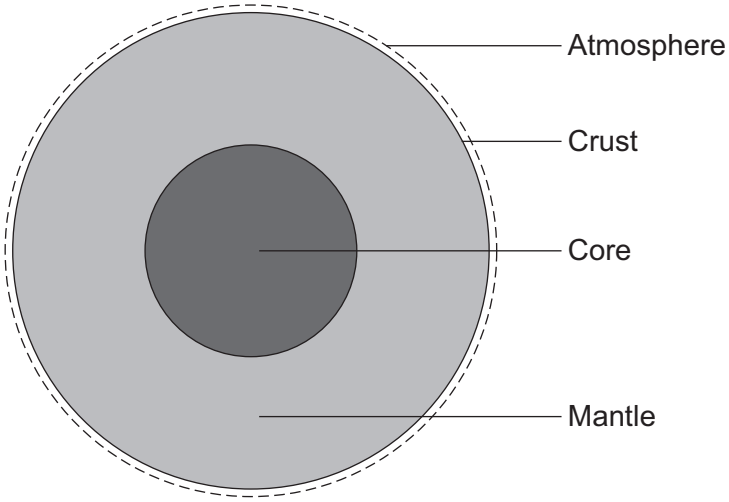
(1 mark)

4.9.1.2 The Earth's early atmosphere

Question 22 · continued

To help you with this question, the information and diagram from the beginning of the question are reprinted here.

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



3 (c) (ii) Use this information and your knowledge and understanding to explain how continents move.

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(3 marks)

11

4.9.1.2 The Earth's early atmosphere

Question 23

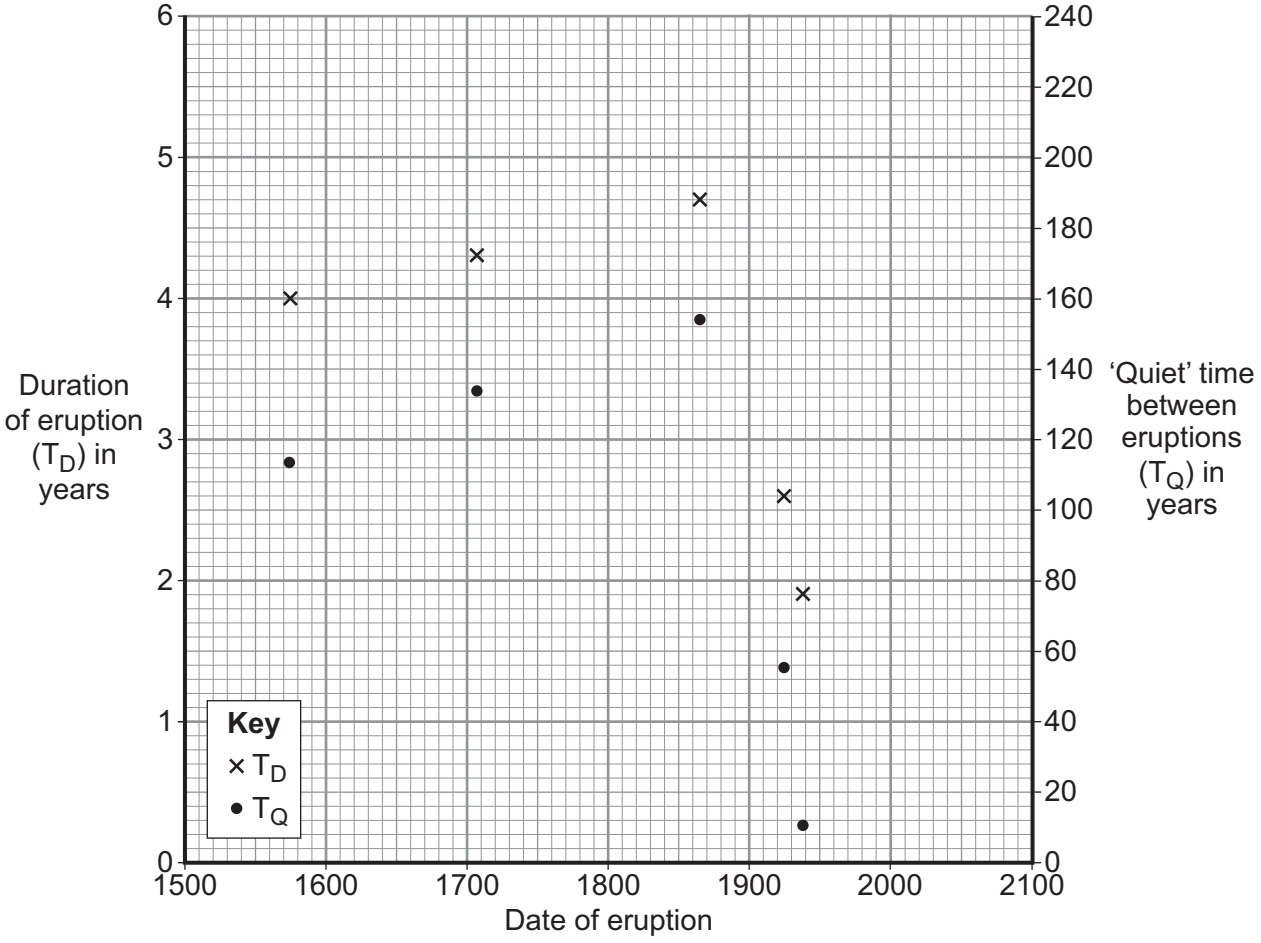
March 2011 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

Use the information given to answer this question.

Santorini is a Greek island. Many volcanic eruptions have occurred there over thousands of years.

The graph refers to the major eruptions which have occurred there during the past 500 years.
T_D is the duration time for each major eruption (the time for which it lasts).
T_Q is the quiet time between the end of each major eruption and the start of the next one.



9A It is probable that the island of Santorini . . .

1 lies at the centre of a large tectonic plate.

2 will be unaffected by earthquakes.

3 is close to a boundary between tectonic plates.

4 will reduce in size as the Earth shrinks.

4.9.1.2 The Earth's early atmosphere

Question 23 · continued

9B The graph indicates that . . .

1 another eruption should have occurred around 1950.

2 major eruptions occur at regular intervals of time.

3 the longer the quiet time (T_Q), the longer the eruption is likely to be.

4 the volcano is gradually becoming extinct so it is unlikely to erupt again.

9C The mean quiet time (T_Q) for the volcano is 93.4 years.

With this information available, scientists . . .

1 can predict when the next major eruption will occur and how long it is likely to last.

2 can predict when the next major eruption will occur but not how long it is likely to last.

3 cannot predict when the next major eruption will occur but can say how long it is likely to last.

4 cannot predict when the next major eruption will occur or how long it is likely to last.

9D The last major eruption occurred in 1939.

Suppose that the next eruption occurs in 2060, it would be most likely to last for . . .

1 6 months.

2 1 year.

3 4 years.

4 6 years.

END OF TEST

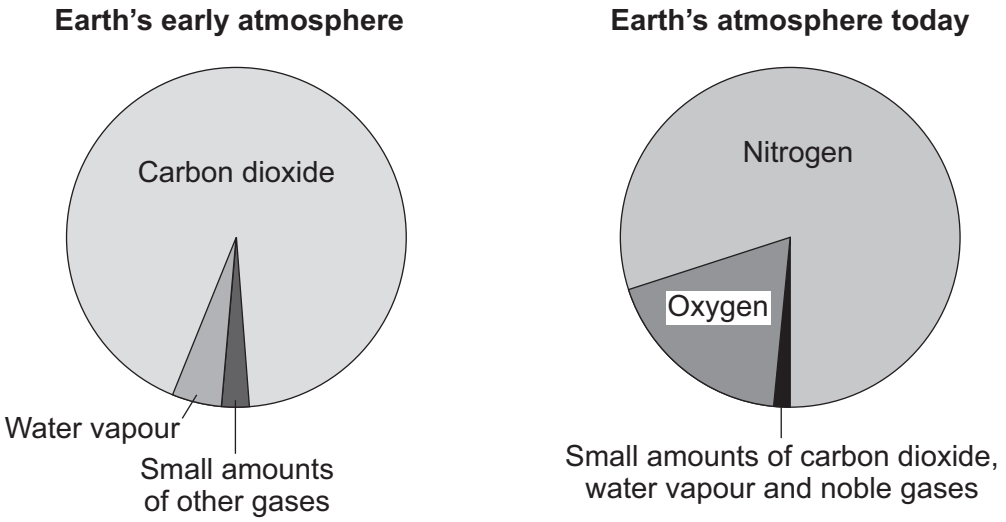
4.9.1.2 The Earth's early atmosphere

Question 24

June 2011 | CHY1BP | Original Q3 | Legacy

QUESTION THREE

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



3A 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

4.9.1.2 The Earth's early atmosphere

Question 24 · continued

3B 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.

3C 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.

3D 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 25

June 2011 | CHY1BP | Original Q9 | Legacy

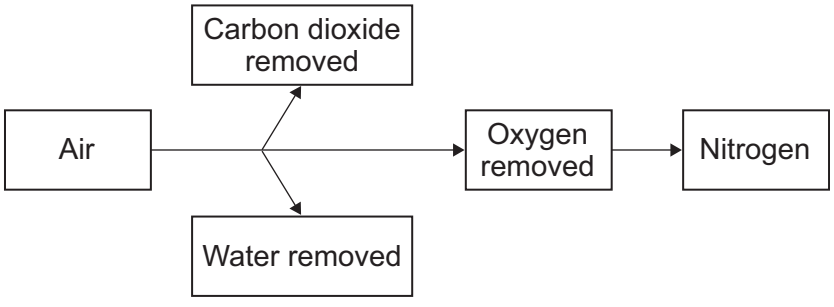
QUESTION NINE

The table below gives information about the gases in the air after removal of any water vapour.

Gas	Melting point in °C	Boiling point in °C	Abundance in %
Nitrogen	−209	−196	78
Oxygen	−223	−183	21
Carbon dioxide	−57	−57	0.03
Helium	−272	−269	Less than 0.1
Neon	−248	−246	Less than 0.1
Argon	−189	−186	0.9
Krypton	−157	−153	Less than 0.1
Xenon	−112	−108	Less than 0.1

In 1892, scientists believed that the air consisted of three gases, nitrogen, oxygen and carbon dioxide.

Lord Rayleigh extracted nitrogen from the air.



He also collected very pure nitrogen by heating ammonium nitrate.

He found that there was a slight difference in the densities of the nitrogen samples from the two different sources.

- Density of nitrogen from the air = 1.2572 g per litre
- Density of nitrogen from ammonium nitrate (NH_4NO_3) = 1.2511 g per litre

Question 25 · continued

9A A correct conclusion from this information is that . . .

1 hydrogen, a gas with a very low density, is present in the nitrogen from ammonium nitrate.

2 the nitrogen from the air contains a small amount of hydrogen.

3 a gas that is heavier than nitrogen is mixed with the nitrogen from the air.

4 some carbon dioxide was given off when the ammonium nitrate was heated.

9B It was several years after 1892 when the other gases in the table were identified.

This was because these other gases . . .

1 are colourless.

2 have a very low density.

3 are unreactive.

4 have very low boiling points.

The separation of gases in the air is done in several stages:

- carbon dioxide is first removed
- the air is then cooled to –200 °C so that it liquefies
- the liquefied air is allowed to warm up
- two main fractions, oxygen and nitrogen, are collected
- a third fraction that is mainly argon is also collected.

9C Why is the carbon dioxide removed before the air is liquefied?

1 It is present only in very small quantities.

2 It is a compound and the other gases are elements.

3 It would solidify during cooling and cause blockages in the pipes.

4 Its density is very similar to the density of argon.

9D What is the order in which these fractions boil off from the liquefied air?

1 argon, nitrogen, oxygen

2 oxygen, nitrogen, argon

3 nitrogen, argon, oxygen

4 argon, oxygen, nitrogen

END OF TEST

4.9.1.2 The Earth's early atmosphere

Question 26

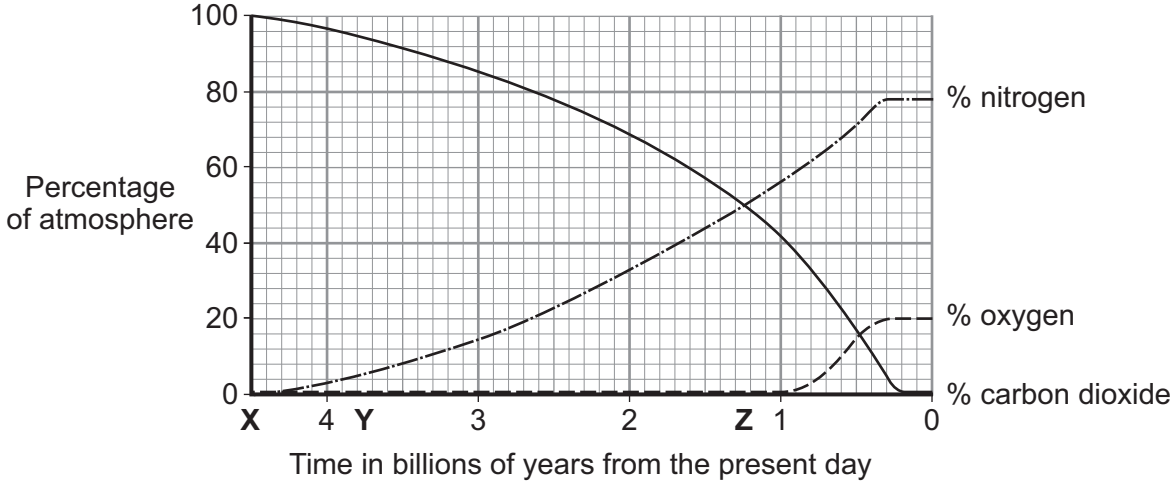
November 2011 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

This question is about changes in the Earth's atmosphere that have occurred over time.

The Earth's early atmosphere was mainly carbon dioxide with small amounts of methane and ammonia.

The graph shows how the percentages of carbon dioxide, nitrogen and oxygen may have changed over time.



7A About how many years after the Earth was formed (**X**) did the percentage of carbon dioxide in the atmosphere fall to 60 %?

1 1.3 billion years

2 1.6 billion years

3 2.4 billion years

4 2.9 billion years

7B At a particular stage in the Earth's formation, some of the iron on its surface was oxidised.

What gas in the atmosphere could **not** have caused this change?

1 nitrogen

2 carbon dioxide

3 oxygen

4 water vapour

4.9.1.2 The Earth's early atmosphere

Question 26 · continued

7C Between times **Y** and **Z**, the amount of carbon dioxide in the atmosphere was reduced.

Which of the following statements could explain this reduction?

Most of the carbon dioxide . . .

1 dissolved in the oceans.

2 was absorbed by plants.

3 was absorbed to form carbonate rocks in the mantle.

4 became locked up in coal, oil and natural gas.

7D The graph showing the percentages of the various gases has . . .

1 categoric variables plotted against a discrete variable.

2 discrete variables plotted against a continuous variable.

3 continuous variables plotted against a continuous variable.

4 continuous variables plotted against a discrete variable.

4.9.1.2 The Earth's early atmosphere

Question 27

June 2012 | CH1HP | Original Q4 | Legacy

4 Venus is often compared to the Earth. The Earth's early atmosphere was mainly carbon dioxide like the atmosphere of Venus today.

Atmosphere of Earth today		Atmosphere of Venus today	
Gas	**Percentage (%)**	**Gas**	**Percentage (%)**
Nitrogen	78	Nitrogen	3.5
Oxygen	21	Oxygen	A trace
Carbon dioxide	0.04	Carbon dioxide	96

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

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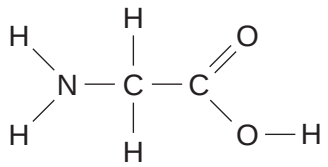
.....

(2 marks)

4 (b) In the 1950s two scientists, Miller and Urey, investigated the origin of life on Earth.
Miller and Urey used the gases that they believed were in the Earth's early atmosphere and used water to represent the oceans.
The gases they used were methane (CH_4), ammonia (NH_3) and hydrogen (H_2).
A continuous electrical spark was used to simulate lightning storms.

After one week the Miller-Urey experiment had produced amino acids.
Amino acids are essential to life.

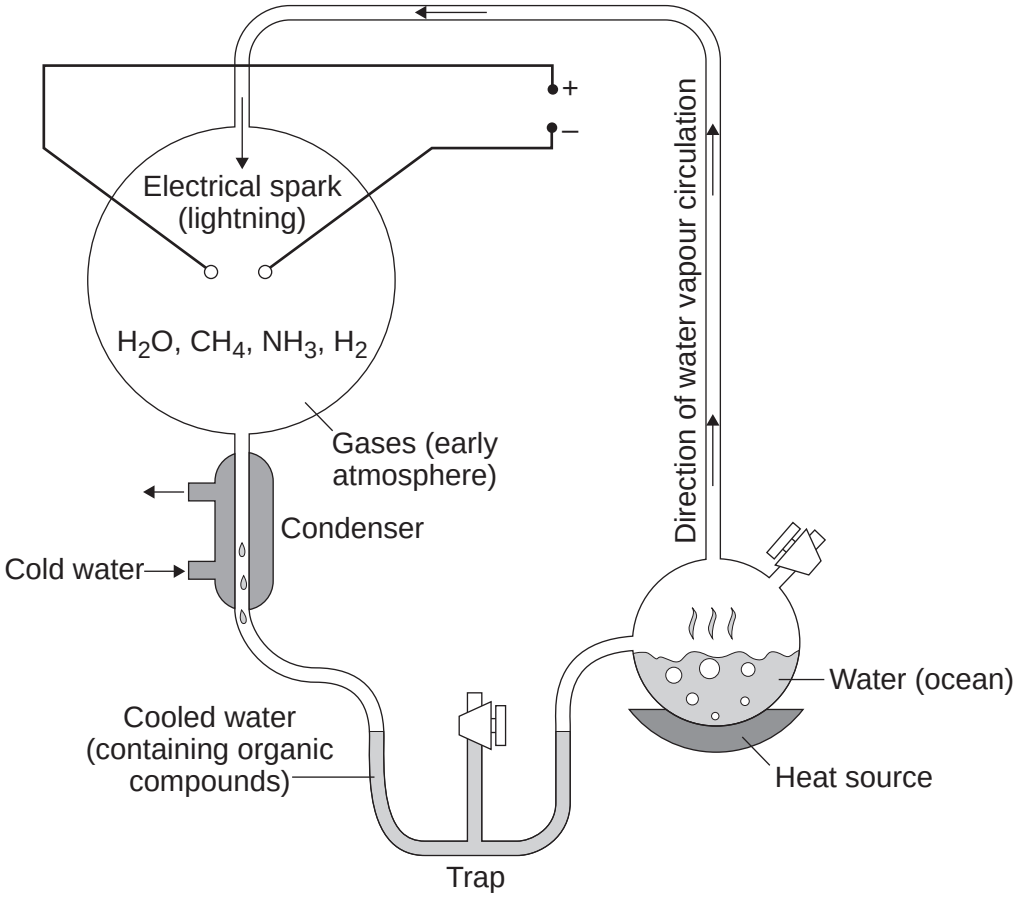
The simplest amino acid is glycine (aminoethanoic acid).



4.9.1.2 The Earth's early atmosphere

Question 27 · continued

The apparatus used in the Miller-Urey experiment is shown in the diagram.



Use the information in the diagram and on page 10 to answer these questions.

4 (b) (i) Miller and Urey used methane, ammonia and hydrogen for the Earth's early atmosphere.

Suggest why.

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(1 mark)

4 (b) (ii) The experiment provides only weak evidence of how amino acids formed on Earth.

Suggest **two** reasons why.

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(2 marks)

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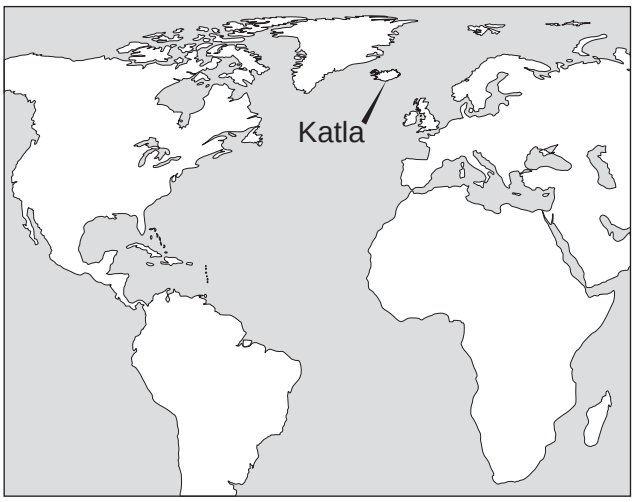
4.9.1.2 The Earth's early atmosphere

Question 28

January 2013 | CH1HP | Original Q4 | Legacy

4 Iceland has many volcanoes.

4 (a) Scientists are monitoring a volcano in Iceland, called Katla.
There has been an increase in the number of tremors (small earthquakes) in this area.



4 (a) (i) Why does Iceland have volcanoes?

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(1 mark)

4 (a) (ii) Scientists predict that Katla may erupt soon.
However, scientists do **not** know exactly when Katla will erupt.

Suggest **one** reason why.

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(1 mark)

4.9.1.2 The Earth's early atmosphere

Question 28 · continued

4 (b) During the first billion years of the Earth's existence its surface was covered with volcanoes.

Describe how this volcanic activity led to the formation of oceans.

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(2 marks)

4 (c) The Earth has about 500 000 earthquakes each year.

Describe how activity within the Earth results in earthquakes.

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(3 marks)

7

4.9.1.2 The Earth's early atmosphere

Question 29

January 2013 | CH1HP | Original Q8 | Legacy

8 Scientists study the atmosphere on planets and moons in the Solar System to understand how the Earth's atmosphere may have evolved.

Titan is the largest moon of Saturn.

The table shows data about some substances in the atmosphere of Titan.

Substance	Melting point in °C	Boiling point in °C
Nitrogen	–210	–196
Methane	–183	–164
Argon	–189	–186
Hydrogen	–259	–253
Carbon monoxide	–205	–192

8 (a) There is no water on Titan. The average surface temperature on Titan is –179 °C.

Which of the substances in the table would form oceans on Titan?

Explain your answer.

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(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 29 · continued

8 (b) Amino acids are essential to life.

In the 1950s the Miller-Urey experiment showed that simple amino acids, such as glycine (NH_2CH_2COOH), could have been produced from the Earth's early atmosphere.

The Miller-Urey experiment showed that simple amino acids could be produced by reactions between hydrocarbons, ammonia and water.

Explain how the Miller-Urey experiment suggests that reactions between the substances in Titan's atmosphere could also produce simple amino acids.

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(4 marks)

6

4.9.1.2 The Earth's early atmosphere

Question 30

June 2013 | CH1HP | Original Q5 | Legacy

5 The amount of carbon dioxide in the Earth's atmosphere has changed since the Earth was formed.
The amount of carbon dioxide continues to change because of human activities.

5 (a) Cement is produced when a mixture of calcium carbonate and clay is heated in a rotary kiln. The fuel mixture is a hydrocarbon and air.

Hydrocarbons react with oxygen to produce carbon dioxide.
Calcium carbonate decomposes to produce carbon dioxide.

5 (a) (i) Complete each chemical equation by writing the formula of the other product.

$$CH_4 + 2O_2 \longrightarrow 2 \text{ .....} + CO_2$$

$$CaCO_3 \longrightarrow \text{.....} + CO_2$$

(2 marks)

5 (a) (ii) Hydrocarbons and calcium carbonate contain *locked up* carbon dioxide.

What is *locked up* carbon dioxide?

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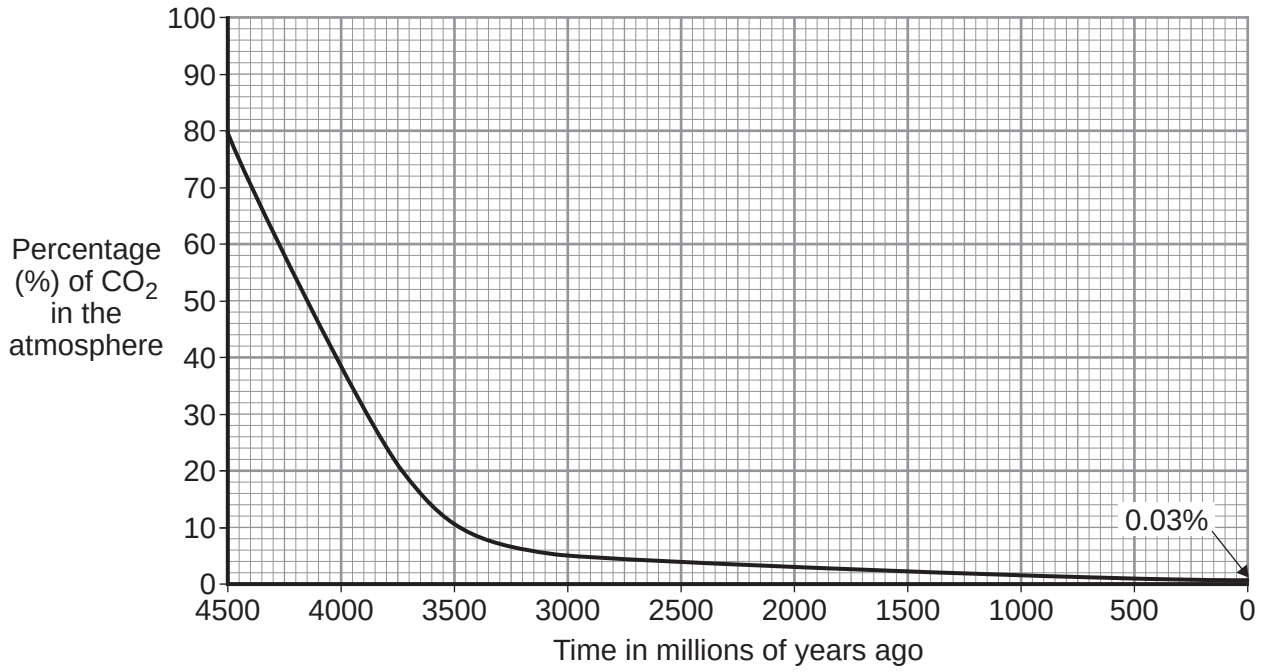
(2 marks)

4.9.1.2 The Earth's early atmosphere

Question 30 · continued

5 (b) **Graph 1** shows how the percentage of carbon dioxide in the atmosphere changed in the last 4500 million years.

Graph 1



Use information from **Graph 1** to answer these questions.

5 (b) (i) Describe how the percentage of carbon dioxide has changed in the last 4500 million years.

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(2 marks)

5 (b) (ii) Give **two** reasons why the percentage of carbon dioxide has changed.

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(2 marks)

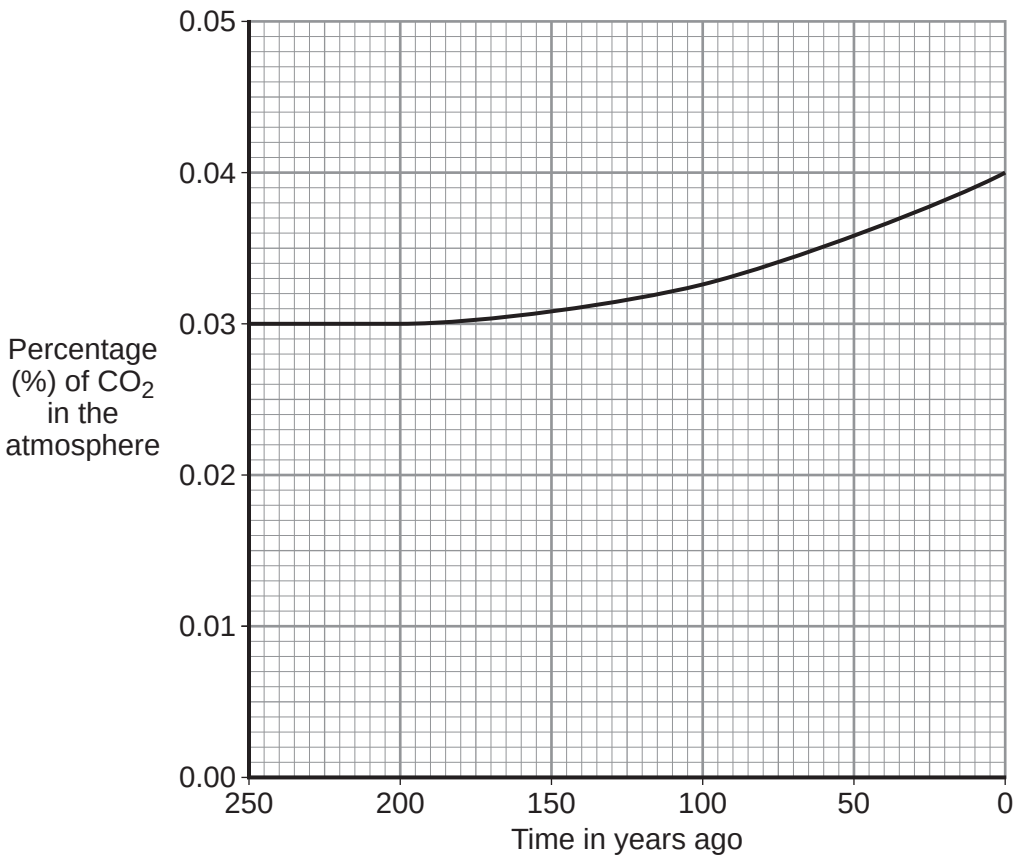
Question 5 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 30 · continued

5 (c) **Graph 2** shows how the percentage of carbon dioxide in the atmosphere changed in the last 250 years.

Graph 2



Should we be concerned about this change in the percentage of carbon dioxide?

Explain your answer.

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(2 marks)

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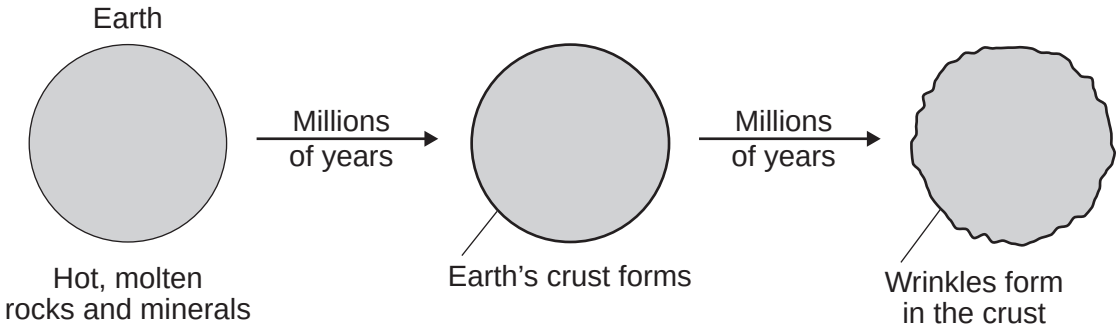
4.9.1.2 The Earth's early atmosphere

Question 31

June 2013 | CH1HP | Original Q6 | Legacy

6 There were many ideas about how the Earth was formed from a molten ball of rock and minerals.

At one time scientists thought the features of the Earth were caused when the molten ball of rock and minerals cooled and wrinkled.



6 (a) Scientists now have evidence that the Earth has a layered structure.

Describe the layered structure of the Earth. You should indicate the relative sizes of the layers.

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(3 marks)

6 (b) At one time scientists thought the Earth's continents were formed in fixed positions when the molten ball of rock and minerals cooled and wrinkled.

In 1912, the scientist Alfred Wegener suggested his idea about how Earth's continents formed.

Describe Wegener's idea of how Earth's continents formed.

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(2 marks)

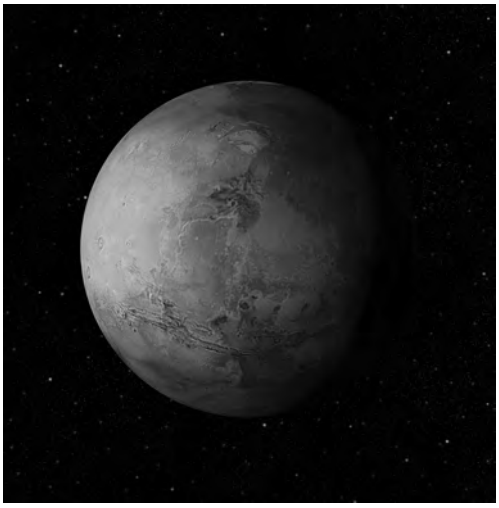
5

4.9.1.2 The Earth's early atmosphere

Question 32

June 2013 | CH2HP | Original Q6 | Legacy

6 Spacecraft have been to the planets Venus and Mars. The spacecraft have sent back information about the atmosphere of each planet.



6 (a) The main gas in the atmosphere of Mars is carbon dioxide.

Explain why, in terms of structure, carbon dioxide is a gas, even at low temperatures.

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(3 marks)

4.9.1.2 The Earth's early atmosphere

Question 32 · continued

6 (b) Gas chromatography linked to a mass spectrometer (GC-MS) is used to identify substances found on Mars.

6 (b) (i) What is the purpose of gas chromatography?

.....

.....

(1 mark)

6 (b) (ii) What information do the molecular ion peaks from the mass spectrometer give about the substances?

.....

(1 mark)

6 (c) The atmosphere on Venus contains droplets of sulfuric acid solution.

6 (c) (i) Suggest a pH value for sulfuric acid solution.

pH = ...

(1 mark)

6 (c) (ii) Name the ion which makes sulfuric acid solution acidic.

.....

(1 mark)

6 (d) The atmosphere of Venus contains the isotopes $^{2}_{1}H$ and $^{1}_{1}H$

Describe the similarities and the differences in the isotopes $^{2}_{1}H$ and $^{1}_{1}H$

You should refer to the sub-atomic particles in each isotope.

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(3 marks)

10

4.9.1.2 The Earth's early atmosphere

Question 33

June 2015 | CH1HP | Original Q3 | Legacy

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

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

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

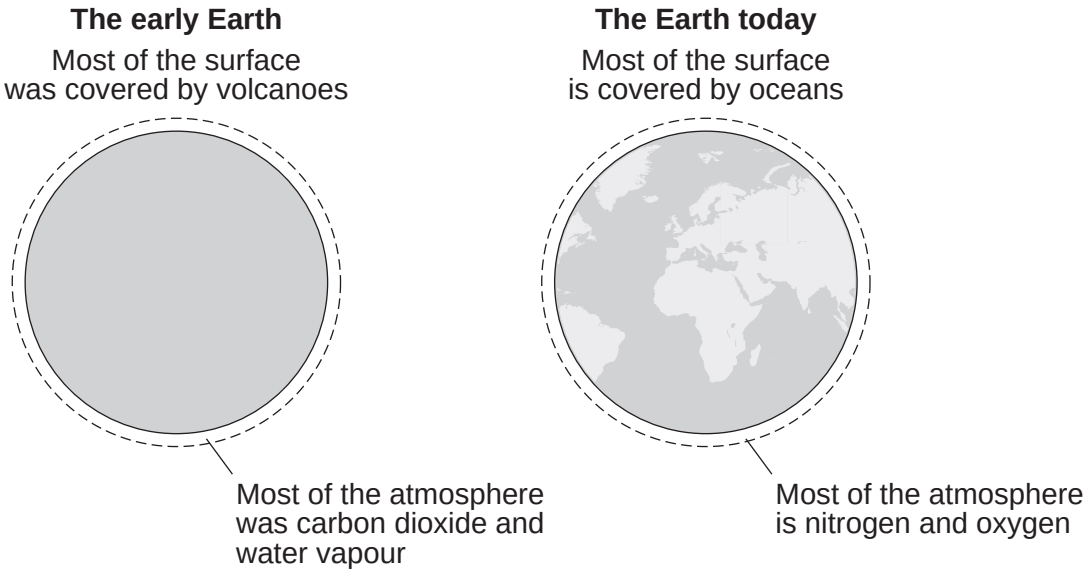
[1 mark]

.....

.....

3 (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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4.9.1.2 The Earth's early atmosphere

Question 34

June 2017 | CH1HP | Original Q5 | Legacy

5 This question is about the Earth's atmosphere.

5 (a) The Earth's early atmosphere was a mixture of gases.

One theory is that the Earth's early atmosphere had the composition shown in **Table 4**.

Table 4

Gas	Percentage in Earth's early atmosphere (%)
Carbon dioxide	96
Nitrogen	3.5
Oxygen	a trace
Other gases including methane, ammonia, hydrogen and water vapour	0.5

5 (a) (i) Amino acids are at the basis of all life processes.
The simplest amino acid is glycine, NH_2CH_2COOH

Two scientists, Miller and Urey, showed that they could produce glycine from a mixture of methane, ammonia, hydrogen and water.
Miller and Urey concluded that this is how life was formed on Earth.

Suggest **one** reason why this conclusion may **not** be correct.

[1 mark]

5 (a) (ii) Give **three** reasons why the percentage of carbon dioxide in the Earth's atmosphere today is less than the percentage of carbon dioxide in the Earth's early atmosphere.

[3 marks]

4.9.1.2 The Earth's early atmosphere

Question 34 · continued

5 (b) **Table 5** shows the boiling points of some gases in the air.

Table 5

Gas	Boiling point in °C
Nitrogen	–196
Oxygen	–183
Carbon dioxide	–79*
Helium	–269
Neon	–246
Argon	–186

*freezes at this temperature

Oxygen from the air is separated by fractional distillation. To do this separation the air is cooled to –200 °C. Most of the gases condense.

5 (b) (i) Name the two gases that would **not** condense at –200 °C.

[1 mark]

_____ and _____

5 (b) (ii) Suggest why carbon dioxide is removed before the air is cooled.

[1 mark]

_____

_____

5 (b) (iii) The liquid at –200 °C is passed into a fractionating column.

Explain why one of the fractions is a mixture of oxygen and one other gas.

[2 marks]

_____

_____

_____

_____

4.9.1.2 The Earth's early atmosphere

Question 34 · continued

5 (c) Oxygen is used in the production of steel.

Cast iron from a blast furnace contains 96% iron and 4% carbon.

The stages for the production of steel from cast iron are:

Stage 1 pass oxygen into molten cast iron

Stage 2 add small amounts of other metals.

Explain why each stage is needed in the production of steel.

[4 marks]

12

4.9.1.2 The Earth's early atmosphere

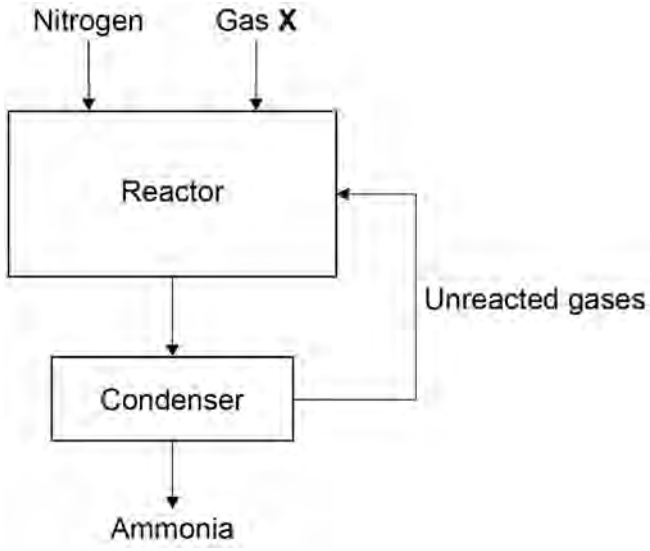
Question 35

June 2018 | 8462/2H | Original Q3

0 3 This question is about gases.

Figure 3 shows how nitrogen is used in the Haber Process to produce ammonia.

Figure 3



0 3 . 1 Gas **X** in **Figure 3** is obtained from methane.

Name gas **X**.

[1 mark]

_____

0 3 . 2 Give the approximate temperature and pressure used in the reactor.

[2 marks]

Temperature _____

Pressure _____

0 3 . 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 35 · 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 2 shows the amounts of carbon dioxide and oxygen in the atmospheres of Venus and Earth today.

Table 2

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

0 3 . 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 35 · continued

0 3 . 5 Why are scientists **not** certain about the percentage of each gas in the Earth's early atmosphere?

[1 mark]

11

Turn over for the next question

4.9.1.2 The Earth's early atmosphere

Question 36

November 2020 | 8462/2H | Original Q9

0 9 This question is about algae.

A student:

- placed algae in water containing dissolved carbon dioxide
- shone bright light on the algae.

Gas bubbles were collected as the algae photosynthesised.

0 9 . 1 Describe a test that would identify the gas collected.

Give the result of the test.

[2 marks]

Test _____

Result _____

_____

0 9 . 2 Glucose is produced when algae photosynthesise.

Name **two** naturally occurring polymers produced from glucose.

[2 marks]

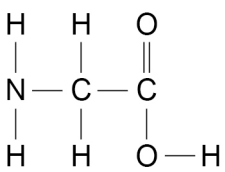
_____ and _____

Question 9 continues on the next page

Question 36 · continued

Figure 6 shows the displayed structural formula of an amino acid called glycine.

Figure 6



0 9 . 3 How many functional groups are there in the molecule in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

1 ☐ 2 ☐ 3 ☐ 4 ☐

0 9 . 4 Glycine reacts by condensation polymerisation to produce a polypeptide and one other substance.

Name the other substance produced.

[1 mark]

_____

0 9 . 5 Scientists think that algae may have used gases in Earth's early atmosphere.

Algae need an element to produce the molecule in **Figure 6** which is **not** present in water or carbon dioxide.

Which **two** gases from Earth's early atmosphere could have provided this element?

[2 marks]

_____ and _____

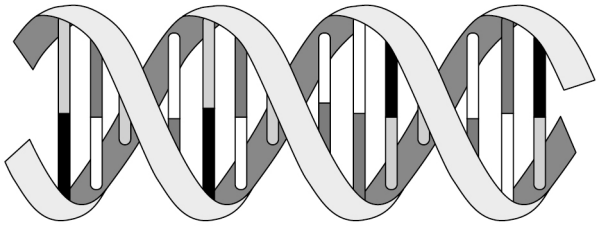
4.9.1.2 The Earth's early atmosphere

Question 36 · continued

0 9 . 6 The development and function of algae are controlled by a naturally occurring polymer.

Figure 7 represents the shape and structure of this polymer.

Figure 7



Describe the shape and structure of this polymer.

[3 marks]

11

4.9.1.2 The Earth's early atmosphere

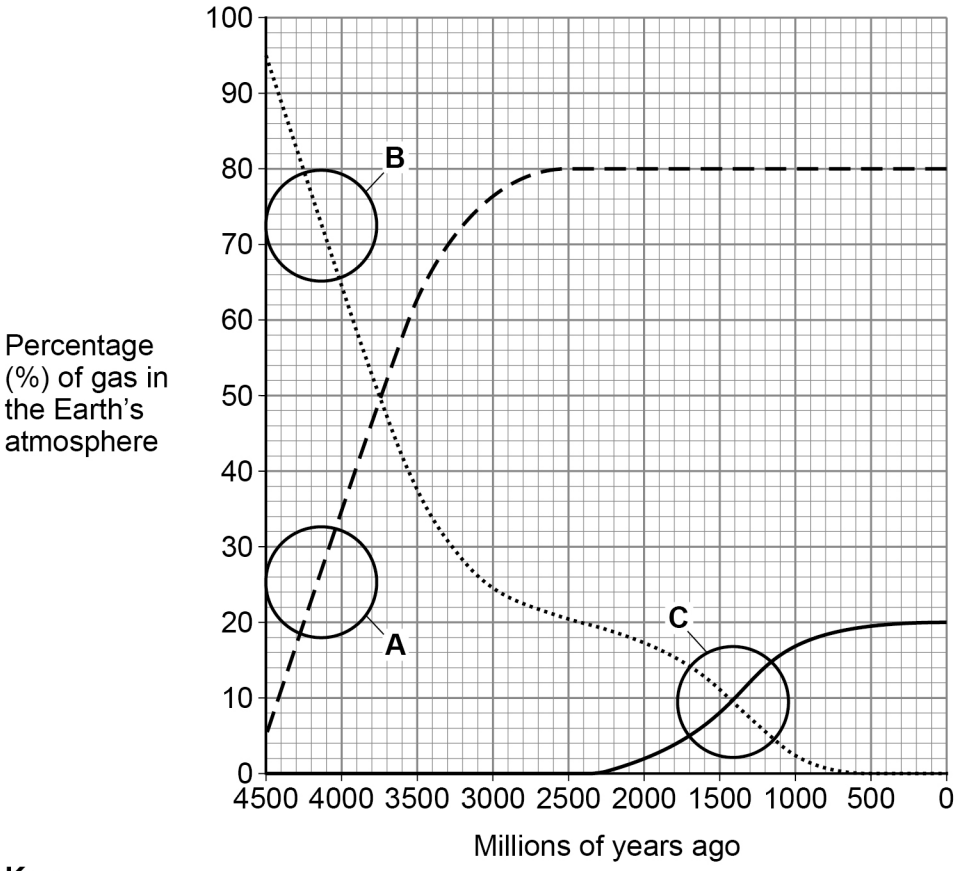
Question 37

June 2022 | 8462/2H | Original Q6

0 6 This question is about the chemistry of the Earth's atmosphere.

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

Figure 3



0 6 . 1 Explain the change in the percentage of gas in the region labelled **A** on **Figure 3**.

[2 marks]

4.9.1.2 The Earth's early atmosphere

Question 37 · continued

0 6 . 2 Explain the change in the percentage of gas in the region labelled **B** on **Figure 3**.

[2 marks]

0 6 . 3 Compare the changes in the percentages of gases in the region labelled **C** on **Figure 3**.

[2 marks]

0 6 . 4 What process caused the changes in the percentages of gases in the region labelled **C** on **Figure 3**?

[1 mark]

0 6 . 5 Natural gas is a fossil fuel.

Describe how deposits of natural gas were formed.

[3 marks]

10

4.9.1.2 The Earth's early atmosphere

Question 38

June 2023 | 8462/2H | Original Q4

0 4 This question is about greenhouse gases and climate change.

Carbon dioxide and methane are greenhouse gases.

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

[1 mark]

Tick (✓) **one** box.

- Chlorine ☐
- Nitrogen ☐
- Oxygen ☐
- Water vapour ☐

In the past 50 years, there has been an increase in:

- the world population
- the concentration of carbon dioxide in the atmosphere
- the concentration of methane in the atmosphere
- the mean temperature of the atmosphere at the Earth's surface.

Most scientists think this information can be used to explain climate change.

0 4 . 2 Explain why the increase in world population may have caused the increase in the concentration of carbon dioxide in the atmosphere.

[2 marks]

4.9.1.2 The Earth's early atmosphere

Question 38 · continued

0 4 . 3 Explain why the increase in world population may have caused the increase in the concentration of methane in the atmosphere.

[2 marks]

0 4 . 4 Describe **two** potential effects of the increase in the mean temperature of the atmosphere at the Earth's surface.

[2 marks]

1

2

0 4 . 5 The mean temperature of the atmosphere at the Earth's surface has increased.

Most scientists think that this has been caused by an increase in the concentration of greenhouse gases in the atmosphere.

Give **one** reason why some scientists do **not** accept this theory.

[1 mark]

8

4.9.1.2 The Earth's early atmosphere

Question 39

June 2025 | 8462/2H | Original Q4

0 4 The Earth's atmosphere has changed over time.

0 4 . 1 Explain how the percentage of nitrogen changed in the Earth's early atmosphere.

[2 marks]

0 4 . 2 **Table 4** shows the percentage (%) of carbon dioxide present in the Earth's early atmosphere.

Table 4

Time in billions of years ago	Percentage (%) of carbon dioxide in the Earth's early atmosphere
4.5	98
4.0	54
3.5	30
3.0	21

The percentage of carbon dioxide in the Earth's **early** atmosphere changed between 4.5 billion and 3.0 billion years ago.

Give **two** reasons why.

[2 marks]

1

2

4.9.1.2 The Earth's early atmosphere

Question 39 · continued

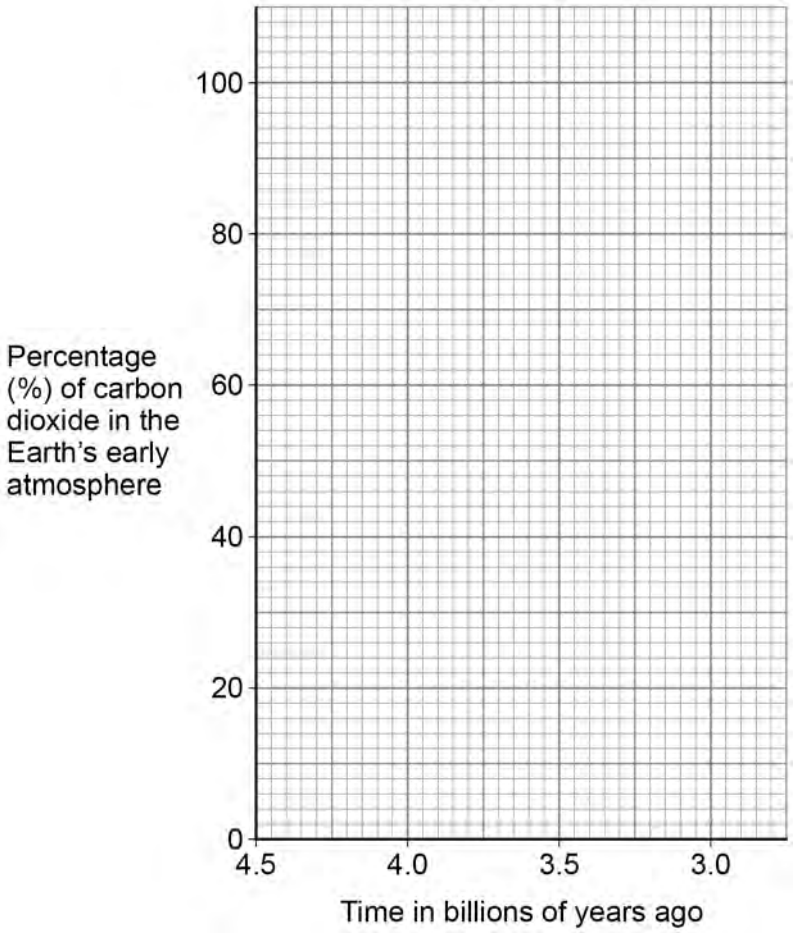
0 4 . 3 Complete **Figure 3**.

You should:

- plot the data in **Table 4**
- draw a line of best fit.

[2 marks]

Figure 3



Question 4 continues on the next page

4.9.1.2 The Earth's early atmosphere

Question 39 · continued

0 4 . 4 **Table 5** shows information about the percentage (%) of carbon dioxide and of oxygen present in the Earth's atmosphere over time.

Table 5

Time in billions of years ago	Percentage (%) of gas in the Earth's atmosphere	
	Carbon dioxide	Oxygen
2.5	18	1
2.0	15	2
1.5	10	8
1.0	3	17
0.5	1	19

The percentages of carbon dioxide and of oxygen in the Earth's atmosphere changed between 2.5 billion and 0.5 billion years ago.

Explain how.

[3 marks]

9