AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.10.3.1

Corrosion and its prevention

Past-paper questions

Tier	**Foundation**
Question groups	**38**
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.

4.10.3.1 Corrosion and its prevention

Question 01

January 2007 | CHY1F | Original Q6 | Legacy

6 (a) Two hundred years ago, scientists thought that the Earth was about 400 million years old. This estimate came from the idea that the centre of the Earth was still molten. More recently, measurement of radioactivity in rocks has shown that the Earth is much older than 400 million years.

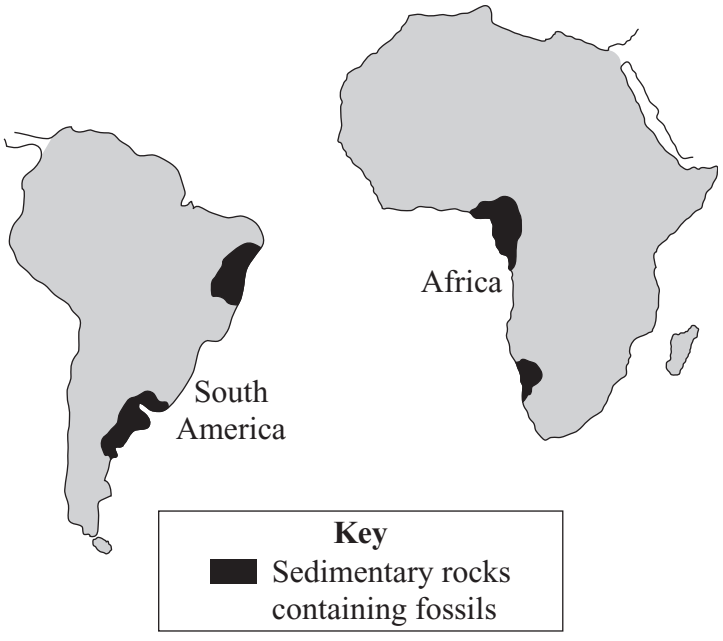
Suggest **one** reason why scientists now know that the Earth is much older than 400 million years.

.....

.....

(1 mark)

(b) About one hundred years ago there was a scientist called Alfred Wegener. He found evidence that the continents, such as South America and Africa, had once been joined and then drifted apart.



Use the diagram to suggest **two** pieces of evidence that could be used to show that the continents had once been joined.

1 .....

.....

2 .....

.....

(2 marks)

4.10.3.1 Corrosion and its prevention

Question 01 · continued

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(c) About fifty years ago, new evidence convinced scientists that the Earth's crust is made up of tectonic plates that are moving very slowly.

Give **two** pieces of evidence that have helped to convince these scientists that the tectonic plates are moving.

1 .....

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2 .....

.....

(2 marks)

5

Turn over for the next question

4.10.3.1 Corrosion and its prevention

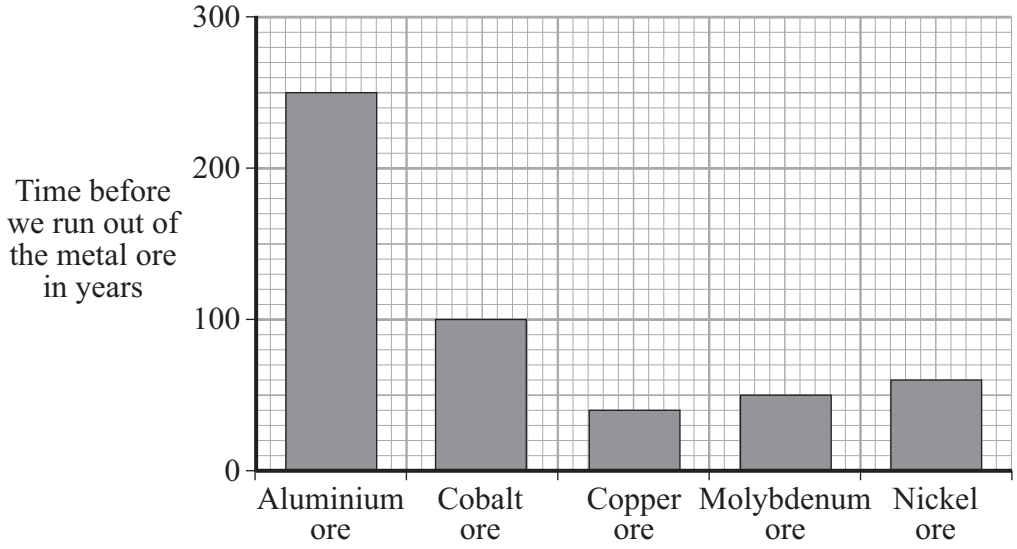
Question 02

March 2007 | CHY1A | Original Q2 | Legacy

QUESTION TWO

Metal ores are found in the Earth's crust.

The graph shows approximately how long it will be before we run out of some of these metal ores, if we continue to use them at the present rate.



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

A aluminium ore

B cobalt ore

C copper ore

D nickel ore

	What we can say about the metal ore
1	It will run out after about 60 years.
2	It will run out about 50 years after the molybdenum ore.
3	The metal from this ore is used in plumbing.
4	The main compound in this ore has the formula Al_2O_3

4.10.3.1 Corrosion and its prevention

Question 03

June 2007 | CHY1A | Original Q6 | Legacy

QUESTION SIX

This question is about iron and steel.

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

A hard

B resistant to corrosion

C easily shaped

D brittle

Iron from the blast furnace has few uses because it is . . . **1** . . . .

A low carbon steel is used to make wire because it is . . . **2** . . . .

A high carbon steel is used to make hammers and chisels because it is . . . **3** . . . .

A stainless steel is used to make cutlery because it is . . . **4** . . . .

4.10.3.1 Corrosion and its prevention

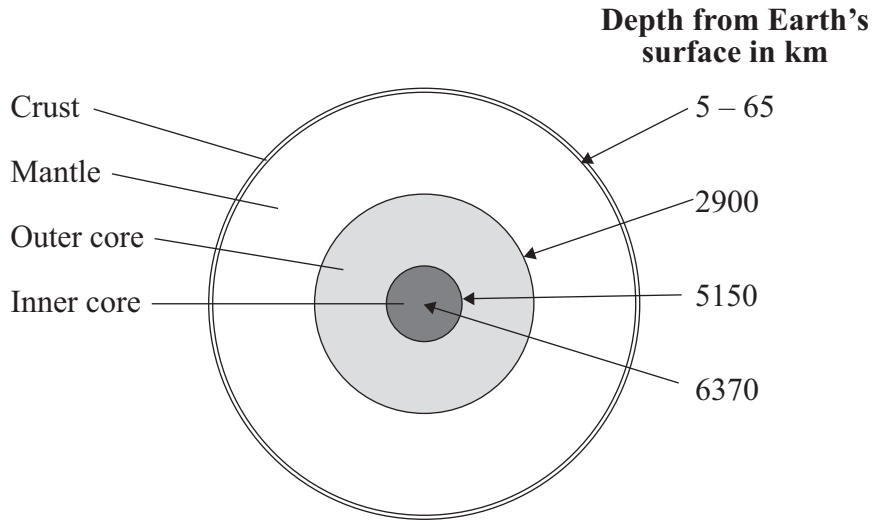
Question 04

June 2007 | CHY1B | Original Q2 | Legacy

QUESTION TWO

The table and the diagram give information about the Earth and its interior.

Layer	Name of layer	Volume (%)	Density in g per cm^3
A	Crust	1.5	2.7–3.0
B	Mantle	82.3	3.3–5.8
C	Outer core	15.4	9.4–12.3
D	Inner core	0.8	13.0–13.5



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

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

The layer with the largest volume is the . . . **2** . . . .

The thinnest layer is the . . . **3** . . . .

The layer with a thickness of 2250 km is the . . . **4** . . . .

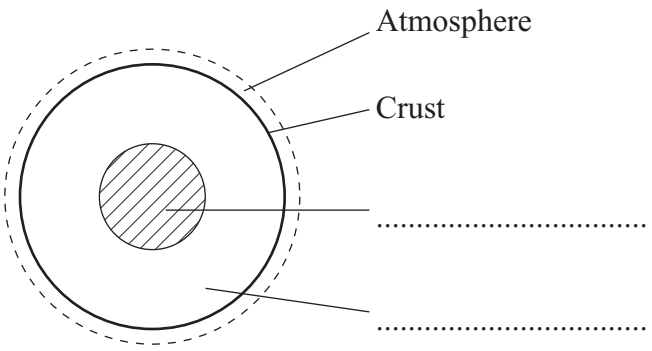
4.10.3.1 Corrosion and its prevention

Question 05

June 2007 | CHY1F | Original Q5 | Legacy

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

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



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

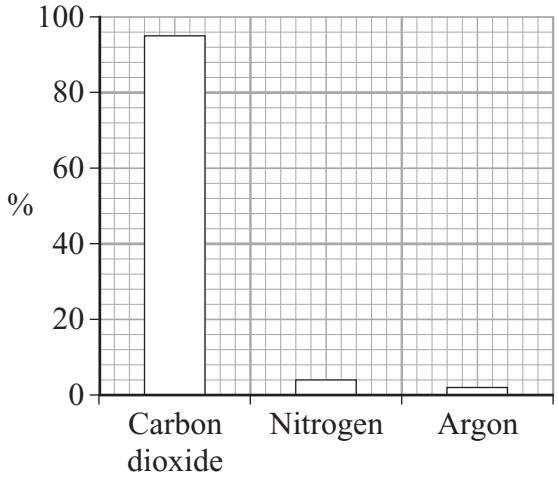
core	**mantle**	**plate**

(2 marks)

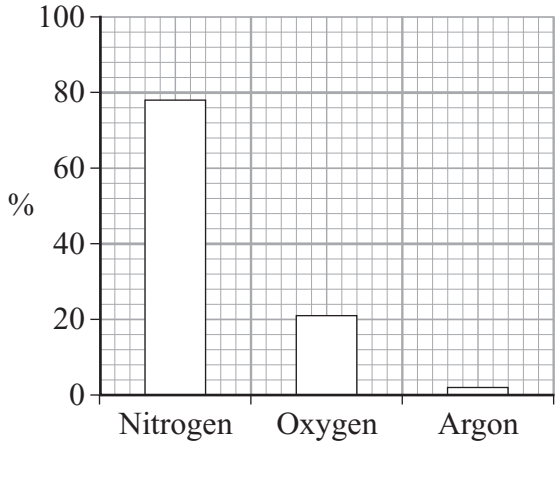
(b) Some theories suggest that the Earth's early atmosphere was like the atmosphere of Mars today.

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

The atmosphere of Mars today



The atmosphere of Earth today



4.10.3.1 Corrosion and its prevention

Question 05 · continued

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

In the atmosphere of Mars today there is mainly ..... and no ..... .

(2 marks)

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

These theories suggest that there was about ..... % nitrogen in the Earth's early atmosphere.

(1 mark)

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

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

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

.....

.....

.....

.....

.....

.....

(3 marks)

8

4.10.3.1 Corrosion and its prevention

Question 06

November 2007 | CHY1A | Original Q9 | Legacy

QUESTION NINE

Jobs for bacteria – metal miners

Copper is found in the Earth's crust as the ore copper sulfide.

Traditionally, copper-rich ores are roasted and smelted to extract the metal.

Copper compounds can now be extracted from low-grade ores by bioleaching. In one type of bioleaching, the copper compounds are extracted from heaps of the crushed ore using bacteria.

- The bacteria live in the ore and gain their energy by slowly breaking down the copper compounds.
- The bacteria produce acidic solutions in which the copper compounds dissolve from the rocks and can be collected.
- The bacteria usually live at 35 °C to 40 °C. This means that breakdown of the compounds takes place only very slowly in the heaps of crushed ore.
- If these bacteria could work at a temperature 10 °C higher, then it is estimated that the rate of breakdown of the compounds would be twice as fast.

9A Which of the following is a disadvantage of extracting copper by bioleaching rather than by the traditional method?

1 Bioleaching allows us to use low-grade ores.

2 Bioleaching is more economical.

3 Bioleaching is slower.

4 Bioleaching uses less energy.

9B Copper compounds can be extracted more quickly from the ore in tanks at a temperature of 75 °C.

Where might bacteria able to work at this temperature be found?

1 in rivers running through rainforests

2 in polluted rivers

3 in streams on the sides of active volcanoes

4 in tropical seas

4.10.3.1 Corrosion and its prevention

Question 06 · continued

9C About 20% of the world's copper is now extracted from low-grade ores by bioleaching.

Some scientists think that this figure will steadily increase in the next few years.

An increase in the use of bioleaching may **not** happen if . . .

1 the price of copper increases dramatically.

2 large new deposits of high-grade ore are discovered.

3 the cost of energy rises quickly.

4 sulfur dioxide levels in the atmosphere reach dangerous levels.

9D Copper can be obtained from solutions containing copper compounds by . . .

1 electrolysis.

2 oxidation.

3 fractionation.

4 combustion.

END OF TEST

4.10.3.1 Corrosion and its prevention

Question 07

June 2008 | CHY1AP | Original Q4 | Legacy

QUESTION FOUR

Metals are used for different purposes depending on their properties.

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

A a good conductor of electricity

B easy to bend when hot

C resistant to corrosion

D very easily worn away

Iron is used for making garden gates because it is . . . **1** . . . .

Aluminium is used for window frames because it is . . . **2** . . . .

Copper wire is used in electrical circuits because it is . . . **3** . . . .

Pure gold is **not** normally used for jewellery because it is . . . **4** . . . .

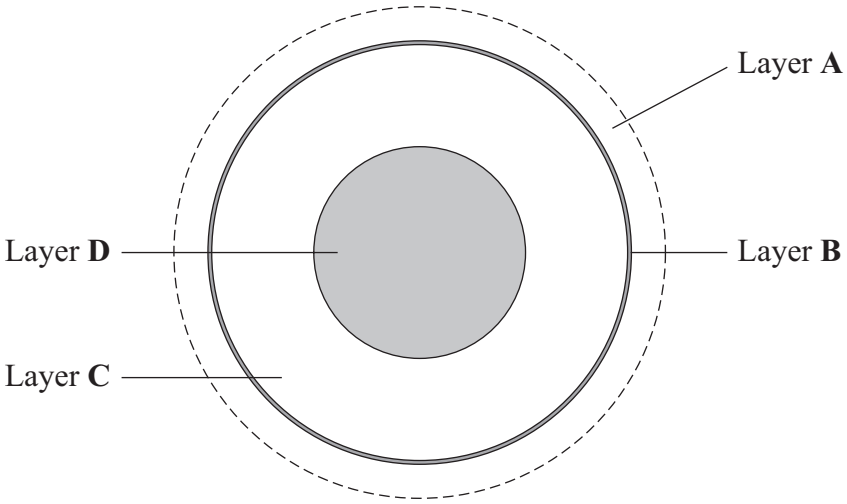
4.10.3.1 Corrosion and its prevention

Question 08

June 2008 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

This question is about the layers in and around the Earth.



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

	Layer
1	Atmosphere
2	Crust
3	Mantle
4	Core

4.10.3.1 Corrosion and its prevention

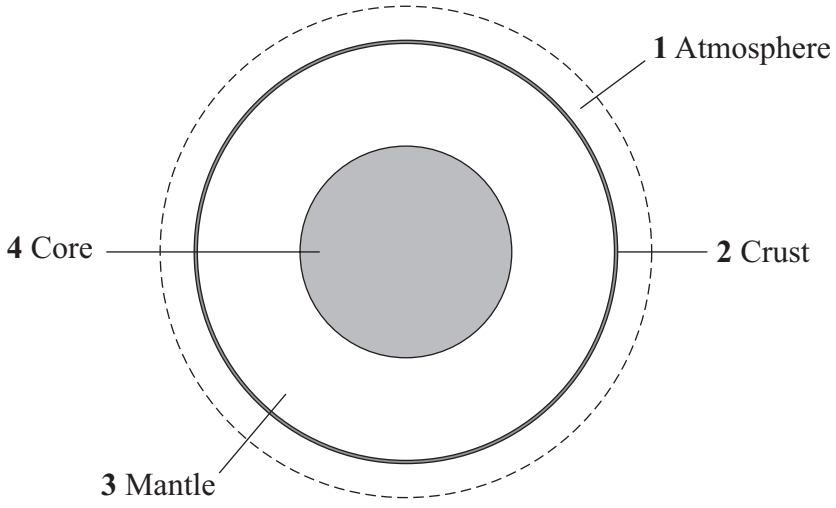
Question 09

March 2009 | CHY1BP | Original Q3 | Legacy

QUESTION THREE

This question is about the structure of the Earth.

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



The Earth's magnetism is thought to be due to the presence of metallic iron and nickel in the centre of the Earth.

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

A where the plates drift apart

B where convection currents occur, creating plate movements

C where global warming occurs

D where iron and nickel are found as metals

4.10.3.1 Corrosion and its prevention

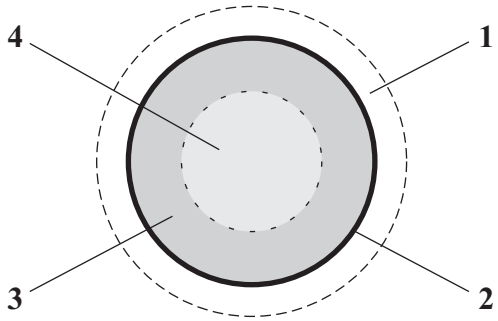
Question 10

June 2009 | CHY1BP | Original Q1 | Legacy

QUESTION ONE

The diagram shows the layered structure of the Earth.

The outer dotted line marks a layer that is above the Earth's surface.



Match words, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram.

A Atmosphere

B Core

C Crust

D Mantle

4.10.3.1 Corrosion and its prevention

Question 11

November 2009 | CHY1BP | Original Q3 | Legacy

QUESTION THREE

The table gives some information about layers of the Earth.

	Name of layer	Thickness in km	Volume as a percentage (%) of the Earth's volume	Density in g per cm^3
A	Crust	5 – 65	1.5	2.7–3.0
B	Mantle	2835	82.3	3.3 – 5.8
C	Outer core	2250	15.4	9.4 – 12.3
D	Inner core	1220	0.8	13.0 – 13.5

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

1	It is the thickest layer.
2	It is the layer with the smallest volume.
3	It is the layer that has the largest range of density.
4	It is the solid layer made up of tectonic plates.

4.10.3.1 Corrosion and its prevention

Question 12

January 2019 | CHY1F | Original Q3 | Legacy

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



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

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

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

and the

atmosphere.
core.
crust.

(1 mark)

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

natural

combustion
radioactive
shrinking

processes.

(1 mark)

4.10.3.1 Corrosion and its prevention

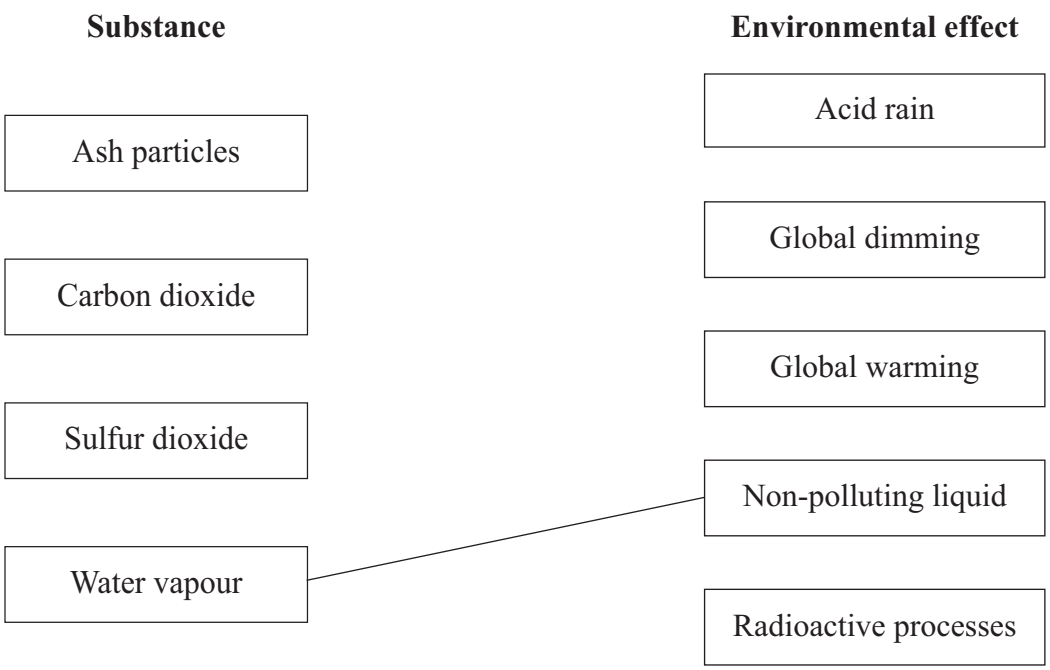
Question 12 · continued

for mark

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

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

One has been done for you.



(3 marks)

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

.....

.....

(1 mark)

6

4.10.3.1 Corrosion and its prevention

Question 13

March 2010 | CHY1AP | Original Q2 | Legacy

QUESTION TWO

This question is about metals.

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

A iron

B aluminium

C gold

D stainless steel

1	It is found in the Earth as the metal itself.
2	It is an alloy which is resistant to corrosion.
3	It is extracted by reduction of its oxide in a blast furnace.
4	It is extracted from its oxide by electrolysis.

4.10.3.1 Corrosion and its prevention

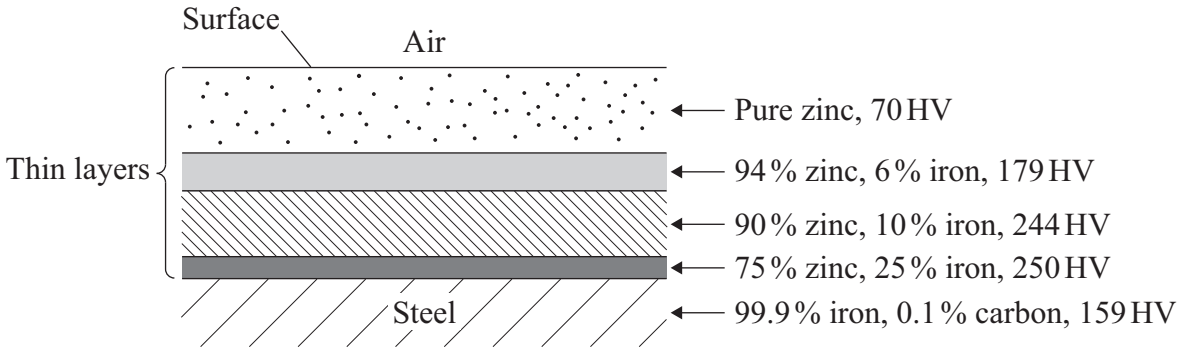
Question 14

March 2010 | CHY1AP | Original Q7 | Legacy

QUESTION SEVEN

Steel is dipped into molten zinc to prevent it from rusting. The zinc combines with the iron in the steel to form layers of zinc-iron alloys.

The diagram shows a cross-section through the layers.



HV is a unit of hardness. The higher the HV number, the harder the metal.

7A The diagram shows that . . .

1 the alloy layers are all of equal thickness.

2 all the layers are pure substances.

3 the steel is in contact with the air.

4 steel is harder than pure zinc.

7B The diagram shows that . . .

1 the amount of iron increases nearer the surface.

2 the percentage of zinc increases nearer the steel.

3 there is no pattern.

4 the percentage of zinc decreases nearer the steel.

4.10.3.1 Corrosion and its prevention

Question 14 · continued March 2010 | CHY1AP | Original Q7 | Legacy

7C The diagram also shows that . . .

1 zinc is the hardest metal.

2 the zinc alloys are softer than steel.

3 increasing the iron content of the zinc alloys softens them.

4 for the zinc alloys, hardness increases with decreasing zinc content.

7D Steel car bodies are coated with zinc before painting.

This is to make them . . .

1 easier to recycle.

2 last longer.

3 weigh less.

4 more dense.

4.10.3.1 Corrosion and its prevention

Question 15

March 2010 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

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

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

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

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

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

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

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

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

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

1 the Earth's crust is divided into plates.

2 earthquakes produce mountain ranges.

3 all mountain ranges are formed by active volcanoes.

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

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

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

2 by earthquakes in the mantle.

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

4 by weathering and erosion of old mountain ranges.

4.10.3.1 Corrosion and its prevention

Question 15 · continued March 2010 | CHY1BP | Original Q7 | Legacy

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

1 friction between the moving tectonic plates.

2 volcanic activity at the plate boundaries.

3 friction between the core and the mantle.

4 natural radioactive processes.

Turn over for the next question

4.10.3.1 Corrosion and its prevention

Question 16

June 2010 | CHY1BP | Original Q2 | Legacy

QUESTION TWO

This question is about the Earth and its structure.

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

A mantle

B core

C atmosphere

D crust

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

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

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

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

4.10.3.1 Corrosion and its prevention

Question 17

June 2010 | CHY1BP | Original Q6 | Legacy

QUESTION SIX

Scientists have tried to predict when and where earthquakes will happen, but they have had limited success. Although they know which regions will have earthquakes, they cannot be precise about the exact place and time.

To gain scientific information, scientists put measuring instruments deep into the Earth's crust where tectonic plates meet.

They have measured tremors which are small vibrations from deep underground. They have found that these tremors occur a short time before earthquakes.

6A The link between tremors and an earthquake occurring is an example of a . . .

1 variable.

2 measurement.

3 calibration.

4 relationship.

6B Scientists could conclude that there is a link between tremors and earthquakes by . . .

1 looking on the internet for information on tremors and earthquakes.

2 collecting more data on both tremors and earthquakes.

3 counting the number of tremors in a year.

4 measuring each earthquake on the Richter scale.

6C The link between tremors and earthquakes is difficult to prove because . . .

1 it is impossible to control other variables.

2 data is not available for tremors.

3 tremors cannot be measured.

4 earthquakes and tremors happen far too often.

4.10.3.1 Corrosion and its prevention

6D It is difficult to predict the exact time and place of an earthquake.

This is because scientists do **not** know . . .

1 what causes tectonic plates to move.

2 where tectonic plates are touching.

3 how all the forces act on tectonic plates.

4 how far tectonic plates move per year.

Turn over for the next question

4.10.3.1 Corrosion and its prevention

Question 18

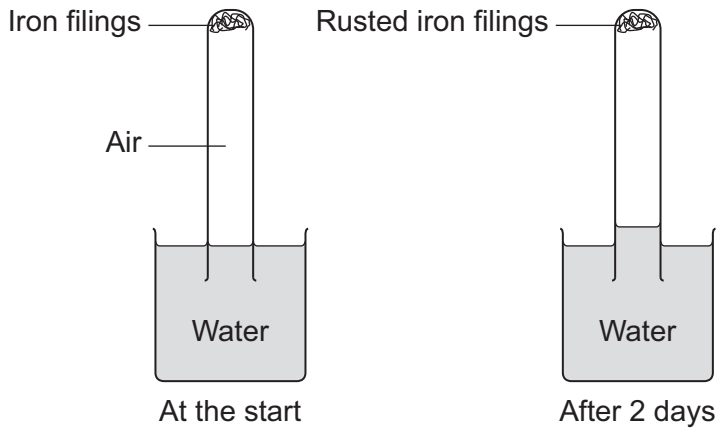
June 2010 | CHY1BP | Original Q7 | Legacy

QUESTION SEVEN

The experiment below can be used to estimate the percentage of oxygen in the air.

- Damp iron filings are placed into a 150 mm long test tube.
- The test tube is inverted and then placed in a beaker of water.
- The test tube is then left for one week.
- The height of the water in the test tube is measured every day.

Rusting is a reaction between iron, oxygen and water.
The water rises up the test tube to replace the oxygen that has reacted.



These are the results of the experiment.

Day	0	1	2	3	4	5	6	7
Height of the water in the test tube in mm	0	9	16	20	23	25	25	25

7A At what height will the water be after another seven days?

1 25 mm

2 50 mm

3 just below the iron filings

4 the top of the test tube

4.10.3.1 Corrosion and its prevention

Question 18 · continued June 2010 | CHY1BP | Original Q7 | Legacy

7B In this experiment, the height of the water in the test tube is the dependent variable.

This is because . . .

1 it is dependent on an accurate measurement being carried out.

2 it changes due to the changes in another variable.

3 it is the value that is measured first.

4 it is not dependent on any other variable.

7C A student used the experiment described to find the percentage of oxygen in the air. He was unsure about his result.

The student could check the reliability of the results by . . .

1 using fewer iron filings.

2 using colder water.

3 repeating the experiment.

4 using already rusted iron filings.

7D Another student did the experiment with more iron filings in the test tube.

One reason for doing this is because . . .

1 the reaction would be much slower.

2 the volume of oxygen reacting would be much greater.

3 there would be less air in the test tube.

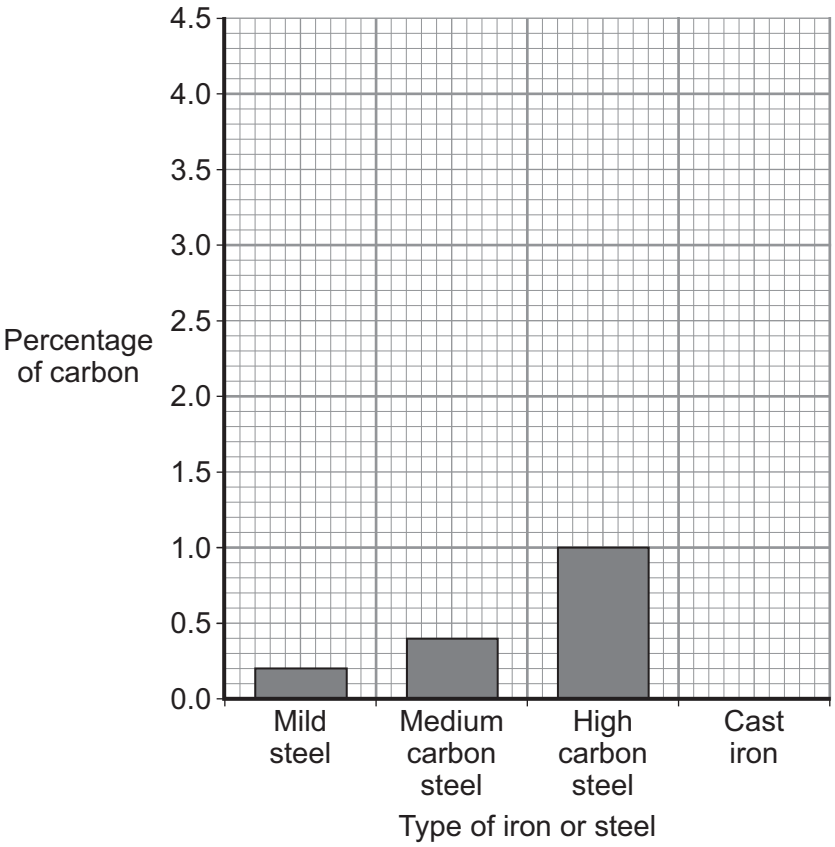
4 it would confirm that all the oxygen had reacted.

4.10.3.1 Corrosion and its prevention

Question 19

June 2010 | CHY1F | Original Q2 | Legacy

2 The bar chart shows the percentage of carbon in three types of steel.



2 (a) Draw a ring around the correct word in the box to complete the sentence.

Steel is the name used for | alloys / atoms / ores | of iron.

(1 mark)

2 (b) Cast iron contains 4% carbon.

Draw the bar for cast iron on the chart.

(1 mark)

2 (c) Cast iron is more brittle than these three types of steel.

Use the bar chart to suggest why.

.....

.....

(1 mark)

4.10.3.1 Corrosion and its prevention

Question 19 · continued June 2019 | CHY1F | Original Q2 | Legacy

2 (d) One type of stainless steel contains iron with 0.2% carbon to which 8% nickel and 18% chromium were added.

2 (d) (i) Tick (✓) the percentage of iron in this type of stainless steel.

Percentage (%) of iron	Tick (✓)
92.4	
88.6	
73.8	

(1 mark)

2 (d) (ii) Use the bar chart to name the type of steel that contains only 0.2% carbon.

.....

(1 mark)

2 (d) (iii) Draw a ring around the correct word in the box to complete the sentence.

Stainless steel is used for knives and forks because it is resistant to

corrosion.

decomposition.

distillation.

(1 mark)

6

4.10.3.1 Corrosion and its prevention

Question 20

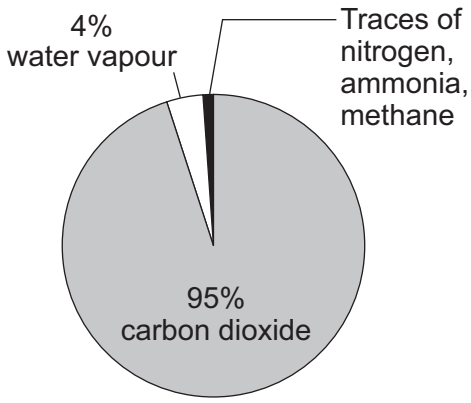
June 2010 | CHY1F | Original Q6 | Legacy

6 (a) Scientists have suggested that:

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

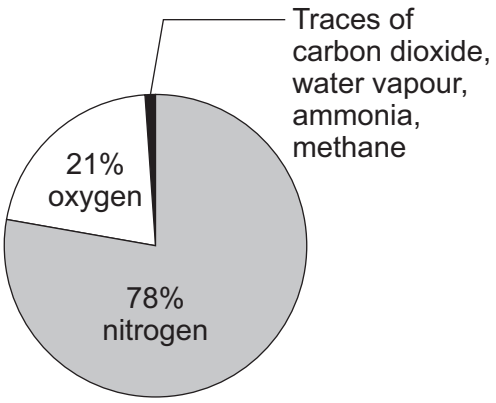
The pie charts show the approximate percentages of gases in the Earth's early atmosphere and in the Earth's atmosphere today.

Earth's early atmosphere



Average surface temperature above 400 °C

Earth's atmosphere today



Average surface temperature 20 °C

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

.....

.....

.....

.....

(2 marks)

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

1 .....

.....

2 .....

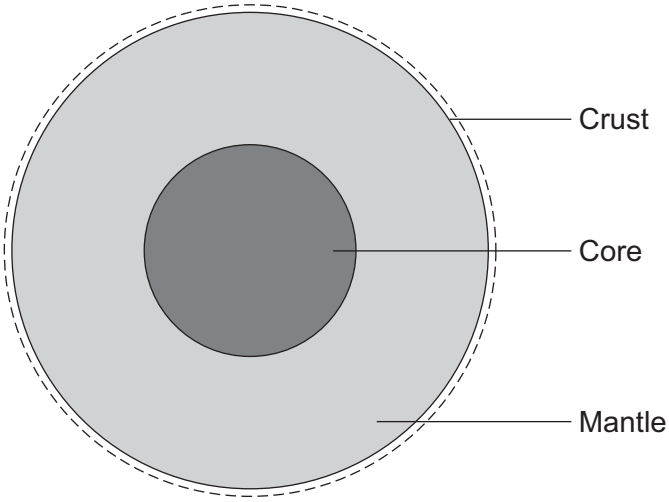
.....

(2 marks)

4.10.3.1 Corrosion and its prevention

Question 20 · continued

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



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

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

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

.....

.....

(1 mark)

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

.....

.....

.....

.....

.....

.....

(3 marks)

8

4.10.3.1 Corrosion and its prevention

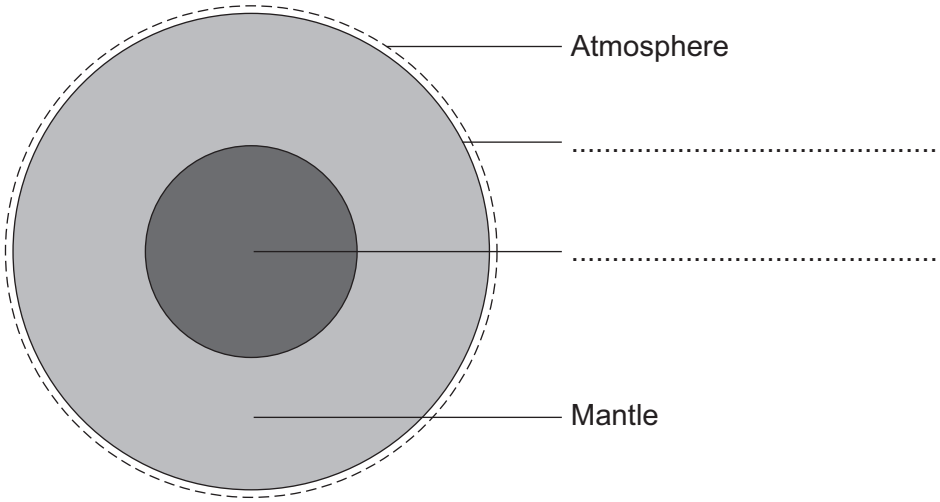
Question 21

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)

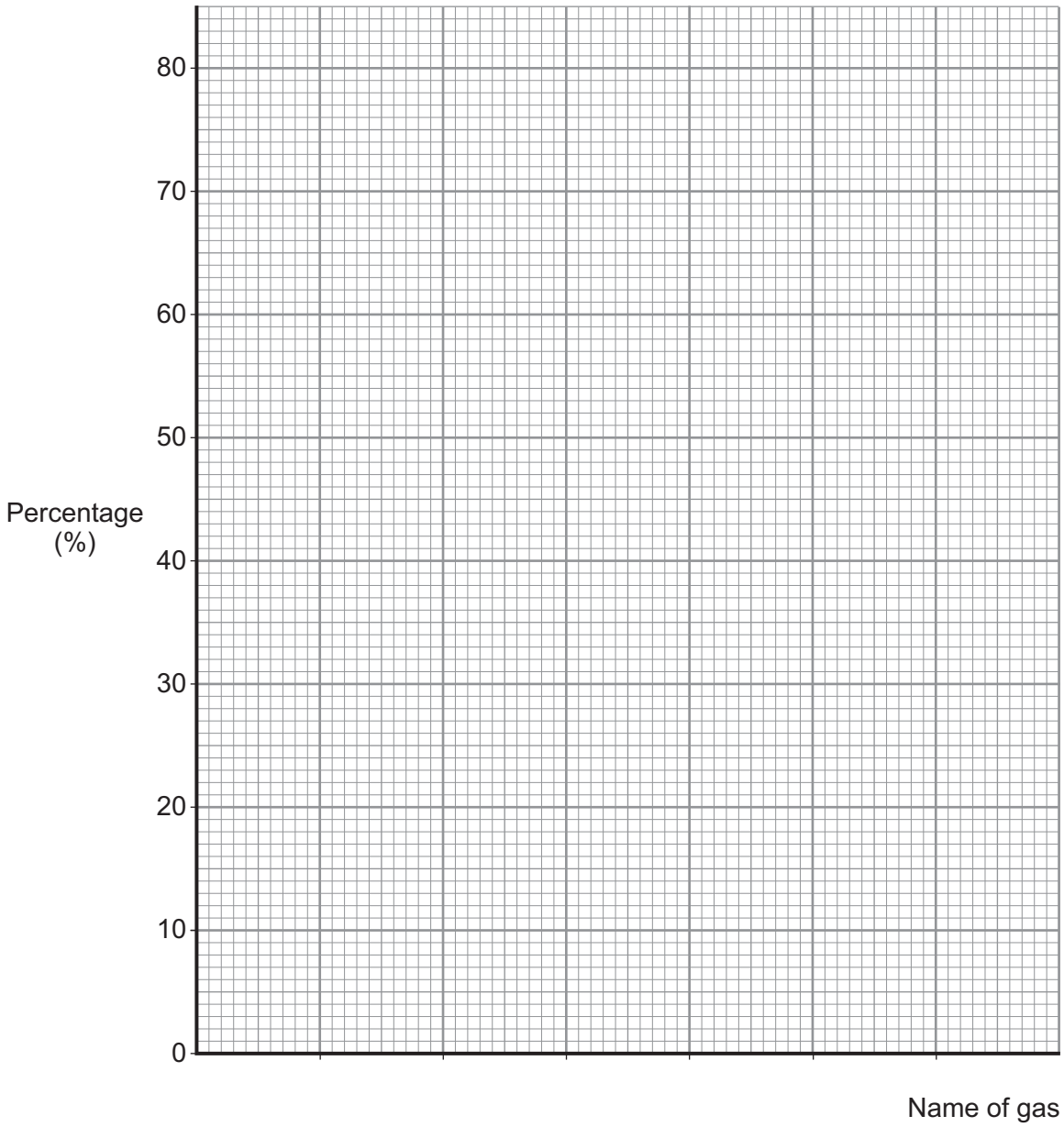
3 (b) The data in the table shows the percentages of the gases in the Earth's atmosphere.

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

4.10.3.1 Corrosion and its prevention

Question 21 · continued

Present the data in the table on the grid below.



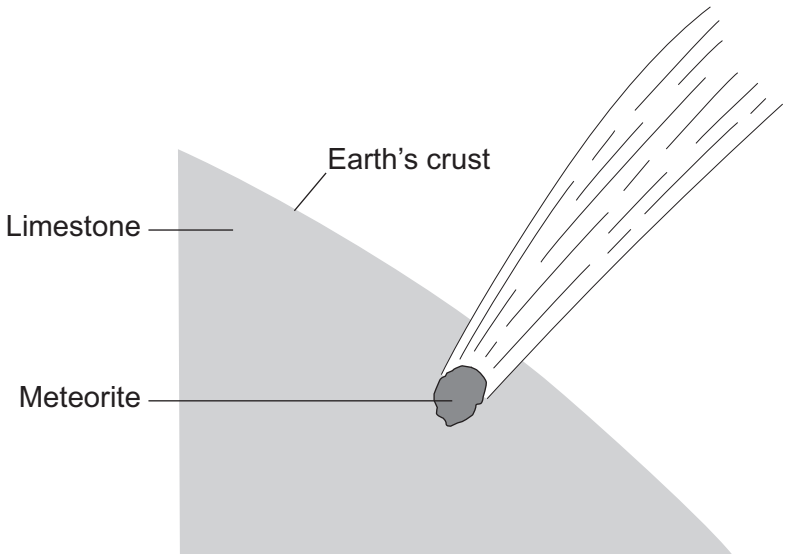
(3 marks)

Question 3 continues on the next page

4.10.3.1 Corrosion and its prevention

Question 21 · continued

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



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

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

decomposed.
evaporated.
reduced.

(1 mark)

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

acid rain.
global dimming.
global warming.

(1 mark)

7

4.10.3.1 Corrosion and its prevention

Question 22

January 2011 | CHY1F | Original Q6 | Legacy

6 The flow diagram shows the main stages used to extract a metal from its ore.

mining the ore → purifying the ore → extracting the metal

The table shows some information about three metals.

Metal	Metal ore	Purified ore	% of metal in the ore	% of metal in the Earth's crust
aluminium	bauxite	aluminium oxide, Al_2O_3	28.0	8.0
copper	chalcocite	copper sulfide, Cu_2S	0.5	0.001
iron	haematite	iron oxide, Fe_2O_3	29.0	5.0

6 (a) Use the information in the table and your knowledge and understanding to help you to answer the questions.

6 (a) (i) Suggest why purifying the copper ore produces large quantities of waste.

.....

.....

.....

(1 mark)

6 (a) (ii) Suggest why the annual world production of iron is forty times greater than that of aluminium.

.....

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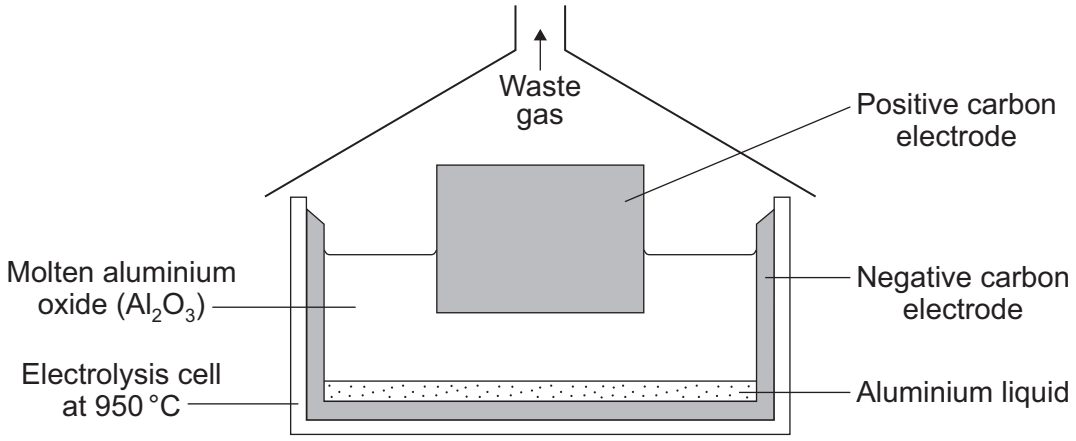
.....

(1 mark)

4.10.3.1 Corrosion and its prevention

Question 22 · continued

6 (b) Aluminium is used for drinks cans.
Aluminium is extracted from its purified ore by electrolysis.



6 (b) (i) Suggest why the aluminium produced in the electrolysis cell is a liquid.

.....

.....

(1 mark)

6 (b) (ii) In this electrolysis, aluminium and oxygen gas are produced from the aluminium oxide.

Use the information in the diagram to suggest why most of the waste gas is carbon dioxide and not oxygen.

.....

.....

.....

.....

(2 marks)

6 (b) (iii) Aluminium is the most abundant metal in the Earth's crust.

Suggest **two** reasons why we should recycle aluminium drinks cans.

1 .....

.....

2 .....

.....

(2 marks)

7

4.10.3.1 Corrosion and its prevention

Question 23

March 2011 | CHY1AP | Original Q1 | Legacy

QUESTION ONE

This question is about uses of metals.

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

A Aluminium

B Calcium

C Copper

D Iron

1	When alloyed with carbon, this metal can form a hard steel.
2	Water pipes in the home are usually made from this metal.
3	Drinks cans are made from this metal because it does not easily corrode.
4	A carbonate of this metal is used to make quicklime.

4.10.3.1 Corrosion and its prevention

Question 24

June 2011 | CHY1AP | Original Q4 | Legacy

QUESTION FOUR

The table gives some information about four metals, **A**, **B**, **C** and **D**.

	Metal	Main ore	Price in £ per tonne	Percentage abundance of the metal in the Earth's crust
A	Aluminium	Bauxite, Al_2O_3	1800	7
B	Copper	Chalcopyrite, $CuFeS_2$	3300	0.005
C	Tin	Cassiterite, SnO_2	8000	0.0002
D	Iron	Haematite, Fe_2O_3	30	4

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

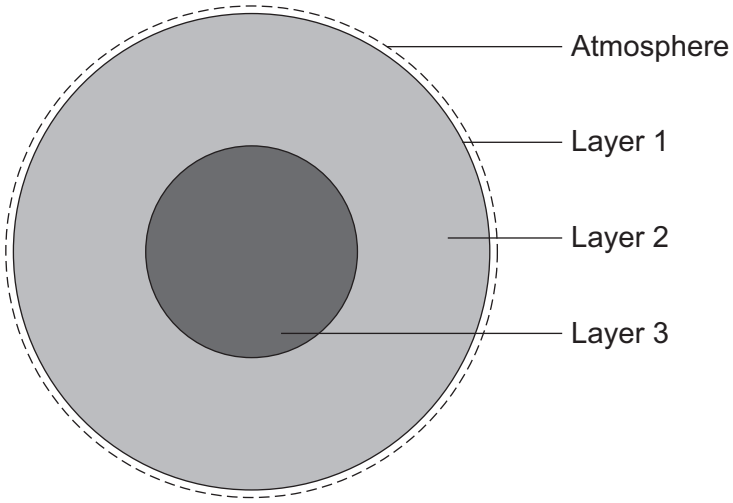
1	It is the least expensive metal.
2	It is the least abundant metal.
3	The main ore of this metal is not an oxide.
4	This metal cannot be obtained from its main ore by reduction with carbon.

4.10.3.1 Corrosion and its prevention

Question 25

June 2011 | CHY1F | Original Q1 | Legacy

1 The Earth is made up of several layers.



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

Layer 1	core
Layer 2	crust
Layer 3	mantle
	nucleus

(3 marks)

4.10.3.1 Corrosion and its prevention

Question 25 · continued

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

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

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

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

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

(1 mark)

1 (b) (ii) Complete the sentence.

The gas in the Earth's atmosphere that

is a compound is ..... .

(1 mark)

5

4.10.3.1 Corrosion and its prevention

Question 26

November 2011 | CHY1AP | Original Q1 | Legacy

QUESTION ONE

This question is about iron and steel.

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

A hard

B resistant to corrosion

C easily shaped

D brittle

Iron from the blast furnace has few uses because it is . . . **1** . . . .

Low-carbon steel is used to make car body panels because it is . . . **2** . . . .

High-carbon steel is used to make knives because it is . . . **3** . . . .

Stainless steel is used to make kitchen sinks because it is . . . **4** . . . .

4.10.3.1 Corrosion and its prevention

Question 27

November 2011 | CHY1AP | Original Q9 | Legacy

QUESTION NINE

Iron oxide can be reduced to iron by mixing the oxide with carbon and heating strongly.

Aluminium oxide cannot be reduced to aluminium in this way. Aluminium is obtained from aluminium oxide by electrolysis.

9A Why is it possible to obtain iron but not aluminium by carbon reduction?

1 Iron is more reactive than aluminium.

2 Carbon is more reactive than aluminium but less reactive than iron.

3 Carbon is more reactive than iron but less reactive than aluminium.

4 Aluminium and iron are both more reactive than carbon.

9B The extraction of aluminium by electrolysis is an expensive process because . . .

1 aluminium easily corrodes in air.

2 a large amount of energy is needed.

3 aluminium oxide is difficult to mine.

4 aluminium reacts with carbon.

9C As electrolysis is expensive, an increasing amount of aluminium is being recycled.

Another important reason to recycle aluminium is that . . .

1 it saves limited aluminium oxide reserves.

2 the recycled aluminium is purer.

3 aluminium scrap does not corrode easily.

4 recycling aluminium does not use energy.

4.10.3.1 Corrosion and its prevention

Question 27 · continued November 2011 | CHY1AP | Original Q9 | Legacy

9D Which two of the following statements could explain why aluminium is preferred to iron for making cans for drinks?

W Aluminium has a lower density than iron.

X Aluminium is a better conductor than iron.

Y Aluminium corrodes less easily than iron.

Z Aluminium is not as strong as iron.

1 **W** and **X**

2 **W** and **Y**

3 **X** and **Y**

4 **Y** and **Z**

END OF TEST

4.10.3.1 Corrosion and its prevention

Question 28

January 2012 | CH1FP | Original Q7 | Legacy

7 There are about 500 000 earthquakes every year. On 12 January 2010 there was an earthquake near Port-au-Prince in Haiti. Many buildings were destroyed causing the deaths of thousands of people. The earthquake did not come as a surprise to scientists who predicted the earthquake a week earlier. The Government and people ignored the prediction.



The Richter scale is used to compare the size of earthquakes.

Richter scale value	Effect of earthquake
Less than 2	People do not feel the earthquake.
2 – 4	People feel the earthquake but the earthquake rarely causes damage to buildings.
4 – 5	People feel the earthquake and the earthquake causes minor damage to a few buildings.
5 – 6	Shaking of the ground and major damage to some buildings.
6 – 8	Violent shaking of the ground and many buildings destroyed.
8 – 10	Very violent shaking of the ground and most buildings destroyed.

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

7 (a) (i) Suggest the Richter scale value for the earthquake that happened near Port-au-Prince in Haiti.

.....

(1 mark)

7 (a) (ii) Governments and people often ignore scientists' predictions of an earthquake.

Suggest **three** reasons why.

1 .....

.....

.....

4.10.3.1 Corrosion and its prevention

Question 28 · continued

2 .....

.....

.....

3 .....

.....

.....

(3 marks)

7 (b) During the twentieth century many scientists proposed ideas about the cause of earthquakes and about the Earth's crust.
In 1912 Alfred Wegener proposed his idea of '*continental drift*'.
In 1930 Arthur Holmes suggested his idea of '*mantle dynamics*'.

7 (b) (i) What did Wegener mean by *'continental drift'*?

.....

.....

.....

.....

.....

(2 marks)

7 (b) (ii) Holmes' idea of '*mantle dynamics*' provided an explanation for Wegener's idea of *'continental drift'*.

Suggest what *'mantle dynamics'* is and state what causes *'mantle dynamics'*.

.....

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.....

(2 marks)

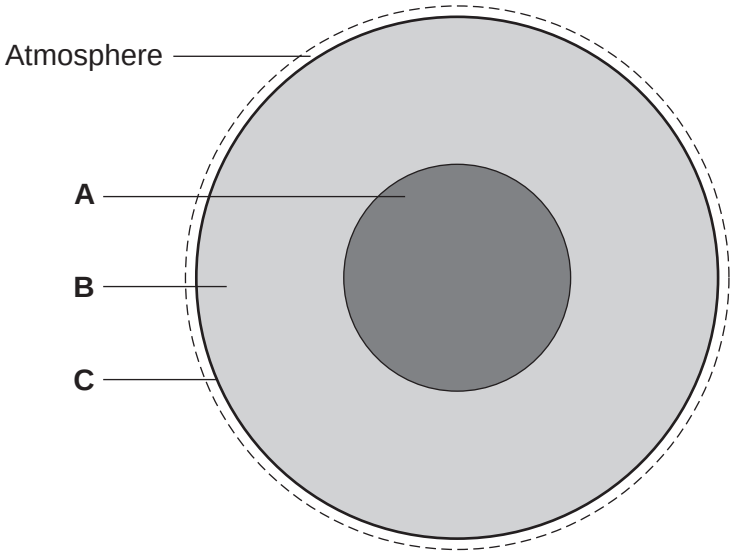
8

4.10.3.1 Corrosion and its prevention

Question 29

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)

4.10.3.1 Corrosion and its prevention

Question 29 · continued

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

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

Give **two** reasons why.

You should consider:

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

.....

.....

.....

.....

(2 marks)

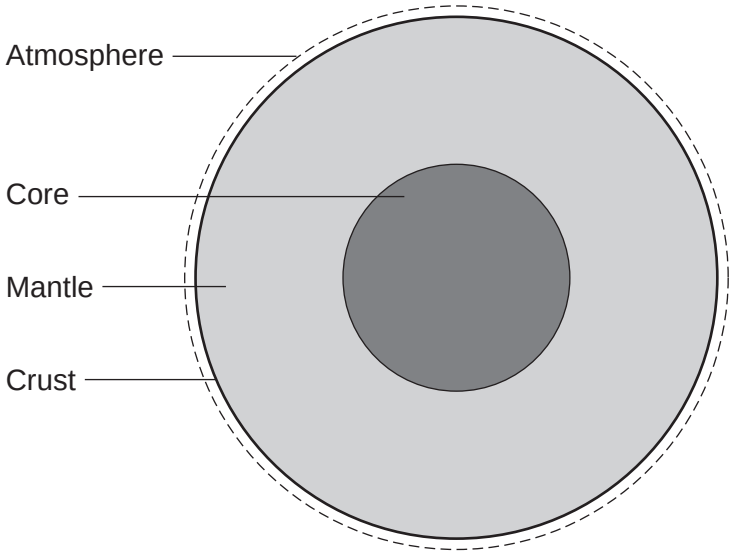
5

4.10.3.1 Corrosion and its prevention

Question 30

January 2013 | CH1FP | Original Q2 | Legacy

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



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

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

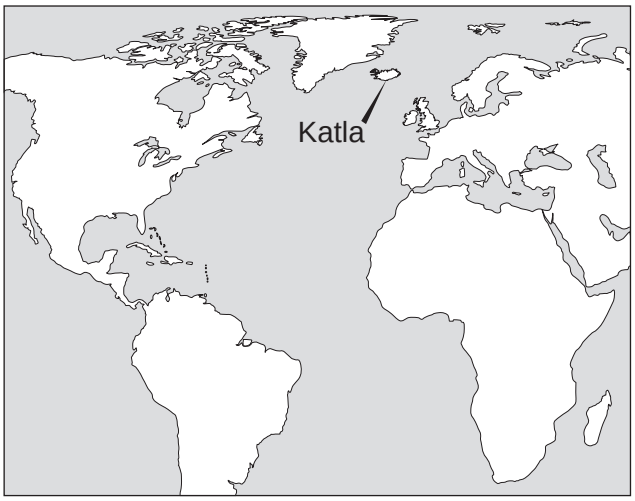
Statement	Layer
There are mountain ranges.	atmosphere
There are convection currents that cause earthquakes.	core
There is a mixture of gases.	crust
	mantle

(3 marks)

4.10.3.1 Corrosion and its prevention

Question 30 · continued

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



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

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

Iceland has volcanoes because it

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

(1 mark)

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

Tick (✓) the correct reason why.

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

(1 mark)

Question 2 continues on the next page

4.10.3.1 Corrosion and its prevention

Question 30 · continued

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

Use the correct answer to complete each sentence.

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

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

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

(2 marks)

7

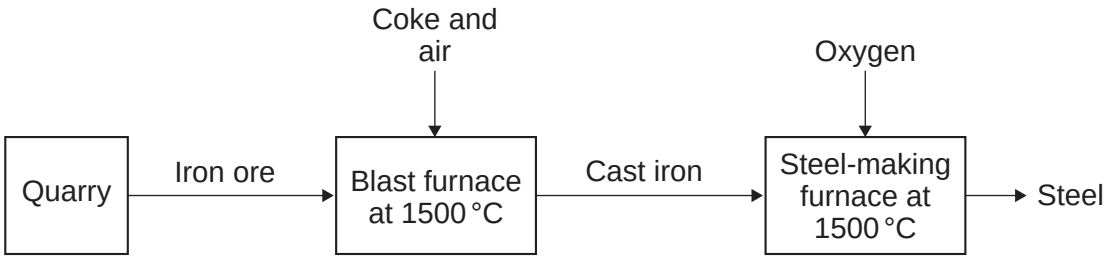
4.10.3.1 Corrosion and its prevention

Question 31

January 2013 | CH1FP | Original Q4 | Legacy

4 The iron produced from iron ore in a blast furnace is called cast iron.

Cast iron is converted into steel in a furnace.



Iron ore contains iron oxide.
Coke contains carbon.

4 (a) Quarrying iron ore will have an impact on everything near to the quarry.

4 (a) (i) Describe **one** positive impact and **one** negative impact of quarrying iron ore.

positive impact .....

.....

negative impact.....

.....

(2 marks)

4 (a) (ii) Draw a ring around the correct answer to complete the sentence.

Ores contain enough metal to make extraction of the metal

carbon neutral.

economical.

reversible.

(1 mark)

4 (b) Many chemical reactions take place in a blast furnace.
Use the flow diagram to help you to answer this question.

Suggest how the blast furnace is heated.

.....

.....

(1 mark)

4.10.3.1 Corrosion and its prevention

Question 31 · continued

4 (c) A chemical reaction for the extraction of iron is:

$$Fe_2O_3 + 3CO \rightarrow 2Fe + 3CO_2$$

4 (c) (i) Complete the word equation for this chemical reaction.

..... + carbon monoxide → iron + ...

(2 marks)

4 (c) (ii) Draw a ring around the correct answer to complete the sentence.

Iron is extracted from its ore by

- decomposition.
- oxidation.
- reduction.

(1 mark)

4 (d) Cast iron contains about 4% carbon.
Cast iron is converted into low-carbon steels.

4 (d) (i) Low-carbon steel is produced by blowing oxygen into molten cast iron.

Suggest how oxygen removes most of the carbon.

.....

.....

.....

.....

(2 marks)

4 (d) (ii) Draw a ring around the correct answer to complete the sentence.

Metals, such as nickel, are added to low-carbon steels to make the steel

- corrode easily.
- easy to shape.
- much harder.

(1 mark)

Question 4 continues on the next page

4.10.3.1 Corrosion and its prevention

Question 31 · continued

4 (e) Recycling steel uses less energy than producing steel from iron ore.

Tick (✓) **one** advantage and tick (✓) **one** disadvantage of recycling steel.

Statement	Advantage Tick (✓)	Disadvantage Tick (✓)
Iron is the second most common metal in the Earth's crust.		
Less carbon dioxide is produced.		
More iron ore needs to be mined.		
There are different types of steel which must be sorted.		

(2 marks)

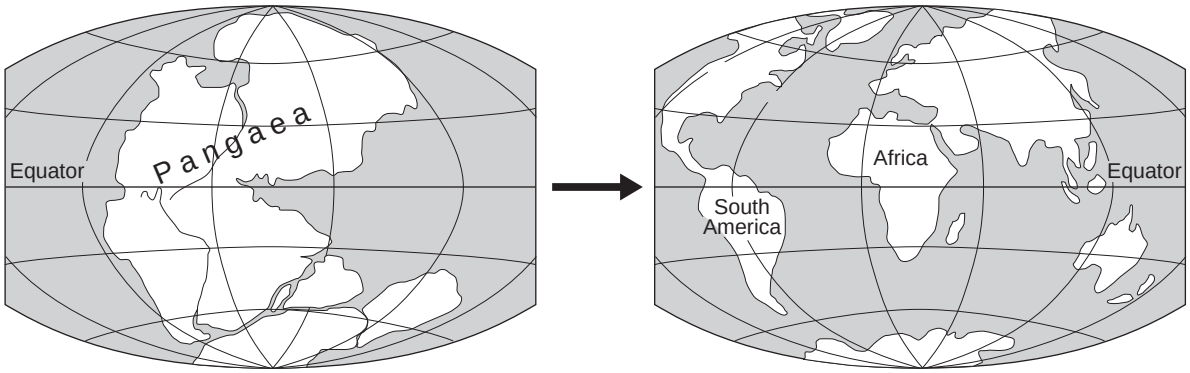
12

4.10.3.1 Corrosion and its prevention

Question 32

June 2013 | CH1FP | Original Q6 | Legacy

6 In 1912 Wegener suggested his theory of continental drift.



In 1912, many scientists did not accept Wegener's theory because he could not explain:

- how Pangaea had split into continents
- how the continents had moved apart.

6 (a) Wegener used evidence to support his theory.

Give **two** pieces of evidence Wegener used.

.....

.....

.....

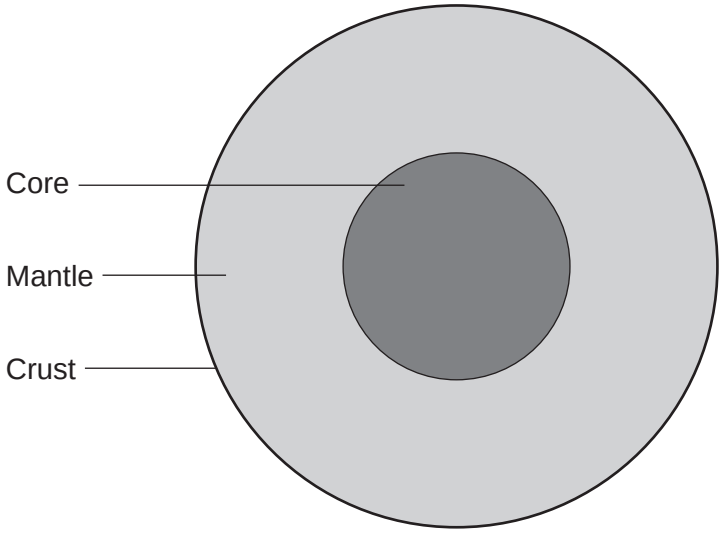
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(2 marks)

4.10.3.1 Corrosion and its prevention

Question 32 · continued

6 (b) Scientists have discovered that the Earth is made up of layers.



Complete the sentences by writing **one** word in each space.

Scientists now accept Wegener's theory because they know that

the Earth's ..... and upper part of the mantle are cracked into tectonic plates.

The tectonic plates move at relative speeds of a few centimetres per year because of convection currents in the Earth's ..... .

These convection currents are driven by ..... released from natural radioactivity.

A volcanic eruption or an ..... can happen at the boundaries between tectonic plates.

(4 marks)

6

4.10.3.1 Corrosion and its prevention

Question 33

June 2015 | CH1FP | Original Q1 | Legacy

1 This question is about metals.

1 (a) Which unreactive metal is found in the Earth as the metal itself?

[1 mark]

Tick (✓) **one** box.

aluminium ☐

gold ☐

magnesium ☐

1 (b) Complete the sentence.

[1 mark]

Aluminium is an element because aluminium is made of

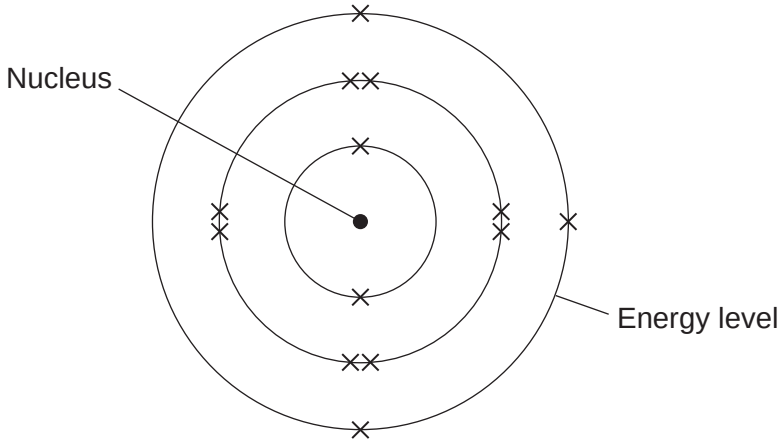
only one type of ..... .

4.10.3.1 Corrosion and its prevention

Question 33 · continued

1 (c) **Figure 1** shows the electronic structure of an aluminium atom.

Figure 1



1 (c) (i) Use the correct words from the box to complete the sentence.

[2 marks]

electrons	**ions**	**protons**	**neutrons**	**shells**

The nucleus of an aluminium atom contains ..... and ..... .

1 (c) (ii) Complete the sentence.

[1 mark]

In the periodic table, aluminium is in Group ..... .

Question 1 continues on the next page

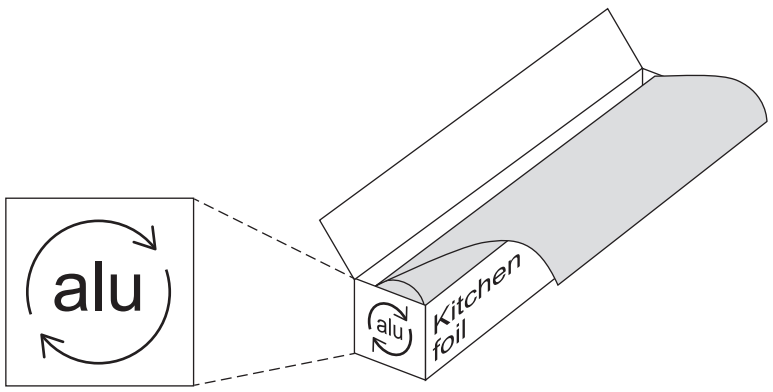
4.10.3.1 Corrosion and its prevention

Question 33 · continued

1 (d) Aluminium is used for kitchen foil.

Figure 2 shows a symbol on a box of kitchen foil.

Figure 2



The symbol means that aluminium can be recycled. It does not show the correct chemical symbol for aluminium.

1 (d) (i) What is the correct chemical symbol for aluminium? ..... .

[1 mark]

1 (d) (ii) Give **two** reasons why aluminium should be recycled.

[2 marks]

.....

.....

.....

.....

1 (e) Aluminium has a low density, conducts electricity and is resistant to corrosion.

Which **one** of these properties makes aluminium suitable to use as kitchen foil?
Give a reason for your answer.

[2 marks]

.....

.....

.....

.....

10

4.10.3.1 Corrosion and its prevention

Question 34

June 2016 | CH1FP | Original Q3 | Legacy

3 Metals are extracted from ores in the Earth's crust.

3 (a) Why is copper used in the manufacture of computers?

[1 mark]

Tick (✓) **one** box.

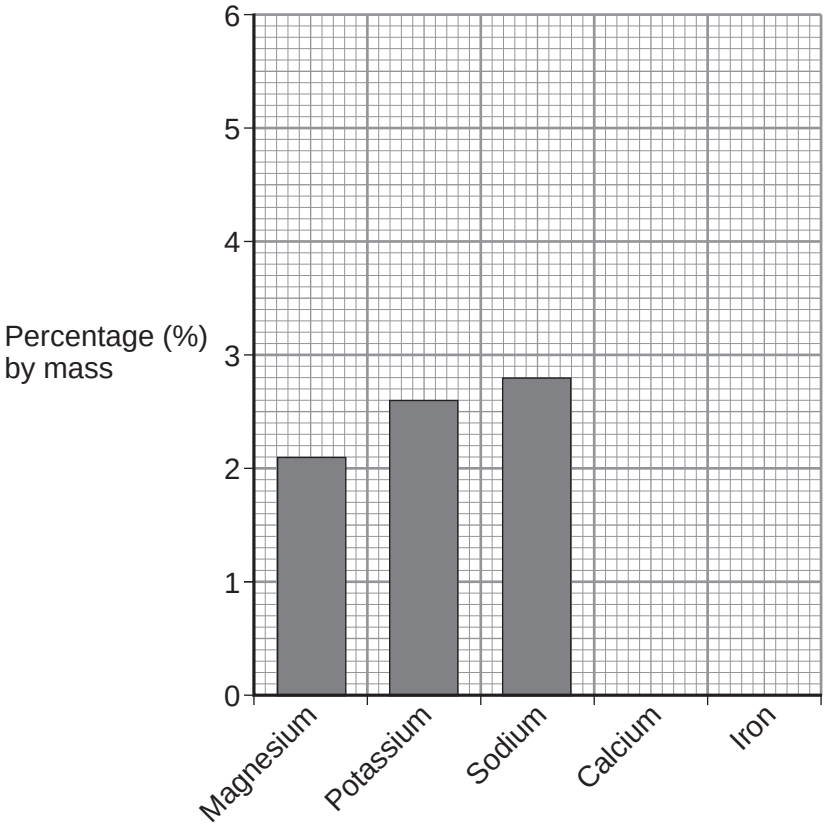
Because it has a high density. ☐

Because it does not react with water. ☐

Because it is a good conductor of electricity. ☐

3 (b) **Figure 6** shows the percentage (%) by mass of some metals in the Earth's crust.

Figure 6



4.10.3.1 Corrosion and its prevention

Question 34 · continued

3 (b) (i) What is the percentage by mass of magnesium in the Earth's crust?

[1 mark]

_____ %

3 (b) (ii) On **Figure 6** draw the bars for:

- calcium at 3.6% by mass
- iron at 5.0% by mass.

[2 marks]

3 (c) An ore of zinc contains zinc carbonate.

The equation for the reaction when zinc carbonate is heated is:

$$\underset{\text{zinc carbonate}}{ZnCO_3} \longrightarrow \underset{\text{zinc oxide}}{ZnO} + \underset{\text{carbon dioxide}}{CO_2}$$

3 (c) (i) What is the name of this type of reaction?

[1 mark]

Tick (✓) **one** box.

corrosion ☐

decomposition ☐

electrolysis ☐

3 (c) (ii) Which substance in the equation is a gas at room temperature (20 °C)?

[1 mark]

Tick (✓) **one** box.

zinc carbonate ☐

zinc oxide ☐

carbon dioxide ☐

Question 3 continues on the next page

4.10.3.1 Corrosion and its prevention

Question 34 · continued

3 (c) (iii) Complete **Table 1** to show the number of atoms of carbon and oxygen in the formula of zinc carbonate.

[2 marks]

Table 1

Element	Number of atoms in the formula $ZnCO_3$
zinc, Zn	1
carbon, C	
oxygen, O	

3 (c) (iv) When 125 g zinc carbonate is heated, 81 g zinc oxide is produced.

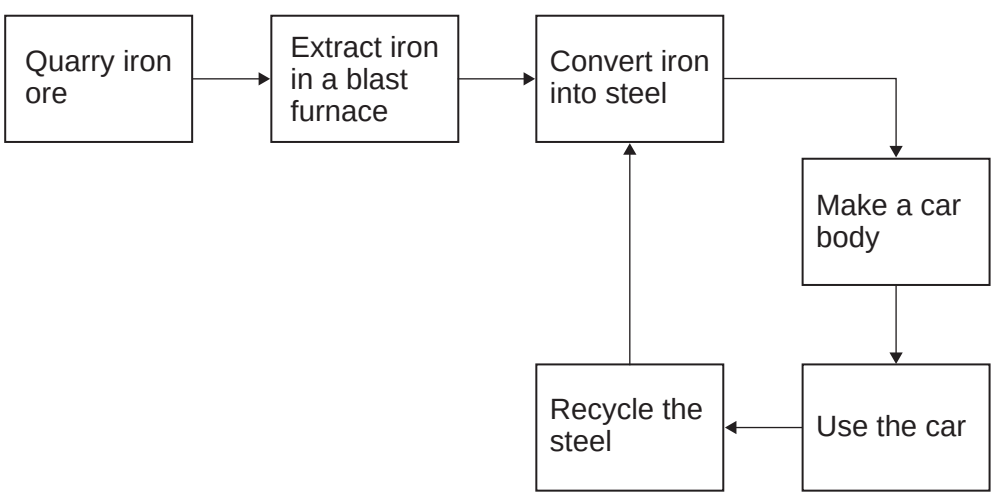
Calculate the mass of carbon dioxide produced.

[1 mark]

Mass of carbon dioxide = _____ g

3 (d) **Figure 7** shows a simple life cycle of a car body.

Figure 7



4.10.3.1 Corrosion and its prevention

Question 34 · continued

3 (d) (i) What is **one** reason why iron from the blast furnace is converted into steel?

[1 mark]

Tick (✓) **one** box.

To make the iron pure. ☐

To make the iron more brittle. ☐

To make alloys for specific uses. ☐

3 (d) (ii) Apart from cost, give **three different** reasons why steel should be recycled.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

13

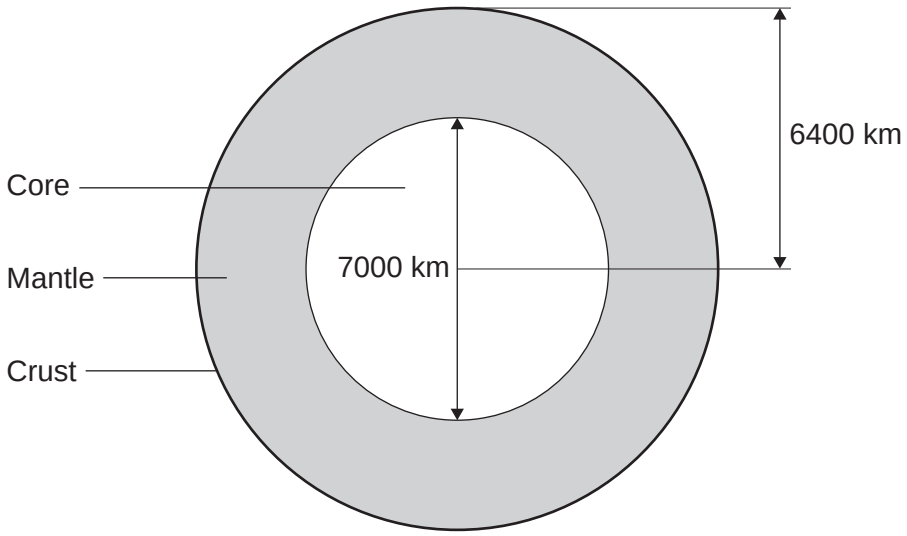
4.10.3.1 Corrosion and its prevention

Question 35

June 2017 | CH1FP | Original Q5 | Legacy

5 (a) **Figure 4** shows the layered structure of the Earth.

Figure 4



5 (a) (i) The radius of the Earth is 6400 km.

Calculate the distance from the surface of the crust to the surface of the core.

[2 marks]

_____

_____

Distance = _____ km

5 (a) (ii) Use the correct answers from the box to complete the sentences.

Each word can be used only once.

[4 marks]

currents	**concentrations**	**distances**
plates	**processes**	**speeds**

Tectonic _____ move at _____ of a few centimetres per year.

This movement is caused by convection _____ within the Earth's mantle

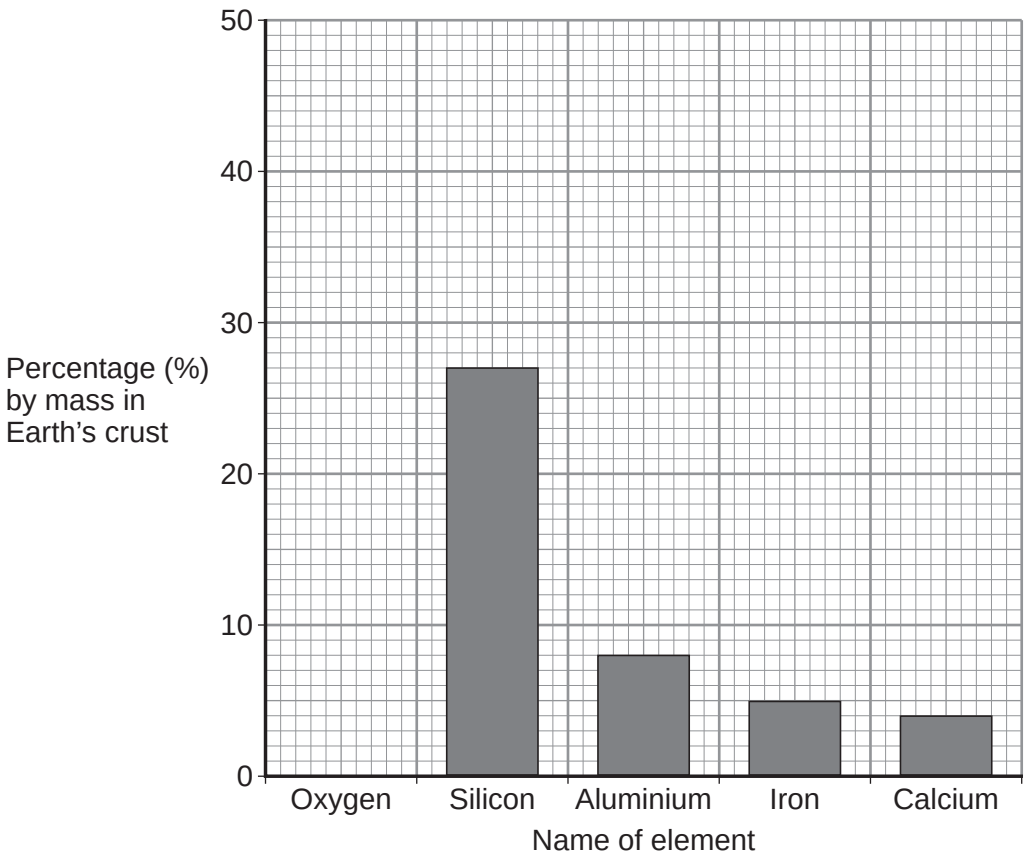
driven by heat released by natural radioactive _____ .

4.10.3.1 Corrosion and its prevention

Question 35 · continued

5 (b) **Figure 5** shows the percentage by mass of some elements in the Earth's crust.

Figure 5



5 (b) (i) The percentage by mass of oxygen is 47%.

Draw the bar for oxygen on **Figure 5**.

[1 mark]

5 (b) (ii) Look at your completed bar chart.

What is the percentage by mass of all the other elements not shown on the chart in the Earth's crust?

[1 mark]

Tick (✓) **one** box.

1% ☐

9% ☐

20% ☐

4.10.3.1 Corrosion and its prevention

Question 35 · continued

June 2017 | CH1FP | Original Q5 | Legacy

5 (b) (iii) There is about 0.007% by mass of copper in the Earth's crust.

Suggest why copper should be recycled.

[1 mark]

_____

_____

Question 5 continues on the next page

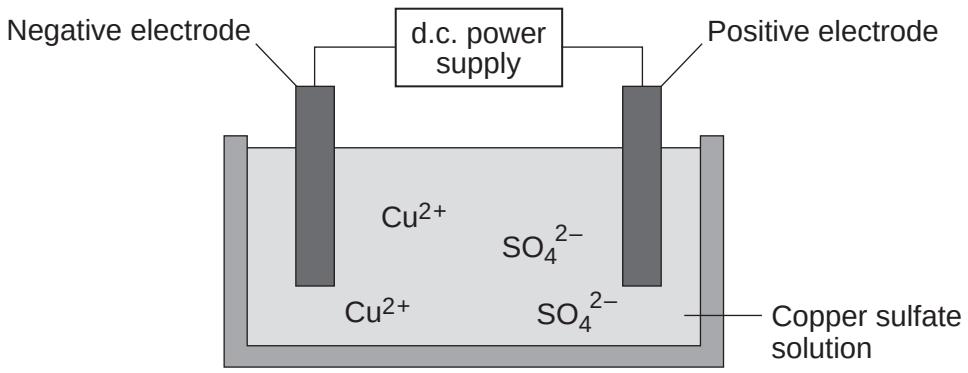
4.10.3.1 Corrosion and its prevention

Question 35 · continued

5 (b) (iv) Bioleaching of low-grade copper ores produces a solution of copper sulfate.

Figure 6 shows apparatus used to obtain copper from copper sulfate solution.

Figure 6



What is the name of the process shown in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

Combustion ☐

Cracking ☐

Electrolysis ☐

Hydration ☐

5 (b) (v) Explain why copper ions move towards the negative electrode in **Figure 6**.

[2 marks]

12

4.10.3.1 Corrosion and its prevention

Question 36

June 2019 | 8462/2F | Original Q6

0 6 This question is about the corrosion of metals.

The corrosion of iron is called rusting.

0 6 . 1 Plan an investigation to show that both water and air are needed for iron to rust.

You should include the results you expect to obtain.

Use apparatus and materials from the list:

- test tubes
- stoppers
- iron nails
- tap water
- boiled water
- drying agent
- oil.

[6 marks]

4.10.3.1 Corrosion and its prevention

Question 36 · continued

A student investigated how the mass of three iron nails, **A**, **B** and **C**, increased after rusting.

Table 4 shows the student's results.

Table 4

Nail	Mass of nail before rusting in g	Mass of nail after rusting in g	Increase in mass of nail in g
A	1.22	1.30	0.08
B	1.25	1.36	**X**
C	1.24	1.33	0.09

0 6 . 2 Calculate **X** in **Table 4**.

[1 mark]

X = _____ g

0 6 . 3 Calculate the mean increase in mass of the three iron nails, **A**, **B** and **C**.

Use **Table 4** and your answer to Question **06.2**

[1 mark]

Mean increase in mass = _____ g

8

4.10.3.1 Corrosion and its prevention

Question 37

June 2023 | 8462/2F | Original Q7

0 7 This question is about alloys.

Steels are alloys of iron.

0 7 . 1 Which non-metal element is in all steels?

[1 mark]

Tick (✓) **one** box.

- Carbon ☐
- Iodine ☐
- Sulfur ☐

0 7 . 2 Which **two** elements other than iron are in stainless steels?

[2 marks]

Tick (✓) **two** boxes.

- Chromium ☐
- Gold ☐
- Magnesium ☐
- Nickel ☐
- Zinc ☐

Question 7 continues on the next page

Question 37 · continued

0 7 . 3 Give **two** properties of stainless steels.

Choose answers from the box.

[2 marks]

brittle	**hard**	**low density**
resistant to corrosion	**soluble in water**	

Property 1 _____

Property 2 _____

Titanium is used in alloys.

Table 6 shows information about some alloys of titanium.

Table 6

Titanium alloy	Other metals in alloy	Strength	Used in
A	6.0% aluminium 4.0% vanadium	high	aircraft parts hip joint replacements
B	5.0% aluminium 2.5% tin	high	aircraft parts
C	3.0% aluminium 2.5% vanadium	medium	tennis rackets heart pacemakers

0 7 . 4 Calculate the mass of titanium in 5.0 kg of titanium alloy **C**.

Use **Table 6**.

[3 marks]

Mass = _____ kg

4.10.3.1 Corrosion and its prevention

Question 37 · continued

June 2023 | 8462/2F | Original Q7

0 7 . 5 Suggest why alloy **A** and alloy **B** are used to make aircraft parts.

Use **Table 6**.

[1 mark]

0 7 . 6 Titanium alloys used for medical purposes must **not** be toxic.

Suggest why alloy **B** is **not** used for medical purposes.

Use **Table 6**.

[1 mark]

10

4.10.3.1 Corrosion and its prevention

Question 38

June 2025 | 8462/2F | Original Q10

1 0 Doors can be made from aluminium or wood.

1 0 . 1 **Table 5** gives information about aluminium and wood.

Table 5

	Aluminium	**Wood**
Raw material	Metal ore from rock	Trees
Relative cost of 1 kilogram of material	87	1
Relative strength	1.3	1.0
Protection	No protection needed to prevent corrosion	Painted to prevent rotting
Disposal	Melted to form new products	Shredded into wood chips for fuel

Evaluate the use of aluminium and of wood for making doors.

[6 marks]

Extra space

4.10.3.1 Corrosion and its prevention

Question 38 · continued

10.2 Aluminium has an oxide coating that protects the metal from corrosion.

Explain how the oxide coating protects aluminium from corrosion.

[2 marks]

10.3 Doors made from wood need painting to prevent rotting.

Paints are **formulations** made by mixing a solid pigment and a liquid.

Which statement describes the composition of a paint?

[1 mark]

Tick (✓) **one** box.

- A fixed mass of pigment and a fixed mass of liquid ☐
- A fixed mass of pigment and a variable mass of liquid ☐
- A variable mass of pigment and a fixed mass of liquid ☐
- A variable mass of pigment and a variable mass of liquid ☐

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