AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.9.1.4

How carbon dioxide decreased

Past-paper questions

Tier	**Foundation**
Question groups	**33**
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:** _____

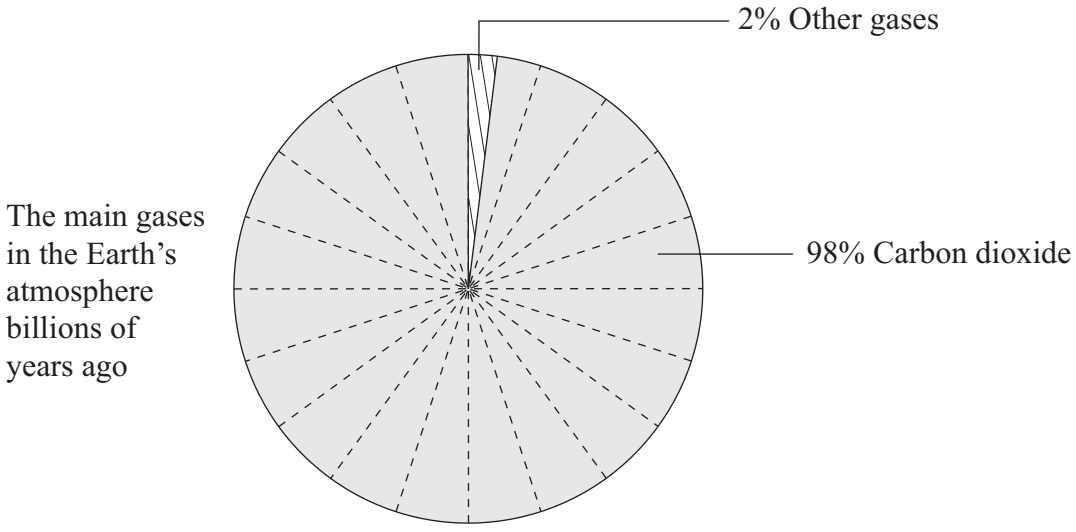
Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.9.1.4 How carbon dioxide decreased

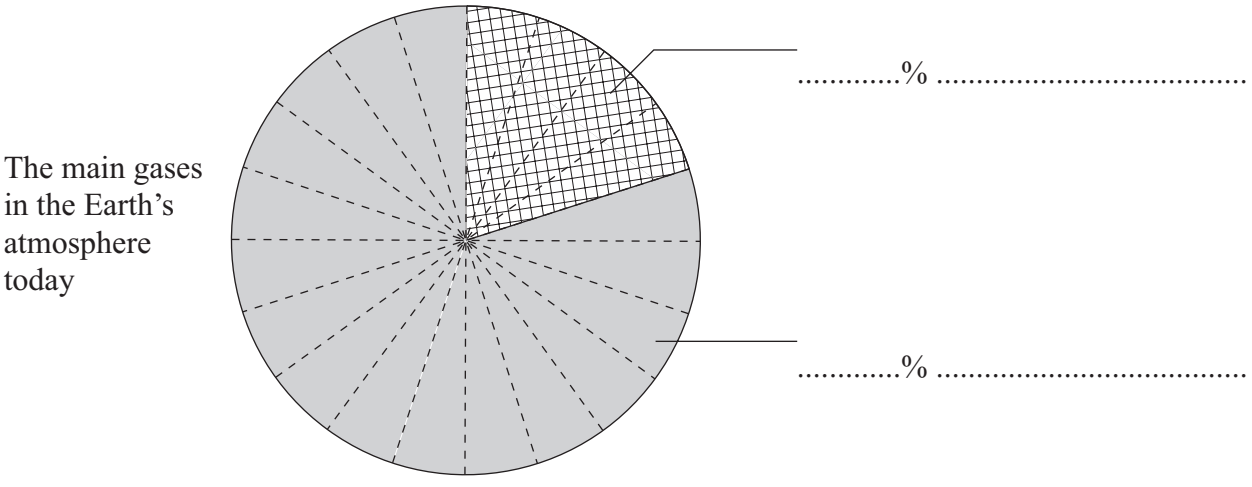
Question 01

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)

4.9.1.4 How carbon dioxide decreased

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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.....

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(2 marks)

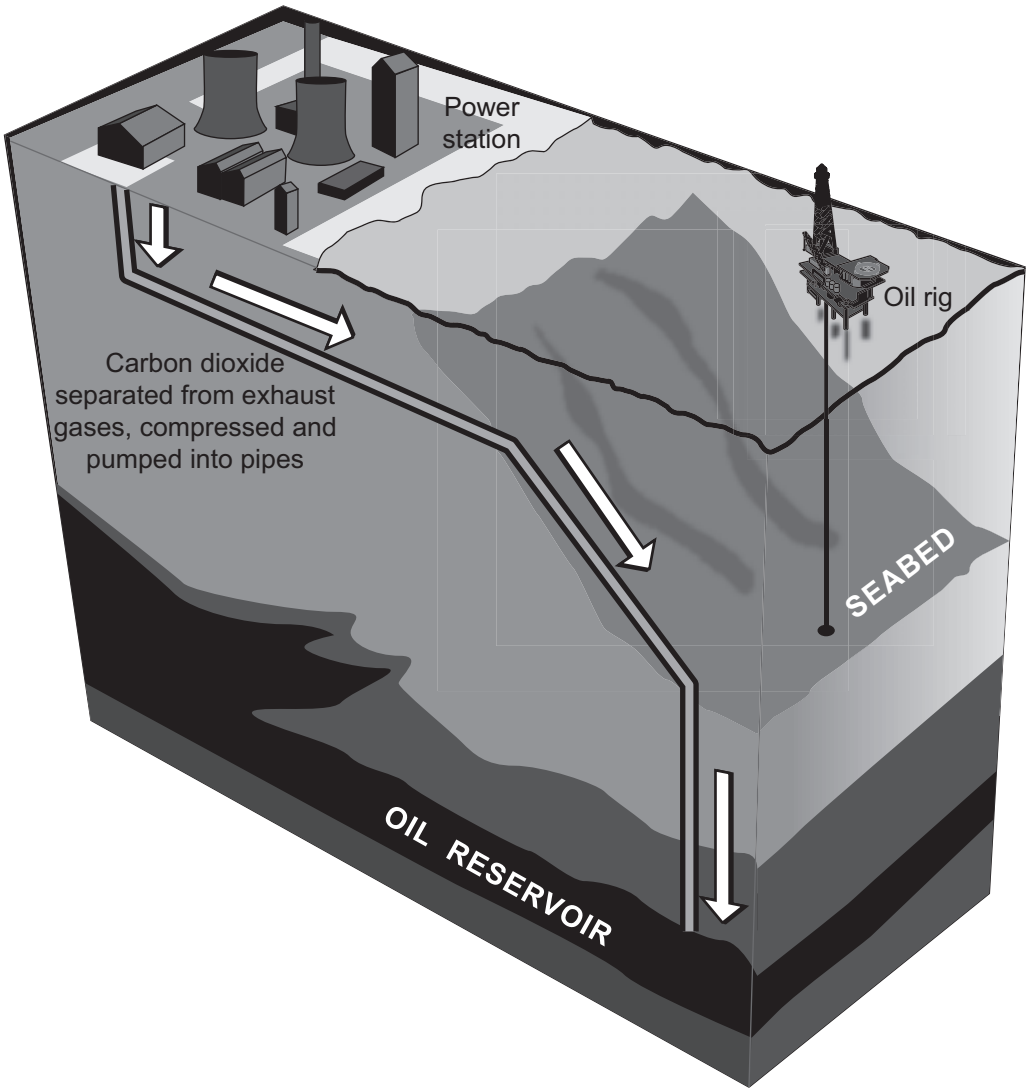
Question 7 continues on the next page

4.9.1.4 How carbon dioxide decreased

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.

.....

.....

.....

.....

(2 marks)

10

4.9.1.4 How carbon dioxide decreased

Question 02

March 2007 | CHY1A | Original Q8 | Legacy

QUESTION EIGHT

Crude oil is a non-renewable energy source. Petrol is a fuel obtained from the fractional distillation of crude oil.

Gasohol is also a fuel. It is a mixture of 90 % petrol and 10 % ethanol. The ethanol can be produced from the waste stems and leaves when crops have been harvested. So ethanol is a renewable energy source.

	Mass in grams of gas produced by completely burning 10 cm^3 of fuel		
Fuel	Carbon dioxide from petrol	Carbon dioxide from ethanol	Water vapour
Petrol	26.4	0	12.6
Gasohol	23.8	1.5	12.2

8A What is the total mass of carbon dioxide produced when 10 cm^3 of gasohol is burned?

1 22.3 g

2 23.8 g

3 25.3 g

4 26.4 g

8B How much more carbon dioxide is produced when 10 cm^3 of petrol is burned than when 10 cm^3 of gasohol is burned?

1 0.4 g

2 1.1 g

3 1.6 g

4 24.9 g

4.9.1.4 How carbon dioxide decreased

Question 02 · continued

8C Why is the water vapour produced by burning fuels not a problem?

1 It condenses to a liquid.

2 It does not cause corrosion.

3 It is not a pollutant.

4 Very little is produced.

8D Carbon dioxide causes environmental problems.

Why is carbon dioxide from burning ethanol thought to be less of a problem than carbon dioxide from burning petrol?

1 Not as much carbon dioxide is produced.

2 The carbon dioxide produced has different chemical properties.

3 It is just recycling carbon dioxide removed from the air by plants.

4 The ethanol is not produced from crude oil.

4.9.1.4 How carbon dioxide decreased

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.

4.9.1.4 How carbon dioxide decreased

Question 04

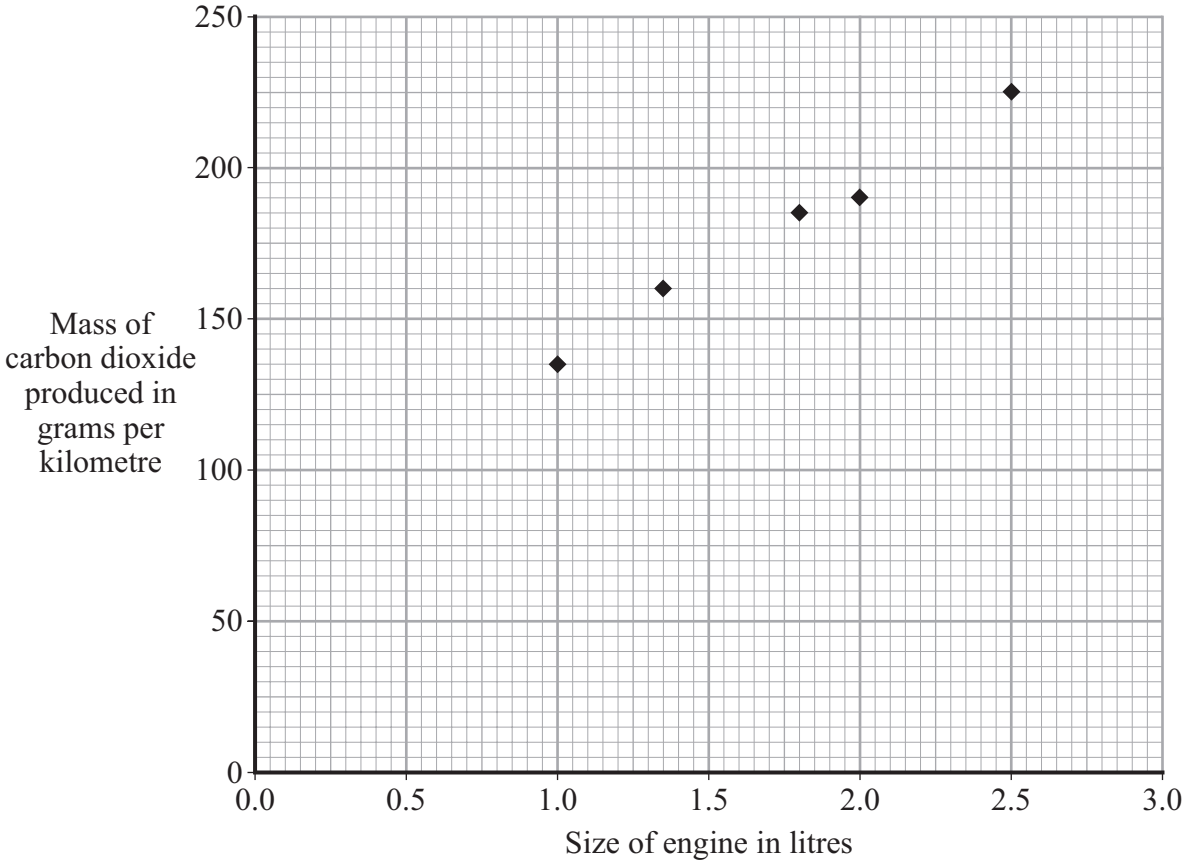
June 2007 | CHY1A | Original Q8 | Legacy

QUESTION EIGHT

Technicians at a car manufacturing company carried out tests on carbon dioxide emissions from their new range of cars.

First, they tested a small, lightweight, four-seater car with a 1.0 litre petrol engine.
They repeated the tests on similar cars, under similar conditions but with different engine sizes.

The results of their tests are shown on the graph.



8A What relationship is supported by these data?

1 Large engines produce more carbon dioxide per kilometre than small engines.

2 Small engines are more economical than large engines.

3 The mass of carbon dioxide produced per kilometre is directly proportional to the engine size.

4 A 2.0 litre engine produces twice as much carbon dioxide per kilometre as a 1.0 litre engine.

4.9.1.4 How carbon dioxide decreased

8B What could the technicians do to improve the reliability of the data in this investigation?

1 repeat the tests with different numbers of passengers in the cars

2 repeat the tests and calculate the mean (average) mass of carbon dioxide produced

3 repeat the tests and use the lowest mass of carbon dioxide produced

4 repeat the tests and use the highest mass of carbon dioxide produced

8C A car salesman claimed that a large, heavy, eight-seater car with the same 2.5 litre petrol engine would produce only 225 grams of carbon dioxide per kilometre.

Was this a fair claim from the data?

1 No, because the reading on the graph is 230 grams of carbon dioxide per kilometre.

2 No, because the result may be different for a heavier vehicle.

3 Yes, because that is the value shown on the graph.

4 Yes, because a 2.5 litre engine will always give the same results.

8D In another series of tests under the same conditions, the small, lightweight, four-seater car with a 2.0 litre diesel engine produced 150 grams of carbon dioxide per kilometre.

What is the best conclusion about petrol and diesel engines that can be drawn from these data?

1 Diesel engines are more efficient than petrol engines.

2 Diesel engines always produce less carbon dioxide than petrol engines.

3 The type of fuel used in a car engine may affect the amount of carbon dioxide produced.

4 The type of fuel used in a car engine does not affect the amount of carbon dioxide produced.

4.9.1.4 How carbon dioxide decreased

Question 05

November 2007 | CHY1A | Original Q8 | Legacy

QUESTION EIGHT

The table shows the emissions of sulfur dioxide, in the United Kingdom (UK), by different fuels in 1990 and in 2004.

	Emissions of sulfur dioxide by different fuels in thousands of tonnes		
Fuel type	**1990**	**2004**	**Percentage change between 1990 and 2004**
Coal	2707	578	–79
Other solid fuels	66	20	–70
Petroleum fuel oil	605	78	–87
Other petroleum products (including petrol and diesel)	193	83	–57
Gaseous fuels	9	11	+22
Other emissions of sulfur dioxide	118	58	–51
TOTAL	**3698**	**828**	**–78**

- Since 1990, the amount of coal used in the generation of electricity at power stations has reduced by more than 60%.
- Since 1990, gaseous fuels have gradually been replacing fuel oil for electricity generation and in industry.
- The small amount of sulfur dioxide emitted from petrol and diesel fuel used in vehicles has decreased. It should decrease further with the increased use of low-sulfur petrol and diesel.

8A Which fuel had the largest reduction in sulfur dioxide emissions, **in thousands of tonnes**, between 1990 and 2004?

1 coal

2 fuel oil

3 other petroleum products

4 gaseous fuels

4.9.1.4 How carbon dioxide decreased

Question 05 · continued November 2007 | CHY1A | Original Q8 | Legacy

8B This data suggests that emissions of sulfur dioxide between 1990 and 2004 . . .

1 decreased for all fuels.

2 decreased by more than 50% for all fuels.

3 decreased by 78% for all fuels except gaseous fuels.

4 decreased by more than 50% for all fuels except gaseous fuels.

8C Which reasonable prediction can be made from the evidence given at the beginning of this question?

1 Sulfur dioxide emissions will begin to increase in the future as the number of vehicles on our roads increases.

2 Overall, sulfur dioxide emissions are likely to continue to decrease.

3 Supplies of fuel oil will be used up in another twenty years.

4 Sulfur dioxide emissions from gaseous fuels will be greater than those from coal in the near future.

8D The data in the table was obtained by estimating the sulfur dioxide emissions from power stations, industrial plants, vehicles, etc.

Sulfur dioxide emissions in the UK could also be monitored by . . .

1 providing each vehicle with a digital readout of sulfur dioxide emitted.

2 measuring the sulfur dioxide concentrations in the air above the largest power stations and industrial plants.

3 measuring the sulfur dioxide concentrations in the air at a large number of sites spread across the UK.

4 measuring the sulfur content of all fuels before they are used.

4.9.1.4 How carbon dioxide decreased

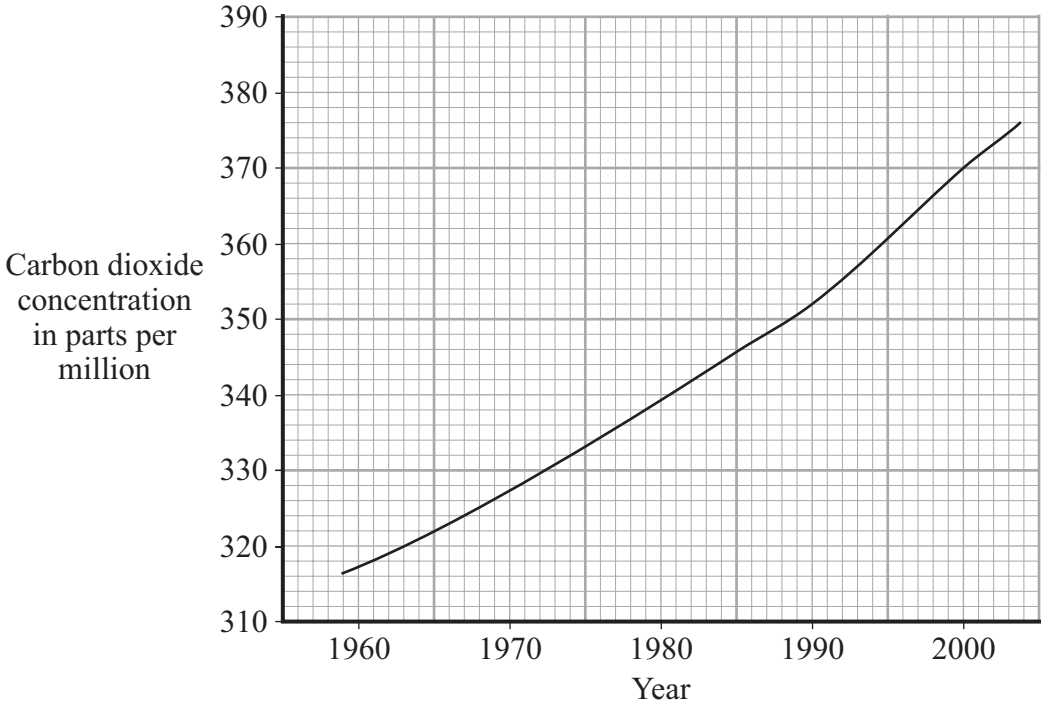
Question 06

November 2007 | CHY1B | Original Q9 | Legacy

QUESTION NINE

Measurements of carbon dioxide in the atmosphere have been made continuously for almost 50 years at the Mauna Loa Observatory, 4000 metres up a mountain in Hawaii.
This site is far enough away from any large carbon dioxide source to be a reliable measuring point.

Atmospheric carbon dioxide levels measured at Mauna Loa, Hawaii



9A What is the mean (average) rate of increase per year of carbon dioxide (in parts per million) in the atmosphere at Mauna Loa between 1990 and 2000?

1 1.8

2 18.0

3 352.0

4 370.0

9B The change in carbon dioxide concentration over the past 50 years is thought to be a result of . . .

1 increased volcanic activity.

2 an increase in the use of fossil fuels.

3 variations in the Sun's energy output.

4 an increase in ocean temperatures.

4.9.1.4 How carbon dioxide decreased

9C Many scientists think that there is a close link between atmospheric carbon dioxide levels and global warming.
Some political leaders have taken no action to reduce carbon dioxide emissions.

One possible reason is that . . .

1 restrictions on industrial development might result.

2 their countries have few oil reserves.

3 they do not think that scientists are qualified to make important judgements.

4 they do not think that global warming will affect their country.

9D Concerns about carbon dioxide levels and global warming have increased research and technical development in some areas.

Which of these has **not** been part of this development?

1 the use of ethanol as a fuel in cars

2 the use of diesel oil instead of petrol in cars

3 the use of vegetable oils as a fuel in cars

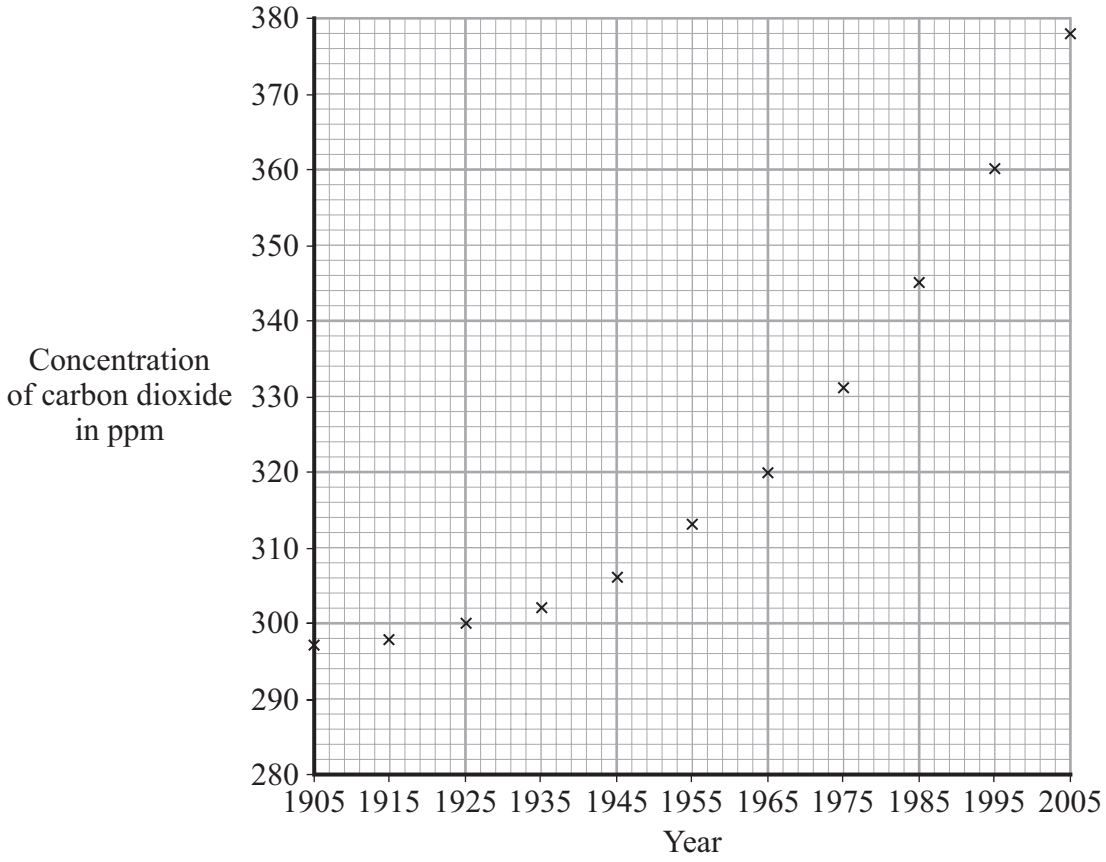
4 the development of electric cars

END OF TEST

4.9.1.4 How carbon dioxide decreased

Question 07

5 Global warming is thought to be happening because of the increased burning of fossil fuels. The concentration of carbon dioxide in the air from 1905 to 2005 has been calculated.



(a) Draw a line of best fit for these points. *(1 mark)*

(b) (i) What was the concentration of carbon dioxide in 1955?

..... ppm *(1 mark)*

(ii) In what year did the concentration of carbon dioxide reach 350 ppm?

.....

(1 mark)

4.9.1.4 How carbon dioxide decreased

Question 07 · continued

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(c) Use the graph to describe, in as much detail as you can, what happened to the concentration of carbon dioxide from 1905 to 2005.

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.....

.....

(2 marks)

5

4.9.1.4 How carbon dioxide decreased

Question 08

March 2008 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about gases found in the atmosphere.

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

A argon (noble gas)

B carbon dioxide

C nitrogen

D oxygen

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

4.9.1.4 How carbon dioxide decreased

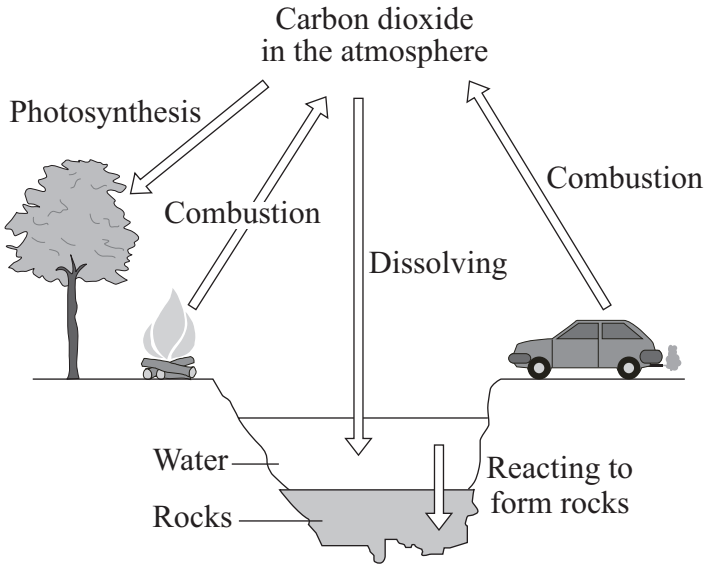
Question 09

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.

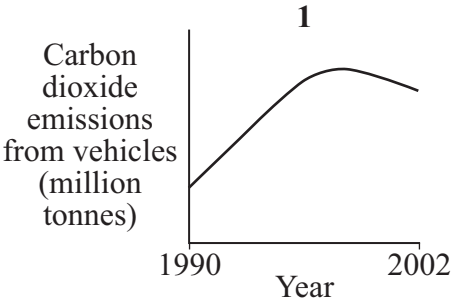
4 measuring the amount of carbon dioxide in the air near a busy motorway.

4.9.1.4 How carbon dioxide decreased

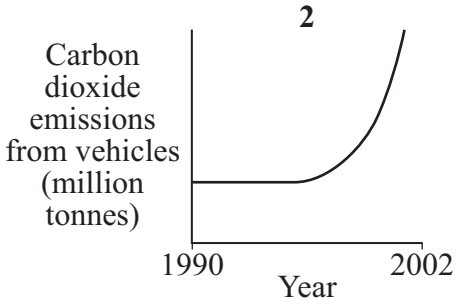
Question 09 · continued March 2008 | CHY1BP | Original Q9 | Legacy

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?

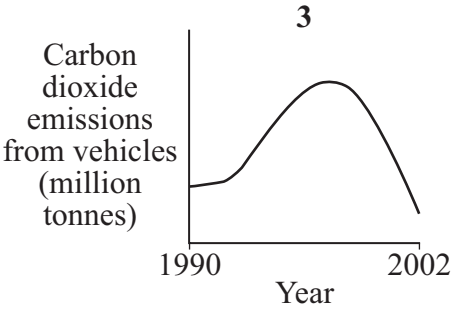
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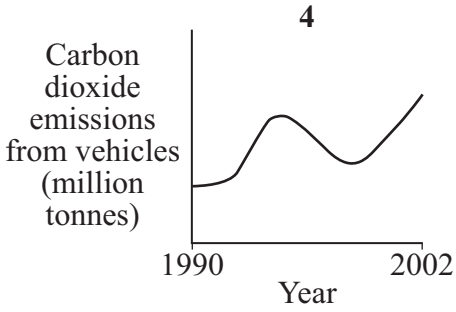
2



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

4.9.1.4 How carbon dioxide decreased

Question 10

June 2008 | CHY1AP | Original Q9 | Legacy

QUESTION NINE

Scientists are researching new catalysts to convert compounds in coal into small hydrocarbon molecules.

These small molecules can be used to make liquid fuels such as petrol.

9A Scientists are trying to develop processes that convert coal into liquid fuels, such as petrol, because . . .

1 they have found new supplies of catalysts.

2 oil reserves are running out quickly.

3 there is no alternative to using coal.

4 catalysts are being used up.

9B Petrol is made from small molecules and **not** large molecules because hydrocarbons with small molecules . . .

1 have a higher boiling point.

2 are more viscous.

3 are darker in colour.

4 ignite more easily.

9C Both petrol and coal produce carbon dioxide when burned.

To compare the volume of the gas produced by a sample of coal with the volume of gas produced by a sample of petrol, a control variable would be . . .

1 how much carbon dioxide is produced.

2 the amount of coal and petrol used.

3 the speed at which each fuel is set alight.

4 the time taken to burn all the fuel.

4.9.1.4 How carbon dioxide decreased

Question 10 · continued

9D Ethanol, made from plant material, is another liquid fuel used in cars.

Ethanol and petrol produce similar amounts of carbon dioxide when they burn.

Burning ethanol made from plant material, in cars, is thought to be less of an environmental problem than burning petrol.

This is because . . .

1 ethanol does **not** produce water when it burns.

2 using ethanol made from plants as a fuel does **not** change the amount of carbon dioxide in the atmosphere.

3 ethanol will burn without using oxygen.

4 in the car engine, only partial combustion of the ethanol occurs.

END OF TEST

4.9.1.4 How carbon dioxide decreased

Question 11

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** . . . .

4.9.1.4 How carbon dioxide decreased

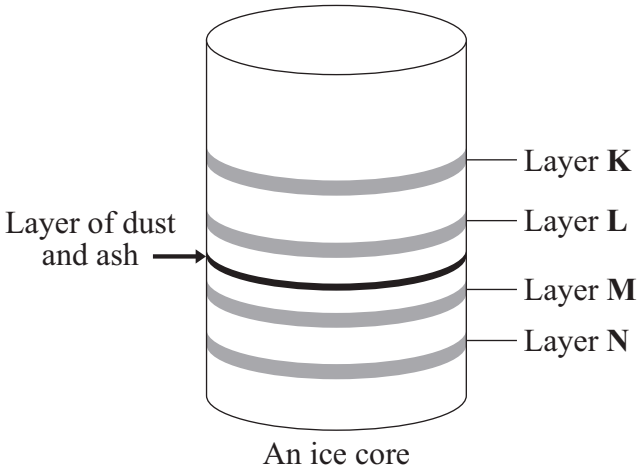
Question 12

November 2008 | CHY1BP | Original Q9 | Legacy

QUESTION NINE

The North Pole is situated on a thick sheet of ice, floating on sea water. There has never been vegetation here. The ice took a very long time to form.
Substances trapped in the ice can provide evidence about the atmosphere in the past.
Cores of ice are drilled out of the ice sheet and analysed.

One of the cores of ice is shown in the diagram.



Layer	Approximate age of the ice in years	Carbon dioxide gas content in ppm
K	100	850
L	300	525
M	500	520
N	700	518

9A There was a large amount of carbon dioxide gas in the atmosphere 100 years ago.

An explanation for this is . . .

1 an increase in global warming.

2 that carbon dioxide was lost from the ice over time.

3 the increased burning of fossil fuels.

4 that plants started to release more carbon dioxide as the Earth warmed up.

4.9.1.4 How carbon dioxide decreased

Question 12 · continued

9B Which statement best describes the variation of carbon dioxide gas in the four layers?

1 There is a slow steady rise from **N** to **K**.

2 There is no overall pattern.

3 It is constant from **N** to **L** followed by a sharp rise in **K**.

4 There is a very slow rise from **N** to **L** followed by a sharp rise in **K**.

9C What is the most likely reason why a layer of dust and ash is found between layers **L** and **M**?

1 Explorers spilled dust and ash in the area.

2 The dust and ash were blown here from elsewhere.

3 There was a forest fire here.

4 There was volcanic activity 300 years ago.

9D The age of the ice could be estimated by . . .

1 chemical analysis of the dust and ash layer and linking it with a known historical event about 400 years ago.

2 finding fossil plants and relating them to samples found elsewhere.

3 comparing the ice core with others taken from near the North Pole.

4 comparing the ice core with others from around the world.

END OF TEST

4.9.1.4 How carbon dioxide decreased

Question 13

June 2009 | CHY1AP | Original Q6 | Legacy

QUESTION SIX

Hybrid cars have both battery-powered motors and petrol engines. Hybrid cars have been developed so they have reduced carbon dioxide emissions when compared with petrol and diesel cars.

Some figures from manufacturers' tests are shown in the table.

Hybrid car	Price	Fuel economy in km per litre of petrol	Carbon dioxide emissions in g per km
K	£18 000	21.6	109
L	£20 000	23.1	104
M	£11 000	26.1	99
N	£16 000	27.1	94

6A The best way to obtain accurate figures for the amount of carbon dioxide emitted by the cars is to drive each car . . .

1 100 m.

2 1 km.

3 1 km five times, and take the highest value.

4 1 km five times, and take an average value.

6B For these cars, as the fuel economy in km per litre of petrol increases, . . .

1 the carbon dioxide emitted by the cars increases.

2 the carbon dioxide emitted by the cars decreases.

3 the cost of the cars increases.

4 the cars use more petrol per km.

4.9.1.4 How carbon dioxide decreased

Question 13 · continued June 2009 | CHY1AP | Original Q6 | Legacy

6C An independent motoring organisation tested the same cars. The values obtained for carbon dioxide emissions were a lot higher than those quoted by the manufacturers.

These values could be considered to be more reliable because the independent motoring organisation . . .

1 is **not** involved in selling cars.

2 is more concerned about environmental issues.

3 used equipment with a greater range.

4 is more likely to be biased.

6D One environmental advantage that a petrol hybrid car has over a conventional petrol car is that . . .

1 when the battery is working, no energy is being used.

2 the addition of a battery makes it lighter.

3 when only the battery is working, no carbon dioxide is being emitted.

4 the car will produce more sulfur dioxide.

4.9.1.4 How carbon dioxide decreased

Question 14

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.

.....

.....

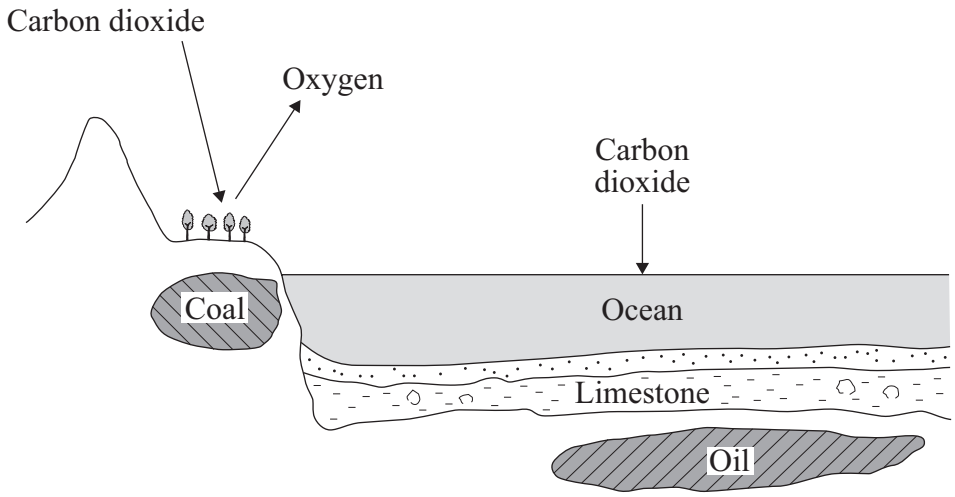
(1 mark)

4.9.1.4 How carbon dioxide decreased

Question 14 · 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

4.9.1.4 How carbon dioxide decreased

Question 15

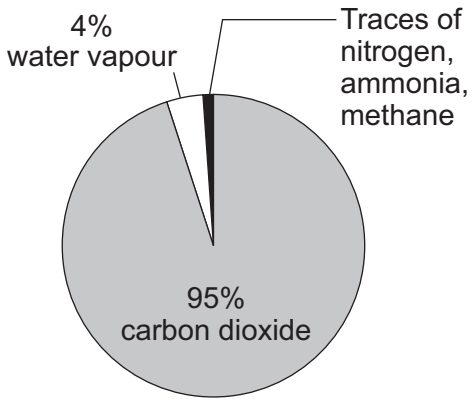
June 2010 | CHY1F | Original Q6 | Legacy

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.

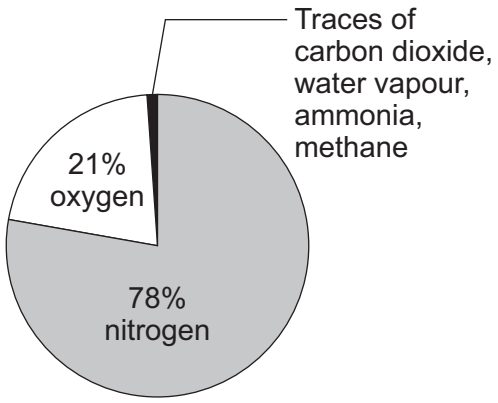
The pie charts show the approximate percentages of gases in the Earth's early atmosphere and in the Earth's atmosphere today.

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.

.....

.....

.....

.....

(2 marks)

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

1 .....

.....

2 .....

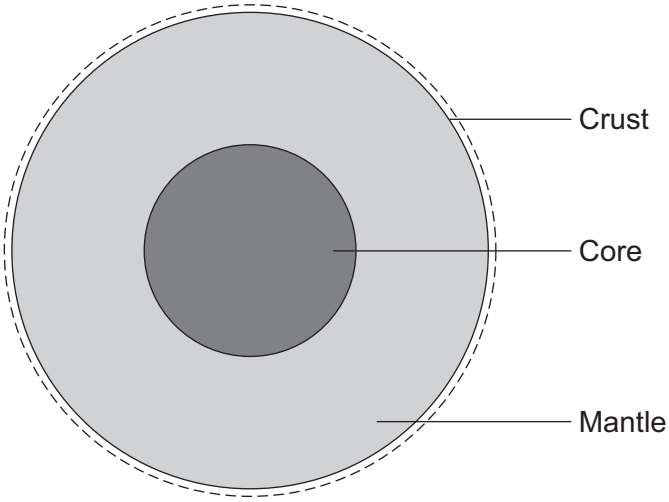
.....

(2 marks)

4.9.1.4 How carbon dioxide decreased

Question 15 · 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

4.9.1.4 How carbon dioxide decreased

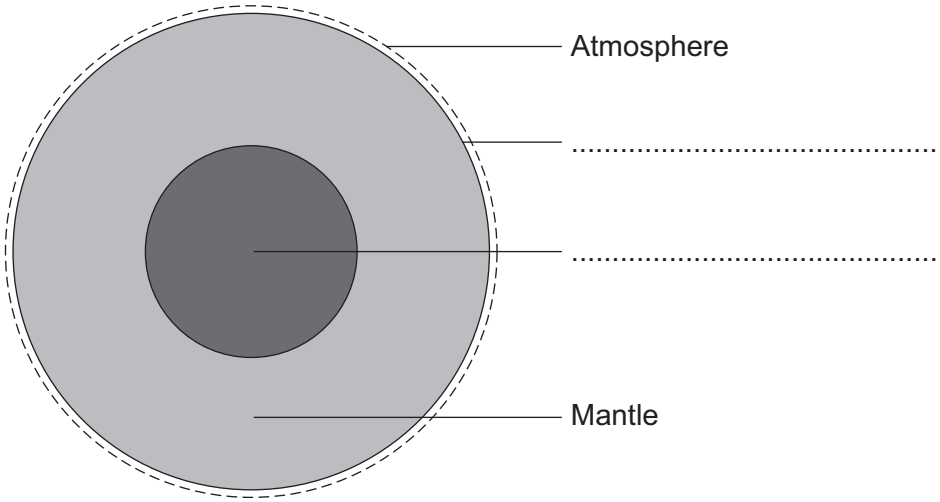
Question 16

January 2011 | CHY1F | Original Q3 | Legacy

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)

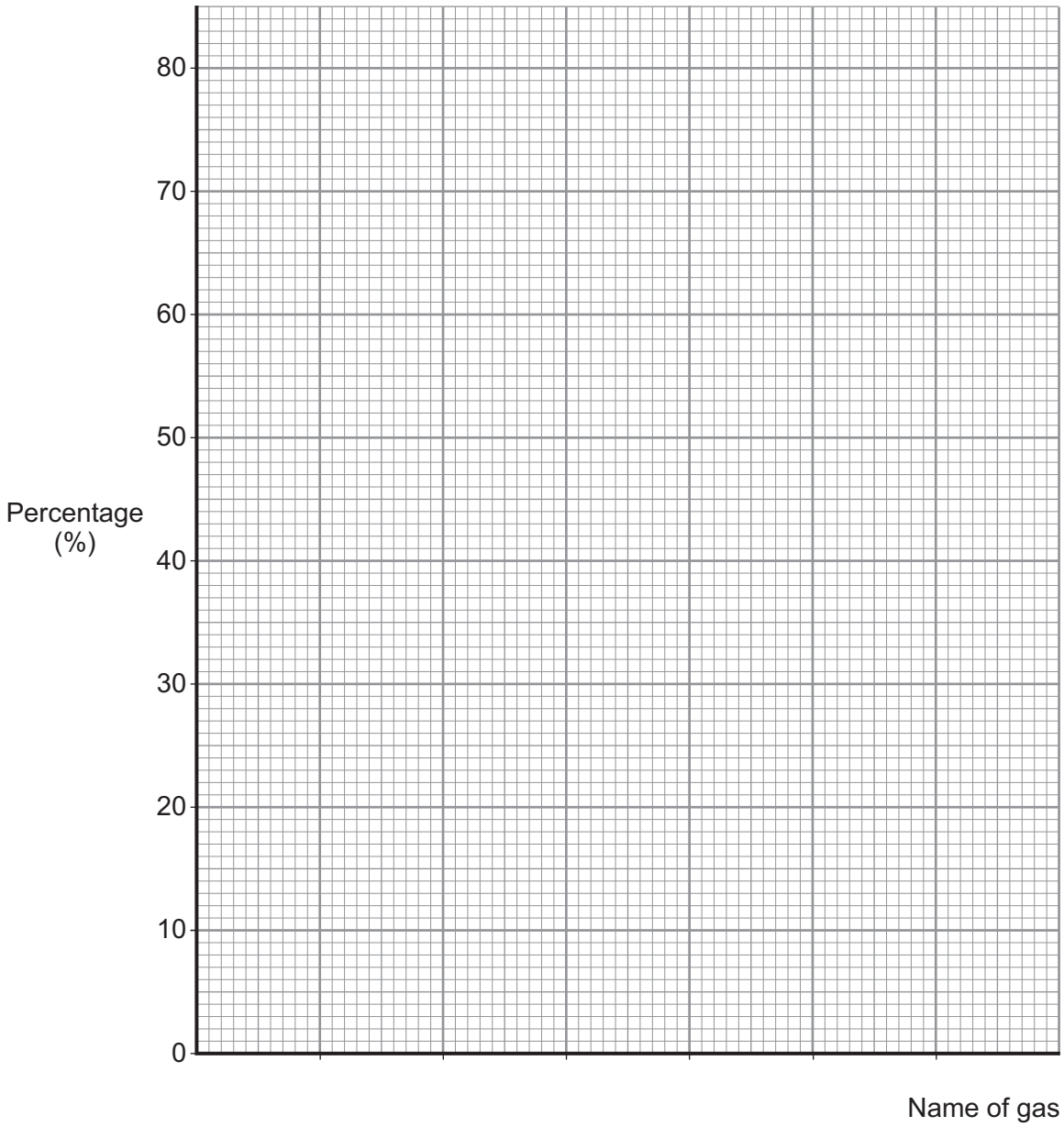
3 (b) The data in the table shows the percentages of the gases in the Earth's atmosphere.

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

4.9.1.4 How carbon dioxide decreased

Question 16 · continued

Present the data in the table on the grid below.



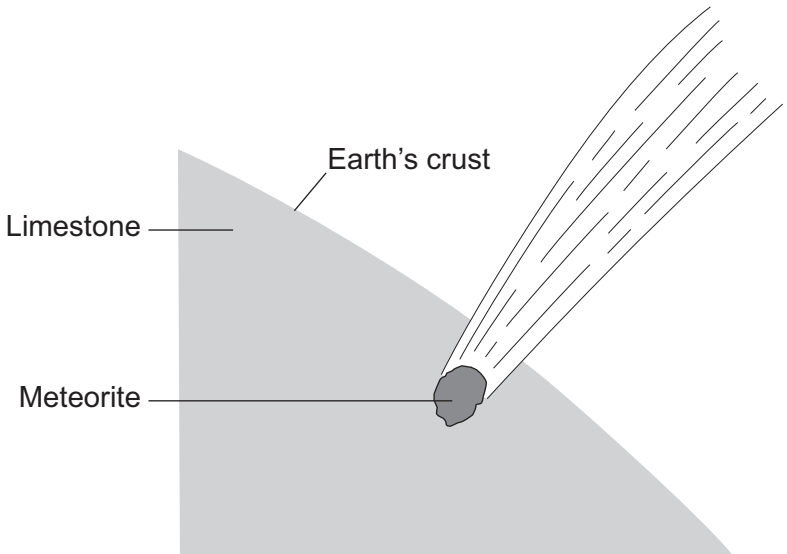
(3 marks)

Question 3 continues on the next page

4.9.1.4 How carbon dioxide decreased

Question 16 · 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

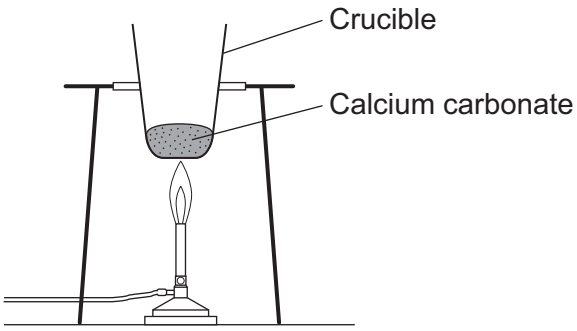
4.9.1.4 How carbon dioxide decreased

Question 17

June 2011 | CHY1AP | Original Q7 | Legacy

QUESTION SEVEN

A student investigated the change in mass when two metal carbonates were heated.
He heated 4.00 g of calcium carbonate in an open crucible. He measured the mass of crucible and contents every minute for 6 minutes.



He then repeated the whole experiment in the same way but used 4.00 g of copper carbonate in the same crucible.

The student's results are shown in the table.

	Time in minutes	0	1	2	3	4	5	6
Calcium carbonate	Mass of crucible and contents in g	24.00	23.02	22.50	22.35	22.31	22.24	22.24
Copper carbonate	Mass of crucible and contents in g	24.00	23.32	22.82	22.58	22.58	22.58	22.58

7A The results show that . . .

1 both carbonates were fully decomposed after 3 minutes.

2 copper carbonate showed the larger loss in mass after 6 minutes.

3 copper carbonate was the first to be fully decomposed.

4 neither carbonate was fully decomposed after 6 minutes.

4.9.1.4 How carbon dioxide decreased

Question 17 · continued June 2011 | CHY1AP | Original Q7 | Legacy

7B The change in mass in both experiments is because carbon dioxide gas is lost from the crucible.

During which period of time was most carbon dioxide lost?

1 0 – 1 minutes

2 1 – 2 minutes

3 2 – 3 minutes

4 5 – 6 minutes

7C The student could find a more precise time for the end of each reaction by . . .

1 heating larger masses of the calcium and copper carbonates.

2 measuring the mass of the crucible and contents every 30 seconds.

3 heating the carbonates in a larger crucible.

4 measuring the mass of the crucible and contents for another 3 minutes.

7D One variable that is difficult to control in the experiment is . . .

1 the mass of the crucible.

2 the masses of the calcium carbonate and copper carbonate.

3 the times for which the calcium carbonate and copper carbonate are heated.

4 the temperature of the crucible.

4.9.1.4 How carbon dioxide decreased

Question 18

January 2012 | CH1FP | Original Q6 | Legacy

6 A mixture of petrol and air is burned in a car engine.
Petrol is a mixture of alkanes. Air is a mixture of gases.

The tables give information about the composition of petrol and the composition of air.

Petrol	
Alkane	**Formula**
hexane	C_6H_{14}
heptane	
octane	C_8H_{18}
nonane	C_9H_{20}
decane	$C_{10}H_{22}$

Air	
Gas	**Percentage (%)**
nitrogen	78
oxygen	21
carbon dioxide	0.035
Small amounts of other gases and water vapour	

6 (a) Use the information above to answer these questions.

6 (a) (i) Give the formula for heptane.

.....

(1 mark)

6 (a) (ii) Complete the general formula of alkanes.
n = number of carbon atoms

$$C_nH$$

(1 mark)

6 (b) Alkanes in petrol burn in air.
The equations represent two reactions of hexane burning in air.

Reaction 1 $2C_6H_{14} + 19O_2 \rightarrow 12CO_2 + 14H_2O$

Reaction 2 $2C_6H_{14} + 13O_2 \rightarrow 12CO + 14H_2O$

Reaction 2 produces a different carbon compound to **Reaction 1**.

6 (b) (i) Name the carbon compound produced in **Reaction 2**.

.....

(1 mark)

6 (b) (ii) Give a reason why the carbon compounds produced are different.

.....

.....

(1 mark)

Question 6 continues on the next page

4.9.1.4 How carbon dioxide decreased

Question 18 · continued

6 (c) The table shows the percentages of some gases in the exhaust from a petrol engine.

Name of gas	Percentage (%)
nitrogen	68
carbon dioxide	15
carbon monoxide	1.0
oxygen	0.75
nitrogen oxides	0.24
hydrocarbons	0.005
sulfur dioxide	0.005
other gases	

6 (c) (i) What is the percentage of the other gases in the table?

.....

(1 mark)

6 (c) (ii) What is the name of the compound that makes up most of the other gases?

.....

(1 mark)

6 (c) (iii) Give a reason why sulfur dioxide is produced in a petrol engine.

.....

.....

(1 mark)

6 (c) (iv) State how nitrogen oxides are produced in a petrol engine.

.....

.....

.....

.....

(2 marks)

4.9.1.4 How carbon dioxide decreased

Question 18 · continued

6 (d) Many scientists are concerned about the carbon dioxide released from burning fossil fuels such as petrol.

Explain why.

.....

.....

.....

.....

(2 marks)

11

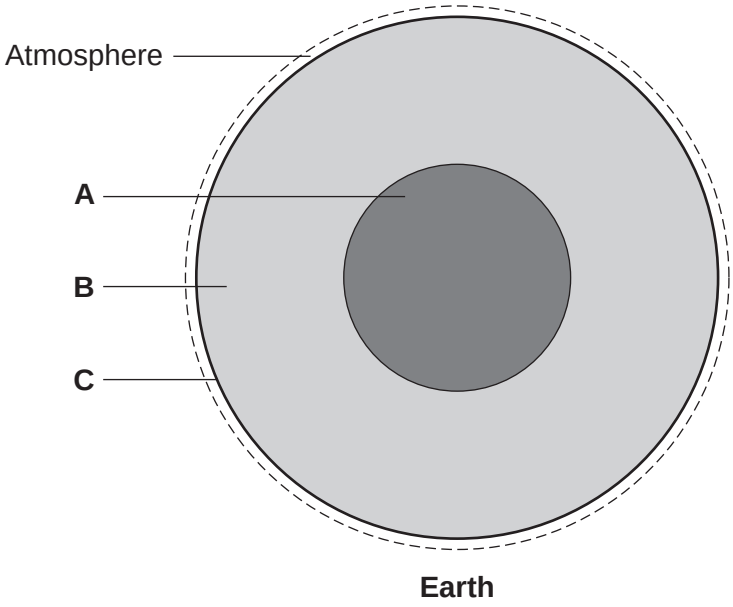
Turn over for the next question

4.9.1.4 How carbon dioxide decreased

Question 19

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)

4.9.1.4 How carbon dioxide decreased

Question 19 · 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)

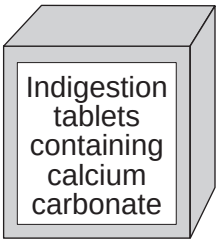
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4.9.1.4 How carbon dioxide decreased

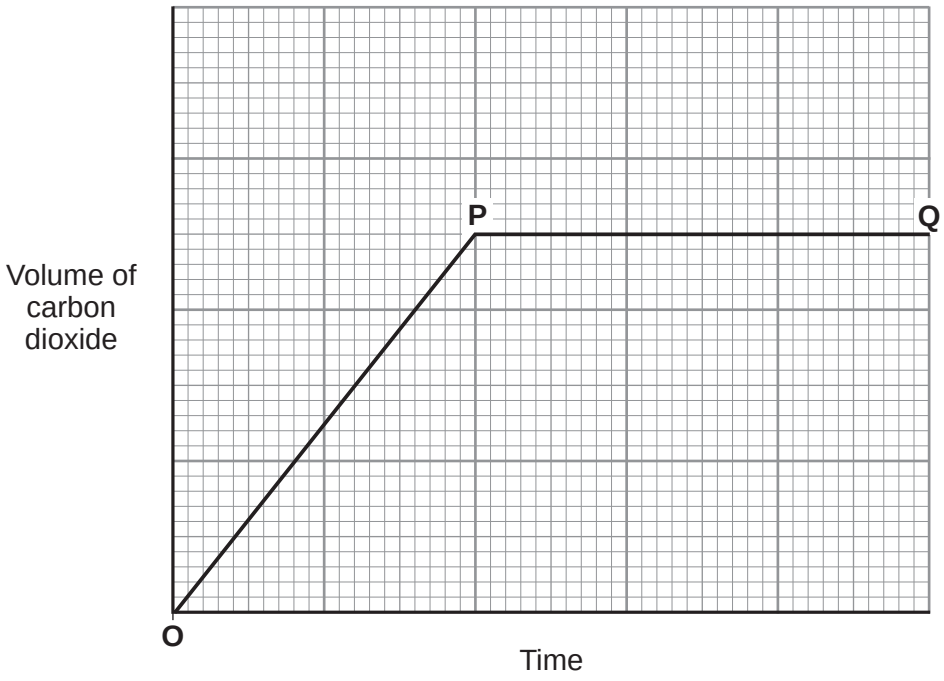
Question 20

June 2012 | CH1FP | Original Q4 | Legacy

4 Human stomachs contain hydrochloric acid.
Stomach ache can be caused by too much acid in the stomach.
Indigestion tablets can be used to reduce the amount of acid in the stomach.



4 (a) The graph shows how the volume of carbon dioxide produced changes with time, after some calcium carbonate is added to hydrochloric acid.



4 (a) (i) Complete the sentence to explain what happens between **O** and **P**.

Between **O** and **P** the calcium carbonate and hydrochloric acid ..... .

(1 mark)

4 (a) (ii) Complete the sentence to explain what happens at **P**.

At **P** the calcium carbonate and hydrochloric acid .....

because .....

(2 marks)

4.9.1.4 How carbon dioxide decreased

Question 20 · continued

4 (a) (iii) Describe the test for carbon dioxide gas.

Test .....

Result of the test .....

(2 marks)

4 (b) Calcium carbonate is found in limestone.
Limestone is removed from the ground by quarrying.



Tick (✓) **one** advantage and tick (✓) **one** disadvantage of quarrying limestone.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
Quarrying limestone destroys the shells and skeletons of marine organisms that formed the limestone.		
Quarrying limestone releases dust, and lorries release carbon dioxide from burning diesel fuel.		
Quarrying limestone provides building materials, employment and new road links.		
Quarrying limestone removes ores from the ground.		

(2 marks)

7

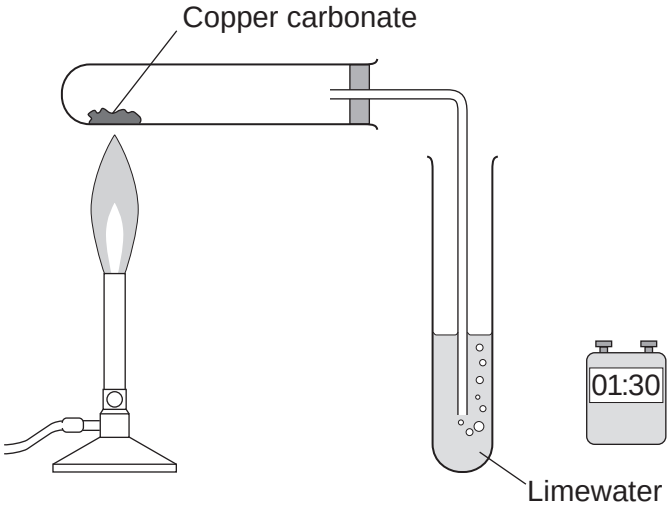
4.9.1.4 How carbon dioxide decreased

Question 21

January 2013 | CH1FP | Original Q6 | Legacy

6 Carbon dioxide is produced when copper carbonate is heated.

A student investigated heating copper carbonate.
The student used the apparatus to measure how long it took for carbon dioxide to be produced.
The student also noted what happened during each minute for three minutes.



6 (a) The student used changes to the limewater to measure how long it took for carbon dioxide to be produced.

Describe how.

.....

.....

.....

.....

(2 marks)

4.9.1.4 How carbon dioxide decreased

Question 21 · continued

6 (b) The student wrote down her observations.

Time interval in minutes	Observations
Between 0 and 1	A slow release of gas bubbles. The limewater did not change. The solid in the test tube was green.
Between 1 and 2	A fast release of gas bubbles. The limewater changed at 1 minute 10 seconds.
Between 2 and 3	No release of gas bubbles. The solid in the test tube was black.

6 (b) (i) Suggest the reason for the student's observations between 0 and 1 minute.

.....

.....

.....

.....

.....

(2 marks)

6 (b) (ii) Explain the student's observations between 1 and 2 minutes.

.....

.....

.....

.....

(2 marks)

6 (b) (iii) Explain the student's observations between 2 and 3 minutes.

.....

.....

.....

.....

(2 marks)

8

4.9.1.4 How carbon dioxide decreased

Question 22

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

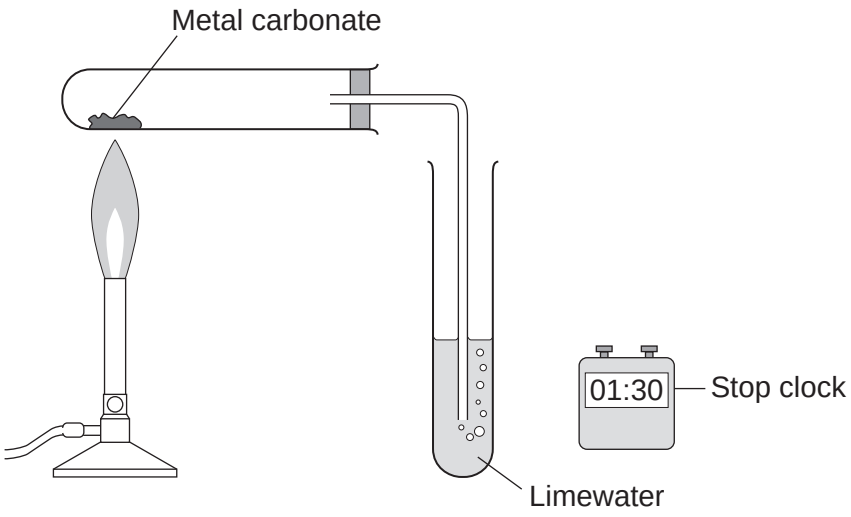
(1 mark)

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.

4.9.1.4 How carbon dioxide decreased

Question 22 · continued June 2013 | CH1FP | Original Q3 | Legacy

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

4.9.1.4 How carbon dioxide decreased

Question 23

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]

4.9.1.4 How carbon dioxide decreased

Question 23 · 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

4.9.1.4 How carbon dioxide decreased

Question 24

June 2015 | CH1FP | Original Q4 | Legacy

4 Polymers and fuels can be produced from crude oil and from plants.

4 (a) There are many types of polymer. Each polymer has different properties.

4 (a) (i) Poly(chloroethene) is a polymer produced from crude oil.

Why is poly(chloroethene) used for water pipes?

[2 marks]

Tick (✓) **two** boxes.

- The polymer is not biodegradable. ☐
- The polymer is made from crude oil. ☐
- The polymer decomposes when heated. ☐
- The polymer is waterproof. ☐
- The polymer does not conduct electricity. ☐

4 (a) (ii) Some shopping bags are made from a biopolymer.

Biopolymers are produced from plants.

Suggest **one** advantage of using a biopolymer.

[1 mark]

.....

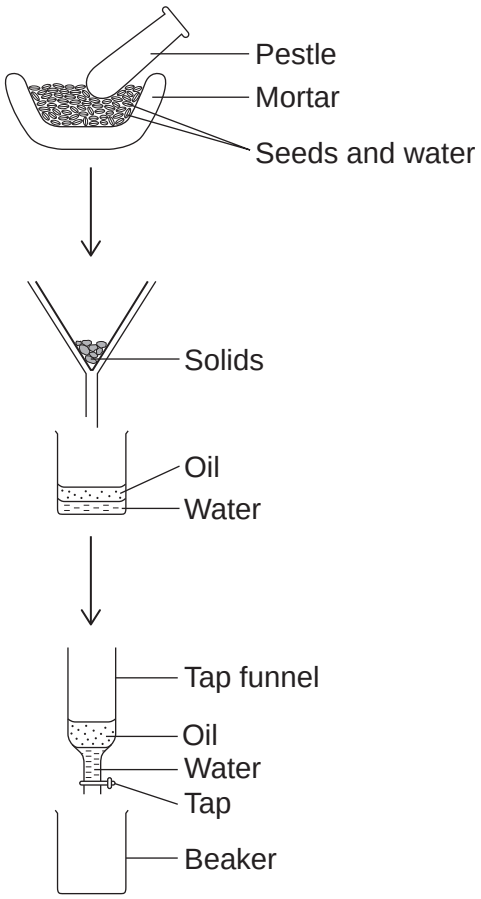
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4.9.1.4 How carbon dioxide decreased

Question 24 · continued

4 (b) Some plants have seeds that contain vegetable oils.
The flow diagram in **Figure 6** shows how the oil can be extracted.

Figure 6



4 (b) (i) Use the correct word from the box to complete each sentence.

[2 marks]

burning	**crushing**	**distilling**	**filtering**

Oil is released from the seeds by..... .

Solids are removed from the oil and water by ..... .

4 (b) (ii) Describe how the tap funnel can be used to separate the oil from the water.

[2 marks]

.....

.....

.....

.....

4.9.1.4 How carbon dioxide decreased

Question 24 · continued

4 (c) Vegetable oils are used as foods and fuels.

4 (c) (i) Why are vegetable oils important foods and fuels?

[1 mark]

Tick (✓) **one** box.

They are used as emulsifiers. ☐

They have high boiling points. ☐

They provide a lot of energy. ☐

4 (c) (ii) Burning fossil fuels made from crude oil increases the overall percentage of carbon dioxide in the atmosphere.

Burning biofuels made from vegetable oil does **not** increase the overall percentage of carbon dioxide in the atmosphere.

Explain why.

[2 marks]

.....

.....

.....

.....

10

4.9.1.4 How carbon dioxide decreased

Question 25

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.

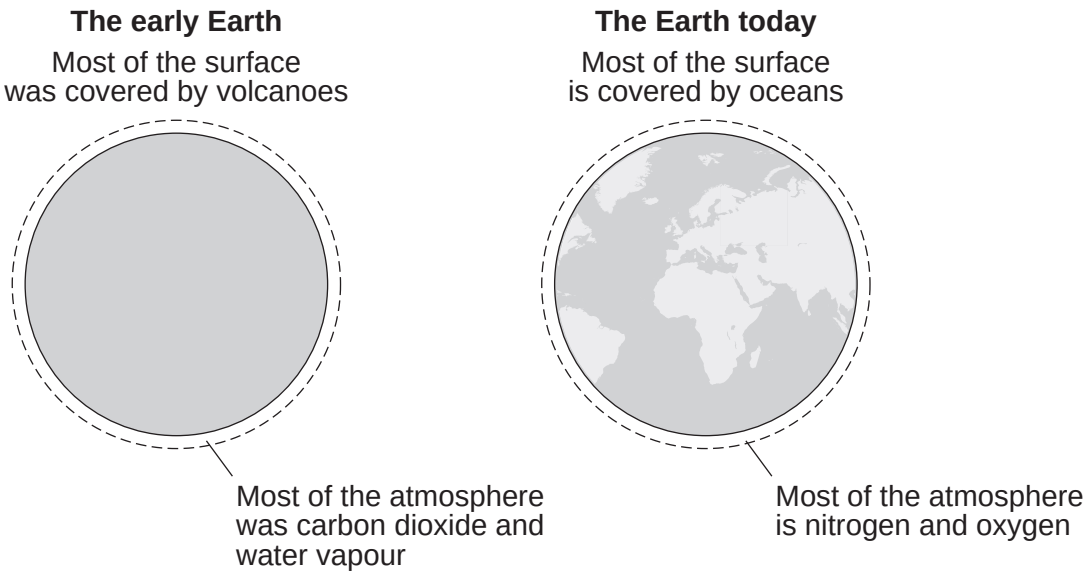
[1 mark]

.....

.....

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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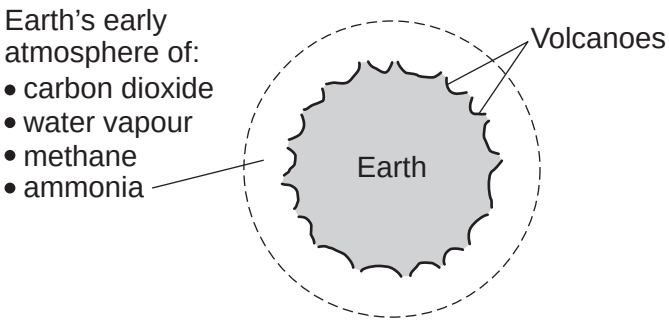
4.9.1.4 How carbon dioxide decreased

Question 26

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

4.9.1.4 How carbon dioxide decreased

Question 26 · 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.

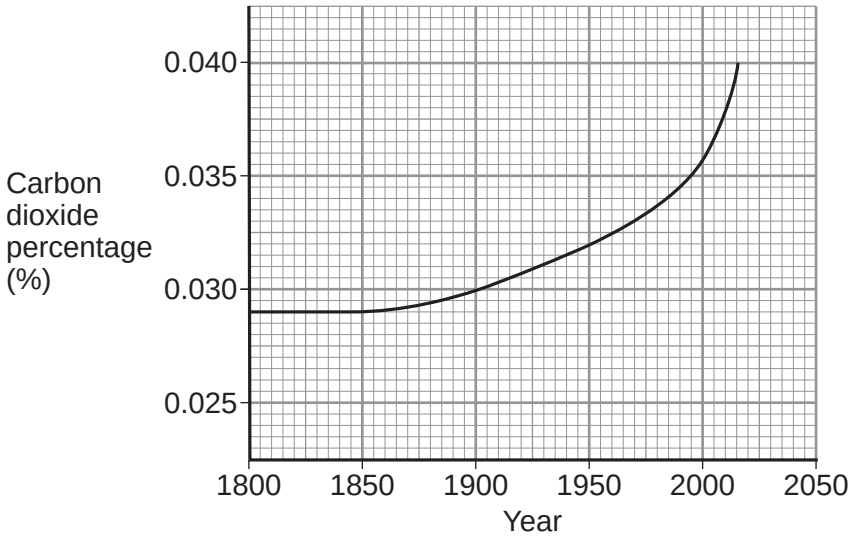
- about 40% ☐
- about 60% ☐
- about 80% ☐

4.9.1.4 How carbon dioxide decreased

Question 26 · 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

4.9.1.4 How carbon dioxide decreased

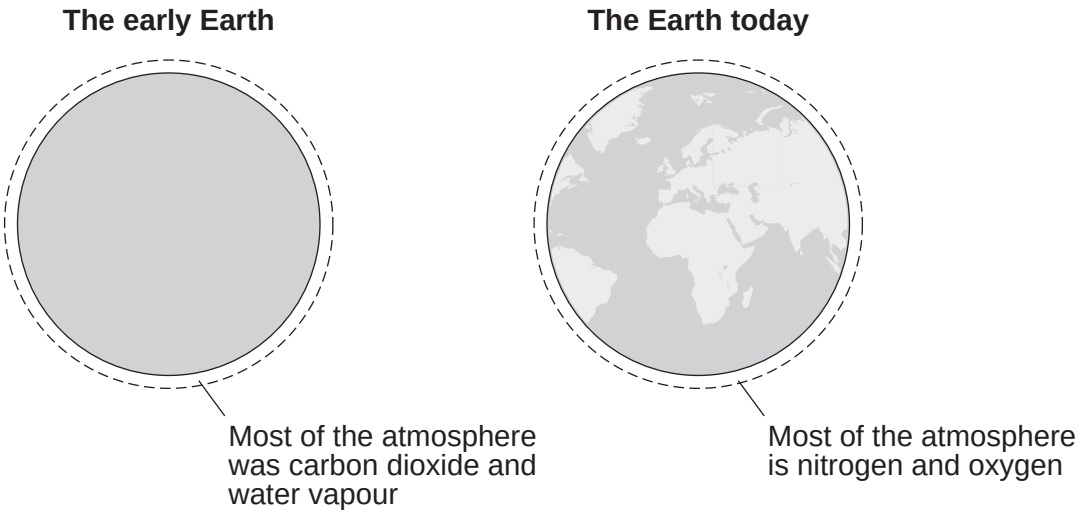
Question 27

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]

_____

4.9.1.4 How carbon dioxide decreased

Question 27 · 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

4.9.1.4 How carbon dioxide decreased

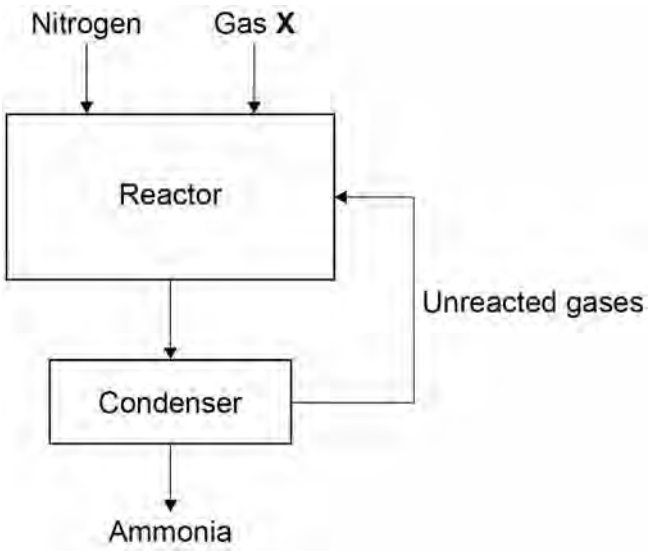
Question 28

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]

_____

_____

4.9.1.4 How carbon dioxide decreased

Question 28 · 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]

4.9.1.4 How carbon dioxide decreased

Question 28 · 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]

4.9.1.4 How carbon dioxide decreased

Question 29

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 = _____ %

4.9.1.4 How carbon dioxide decreased

Question 29 · 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 ☐

4.9.1.4 How carbon dioxide decreased

Question 29 · 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

4.9.1.4 How carbon dioxide decreased

Question 30

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) ☐

4.9.1.4 How carbon dioxide decreased

Question 30 · 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.

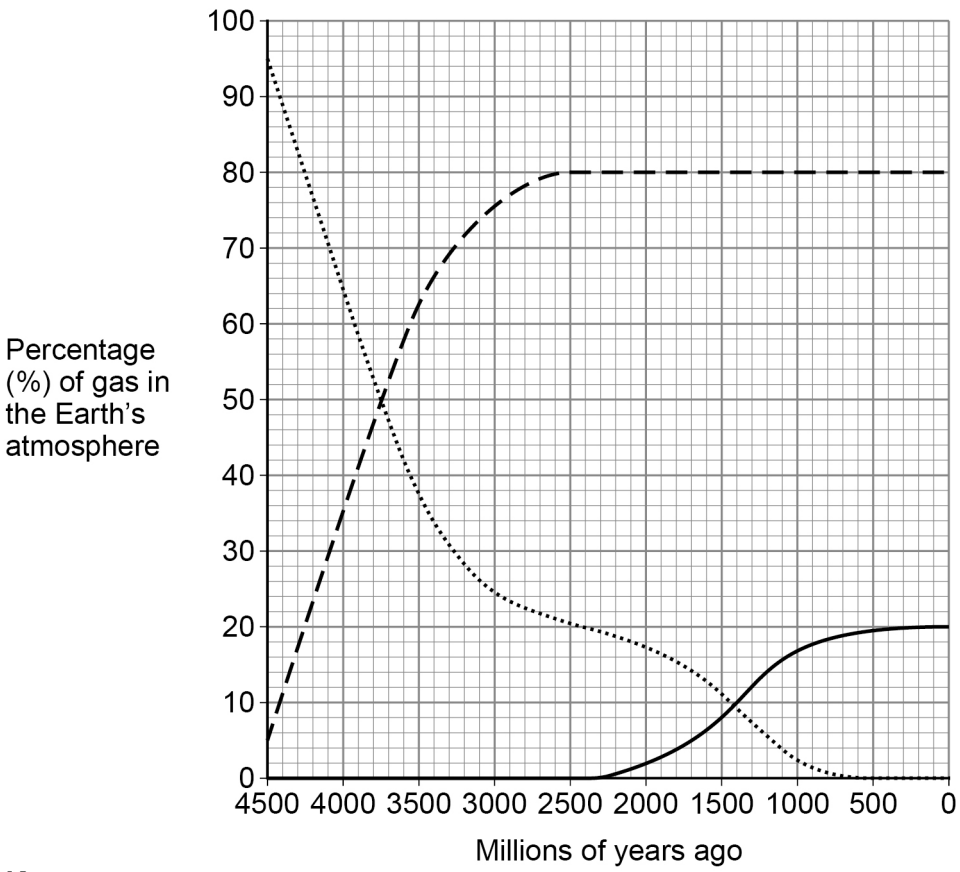
- Burning fossil fuels ☐
- Dissolving carbon dioxide in oceans ☐
- Eruption of volcanoes ☐
- Evolution of animals ☐
- Formation of sedimentary rocks ☐

4.9.1.4 How carbon dioxide decreased

Question 30 · 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

4.9.1.4 How carbon dioxide decreased

Question 30 · 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

4.9.1.4 How carbon dioxide decreased

Question 31

0 2 This question is about burning coal.

A power station has four coal-burning furnaces.

Each furnace burns 3000 kg of coal per minute.

Table 1 shows some information about this coal burning power station

Table 1

Number of furnaces in use	Mass of coal burned per minute in kilograms	Mass of sulfur dioxide produced per minute in kilograms	Mass of carbon dioxide produced per minute in kilograms
0	0	0	0
1	3000	100	7000
2	6000	200	14 000
3	9000	300	21 000
4	12 000	400	28 000

0 2 . 1 Carbon dioxide is a greenhouse gas.

What is the effect on the rate of global climate change of using more furnaces in this power station?

Complete the sentence.

Choose the answer from the box.

[1 mark]

decreases	**stays the same**	**increases**

Use **Table 1**.

The rate of global climate change _____.

4.9.1.4 How carbon dioxide decreased

Question 31 · continued

0 2 . 2 7000 kg of carbon dioxide are produced when 3000 kg of coal are burned.

Calculate the mass of carbon dioxide produced when 1 kilogram of coal is burned.

[2 marks]

Mass of carbon dioxide = _____ kg

0 2 . 3 Complete the sentence.

[1 mark]

Sulfur dioxide causes an environmental effect called acid _____ .

Question 2 continues on the next page

4.9.1.4 How carbon dioxide decreased

Question 31 · continued

Table 1 is repeated below.

Table 1

Number of furnaces in use	Mass of coal burned per minute in kilograms	Mass of sulfur dioxide produced per minute in kilograms	Mass of carbon dioxide produced per minute in kilograms
0	0	0	0
1	3000	100	7000
2	6000	200	14 000
3	9000	300	21 000
4	12 000	400	28 000

0 2 . 4 **Figure 3** shows how the mass of sulfur dioxide produced per minute varies with the mass of coal burned per minute.

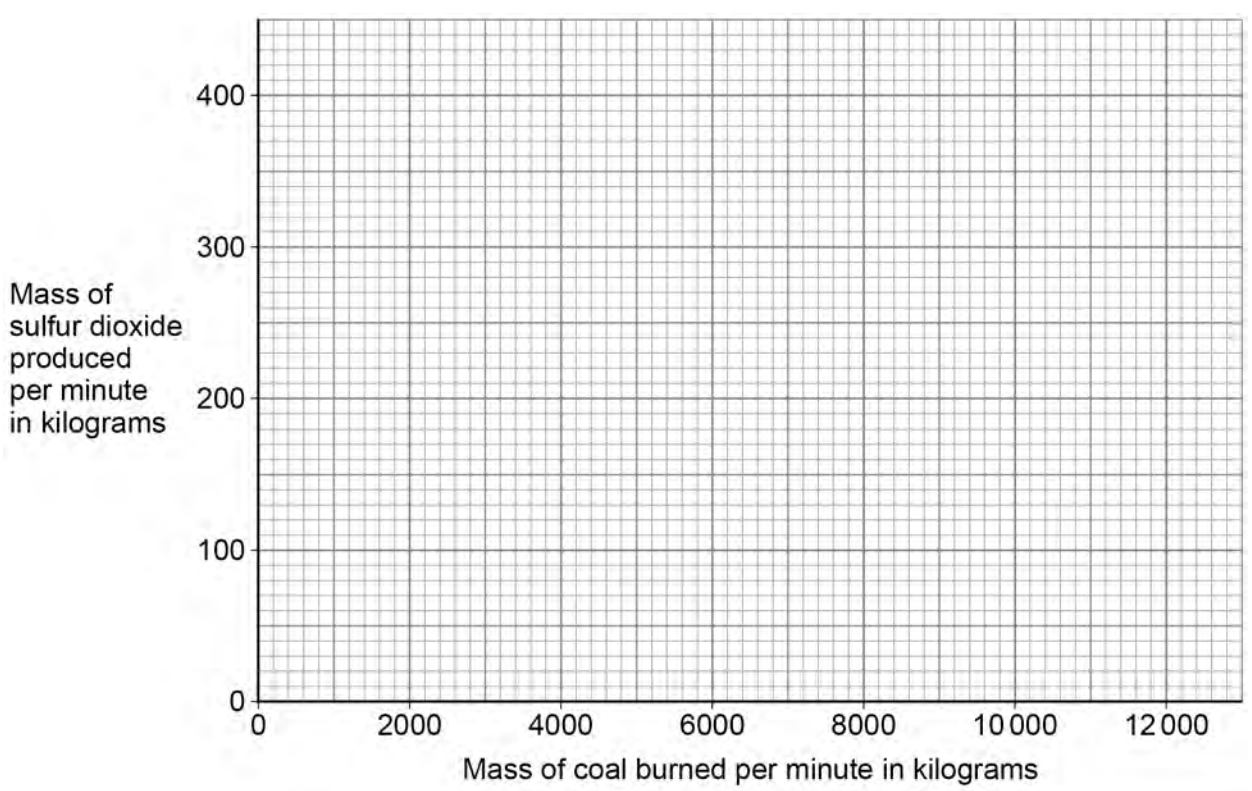
Complete **Figure 3**.

You should:

- plot data from **Table 1** on **Figure 3**
- draw a line of best fit.

[3 marks]

Figure 3



4.9.1.4 How carbon dioxide decreased

Question 31 · continued

0 2 . 5 Complete the sentence.

Use **Table 1** and **Figure 3**.

[1 mark]

As the mass of coal burned per minute increases, the mass of sulfur dioxide produced per minute _____ .

0 2 . 6 This power station also releases particulates into the air.

Complete the sentence.

[1 mark]

The release of particulates into the air causes global _____ .

9

Turn over for the next question

4.9.1.4 How carbon dioxide decreased

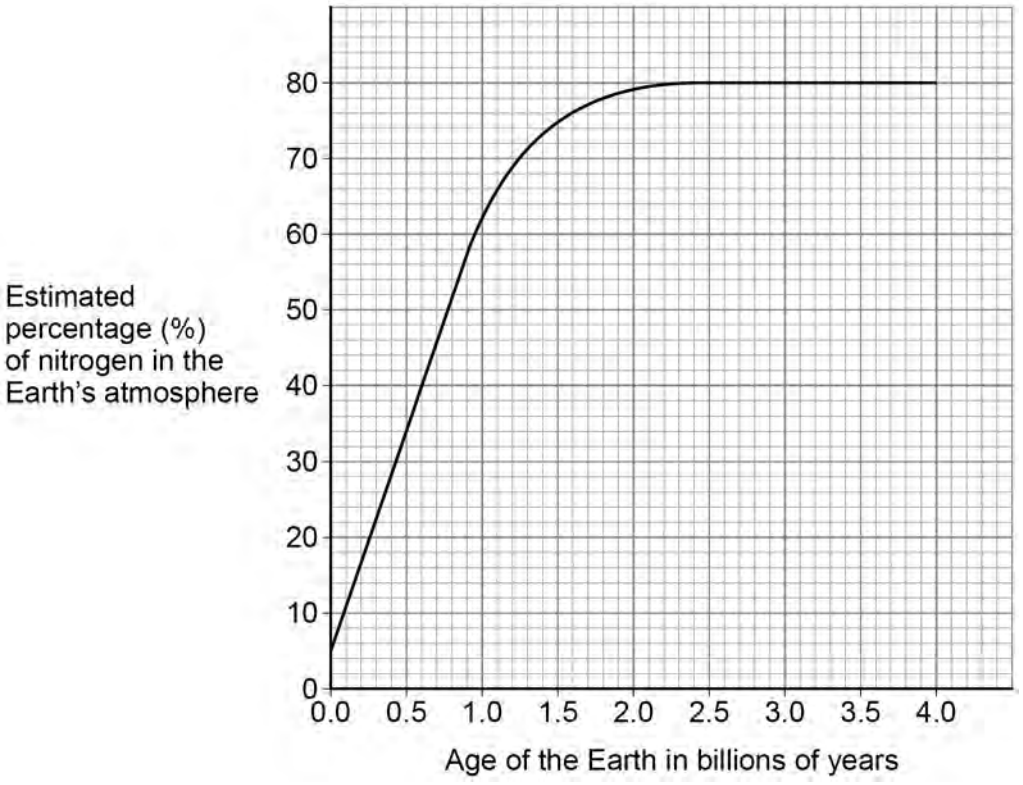
Question 32

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

4.9.1.4 How carbon dioxide decreased

Question 32 · continued June 2024 | 8462/2F | Original Q4

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 _____.

4.9.1.4 How carbon dioxide decreased

Question 32 · 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

4.9.1.4 How carbon dioxide decreased

Question 32 · 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 _____ .

4.9.1.4 How carbon dioxide decreased

Question 32 · continued

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

[1 mark]

Tick (✓) **one** box.

1 ☐

2 ☐

3 ☐

4 ☐

13

Turn over for the next question

4.9.1.4 How carbon dioxide decreased

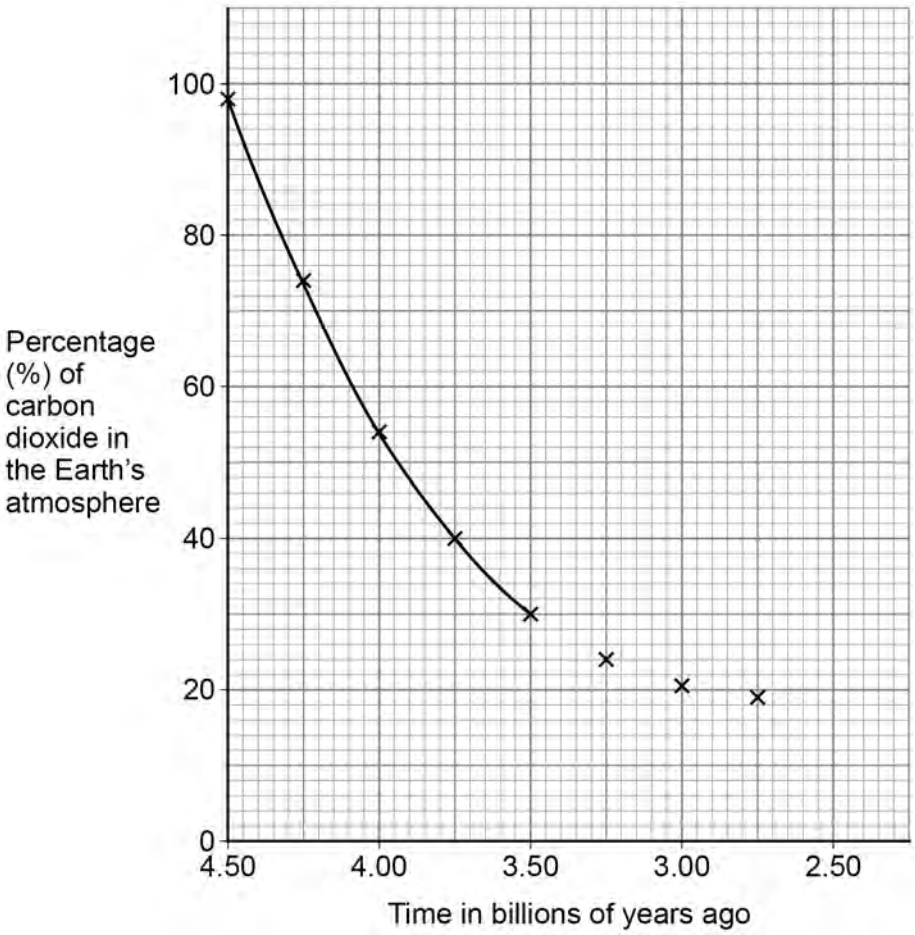
Question 33

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]

4.9.1.4 How carbon dioxide decreased

Question 33 · 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

4.9.1.4 How carbon dioxide decreased

Question 33 · 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. ☐

4.9.1.4 How carbon dioxide decreased

Question 33 · continued

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

Use **Table 2**.

[1 mark]

Tick (✓) **one** box.

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

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

[2 marks]

Tick (✓) **two** boxes.

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

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

[1 mark]

_____

8