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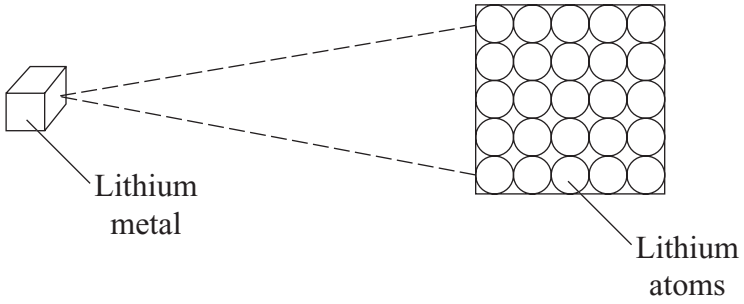
Answer **all** questions in the spaces provided.

1 Lithium metal is used in alkaline batteries.

(a) The diagram shows the atoms in lithium metal.



Why is lithium metal described as an element?

.....

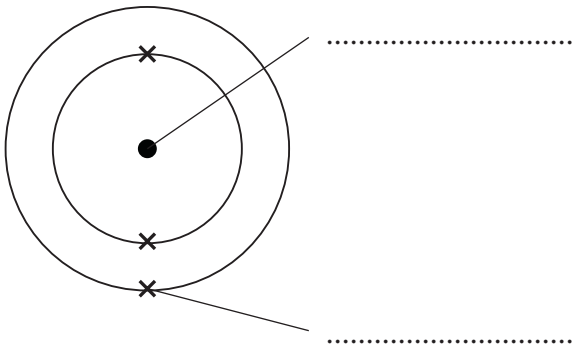
.....

(1 mark)

(b) The diagram below represents a lithium atom.

Choose words from the box to label parts of the atom.

bond	**electron**	**molecule**	**nucleus**

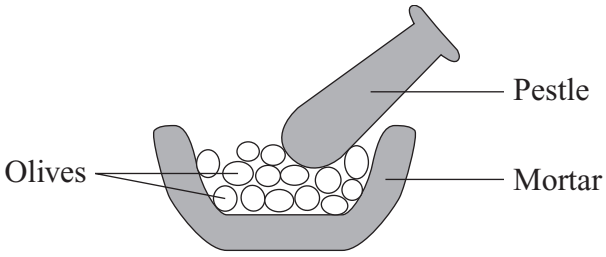


(2 marks)

3

2 A vegetable oil can be extracted from olives.

(a) The diagram shows the first step in this extraction.



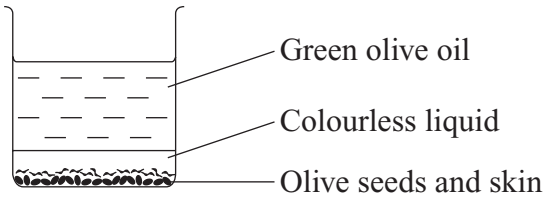
Use the correct word from the box to complete the sentence about this first step.

evaporating	**filtering**	**pressing**

The olive oil is extracted by ..... the olives.

(1 mark)

(b) The contents from the mortar are tipped into a beaker. The mixture is left to settle.



(i) What is the name of the colourless liquid?

.....

(1 mark)

(ii) How can the olive seeds and skins be removed from the liquids?

.....

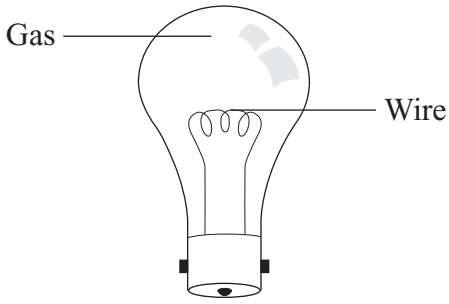
.....

(1 mark)

3

3 When electricity passes through a thin wire, the wire gets hot. If the wire gets very hot, it may glow. This idea is used in filament lamps.

Filament lamp



(a) The table shows some metals and their melting points.

Metal	Melting point in °C
Aluminium	660
Copper	1084
Iron	1540
Tungsten	3410

Which metal in the table should be used to make the wire in a filament lamp?

Give a reason for your answer.

.....

.....

.....

.....

(2 marks)

(b) The table shows some gases.

Gas
Argon
Carbon dioxide
Oxygen
Sulfur dioxide

Which gas in the table should be used in a filament lamp?

Give a reason for your answer.

.....

.....

.....

.....

(2 marks)

4

Turn over for the next question

4 Limestone contains calcium carbonate.

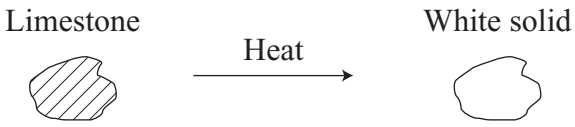
(a) Calcium carbonate has the formula $CaCO_3$.

Complete the sentence by writing in the correct numbers.

The formula of calcium carbonate is made up of 1 calcium atom, ... carbon atom(s) and ..... oxygen atom(s).

(2 marks)

(b) When limestone is heated it forms two other compounds.



$$\mathbf{CaCO_3} \rightarrow \mathbf{CaO} + \mathbf{CO_2}$$

(i) State **one** safety precaution that you should take when heating limestone.

.....

(1 mark)

(ii) Name the white solid produced.

.....

(1 mark)

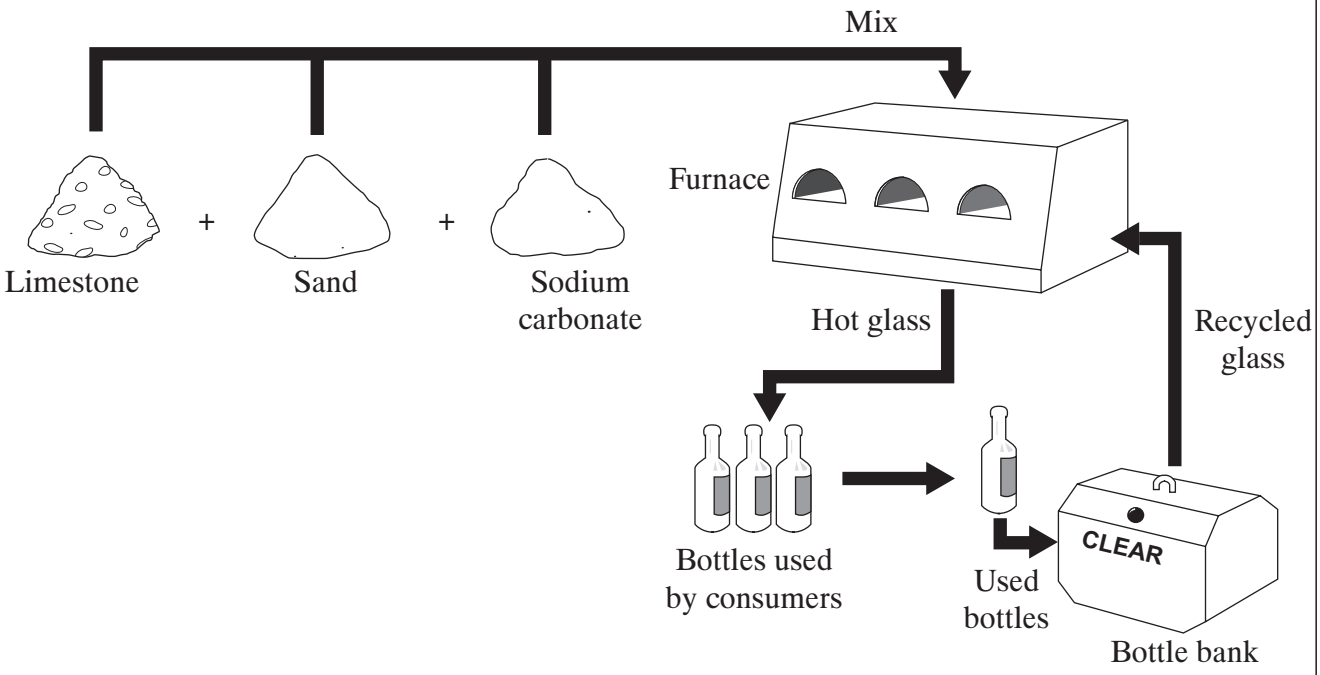
(iii) Why does a piece of limestone lose mass as it is heated?

.....

.....

(1 mark)

(c) Limestone is used to manufacture glass. Glass is made by heating a mixture of limestone, sand and sodium carbonate in a furnace.
The reaction requires a high temperature. If some recycled glass is added, the reaction takes place at a lower temperature.



Suggest **two** reasons why people are encouraged to recycle glass.

1 .....

.....

2 .....

.....

(2 marks)

Question 4 continues on the next page

(d) A company wants to quarry limestone. There are some houses near the quarry.

Residents in the houses say that they do not want a quarry next to them.

(i) Suggest **two** reasons why they do not want the quarry next to them.

1 .....

.....

2 .....

.....

(2 marks)

(ii) Suggest **one** possible benefit to the residents of having a quarry near their houses.

.....

.....

(1 mark)

10

5 Polymers are used to make many materials that people need.

(a) Plastic bags are used to carry, protect and store food. Plastic bags are made from polymers.

Plastic bag made from a polymer

(i) Ethene is the small molecule (the monomer) used to make the polymer for this plastic bag.

Name the polymer that is made from ethene.

.....

(1 mark)

(ii) Use the correct word from the box to complete the sentence about ethene.

condensing	**corroding**	**cracking**

Ethene is made by breaking down large hydrocarbon molecules into smaller hydrocarbon molecules by a process called ..... .

(1 mark)

(iii) The hydrocarbon ethene has the formula C_2H_4

Complete the sentence about ethene.

Ethene is a hydrocarbon made up of carbon and ..... atoms.

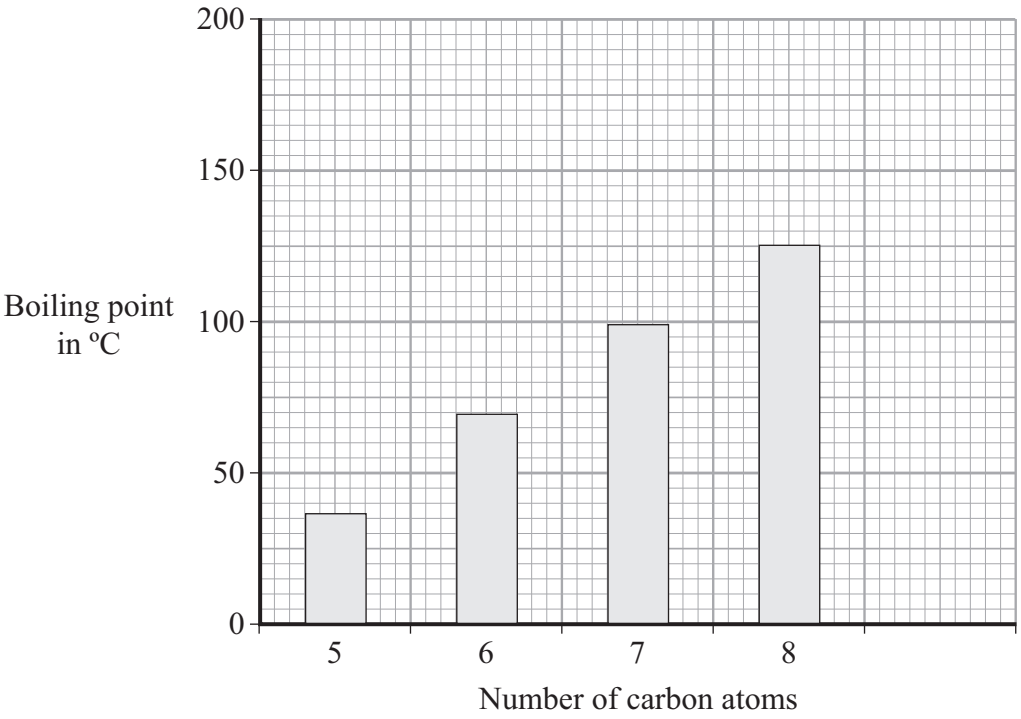
(1 mark)

Question 5 continues on the next page

(b) The hydrocarbons used to make ethene come from crude oil.
The properties of hydrocarbons are linked to the number of carbon atoms in their molecules.

Number of carbon atoms	5	6	7	8	9
Boiling point in °C	36	69	99	125	151

(i) Use the data in the table to complete the bar chart.



(2 marks)

(ii) What happens to the boiling point of a hydrocarbon as the number of carbon atoms increases?

.....

(1 mark)

(iii) All the hydrocarbons in the table are found in petrol. Petrol is one of the fractions separated from crude oil.

Describe how the fractions are separated from crude oil.

.....

.....

.....

.....

.....

(2 marks)

(c) Most plastic bags that are made of hydrocarbons are not biodegradable.

Used plastic bags can be:

- dumped into large holes, which is called landfill
- burned to give out heat energy, which would produce large amounts of gases.

Would burning used plastic bags be better for the environment than dumping them in landfill?

Explain your answer.

.....

.....

.....

.....

(2 marks)

10

Turn over for the next question

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.

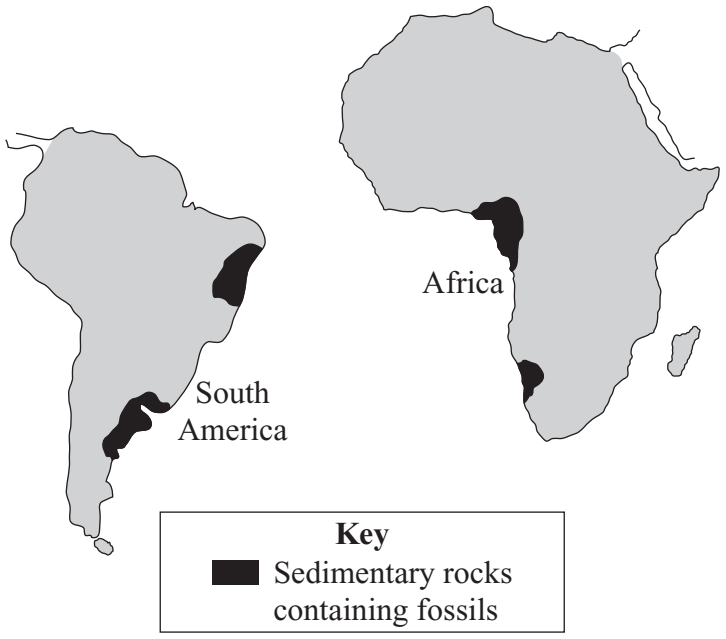
Suggest **one** reason why scientists now know that the Earth is much older than 400 million years.

.....

.....

(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)

(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 .....

.....

2 .....

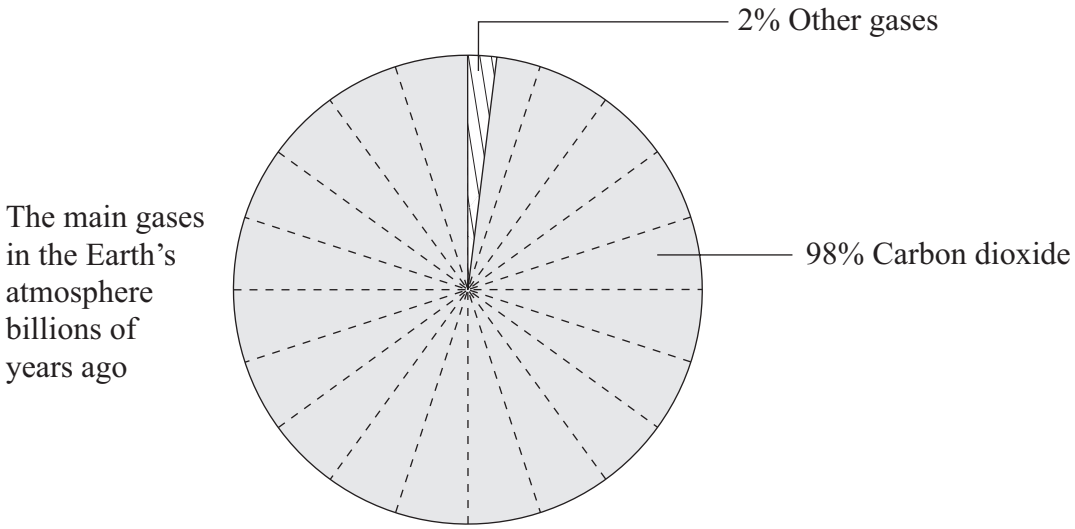
.....

(2 marks)

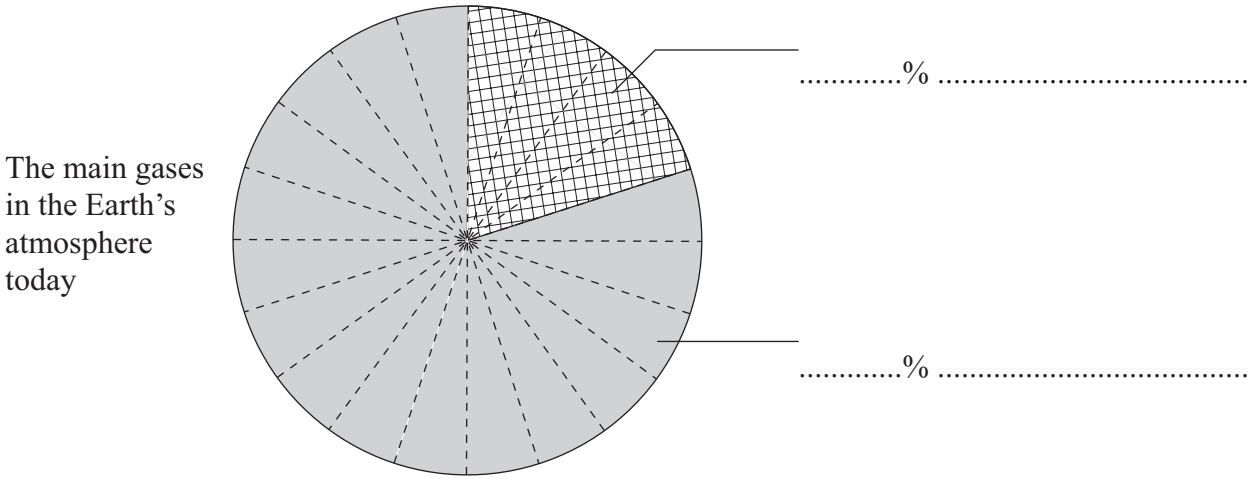
5

Turn over for the next question

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)

(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.

.....

.....

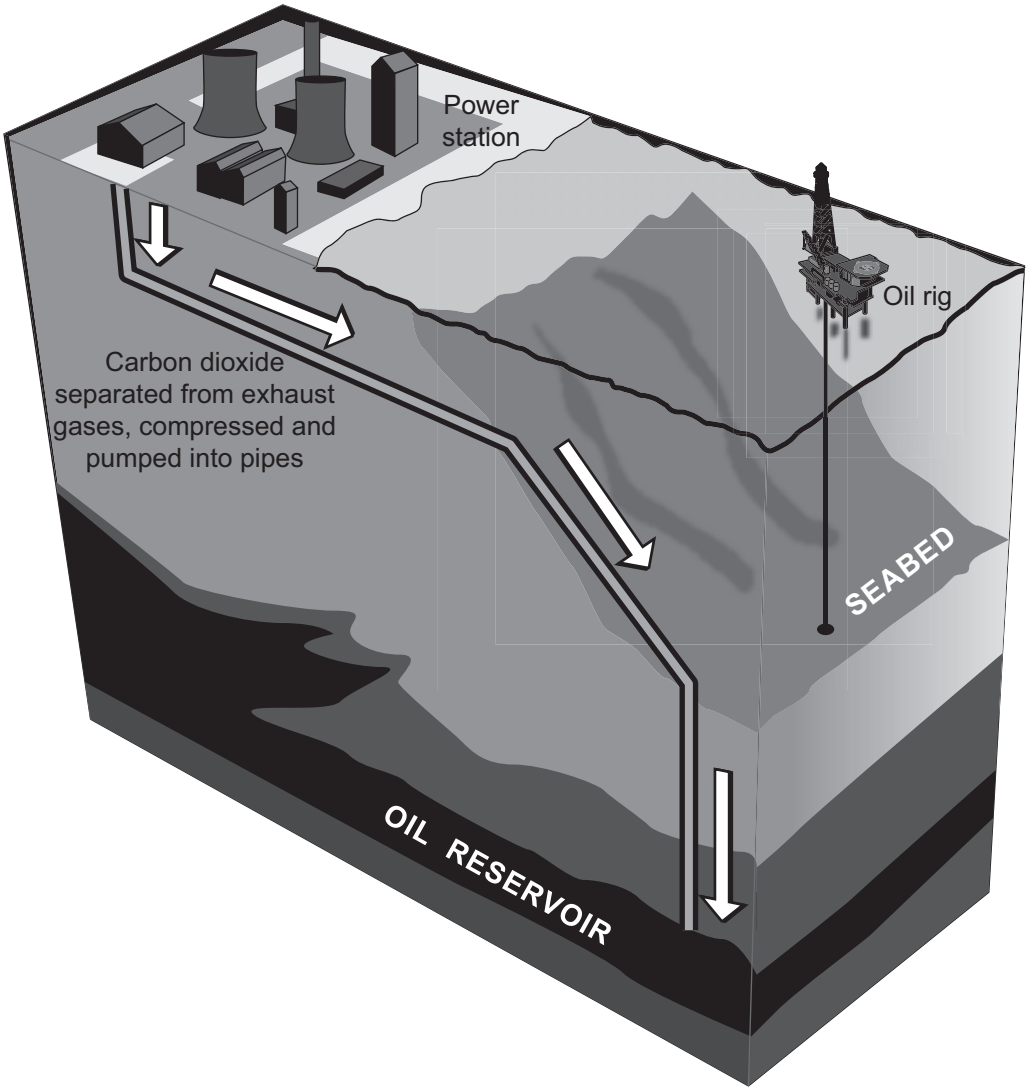
.....

.....

(2 marks)

Question 7 continues on the next page

(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

END OF QUESTIONS

Answer **all** questions in the spaces provided.

1 (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.

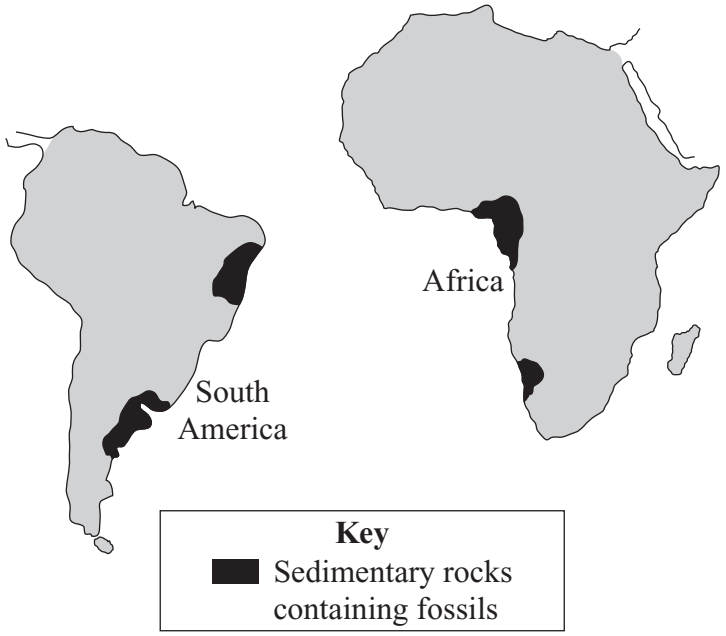
Suggest **one** reason why scientists now know that the Earth is much older than 400 million years.

.....

.....

(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)

(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 .....

.....

2 .....

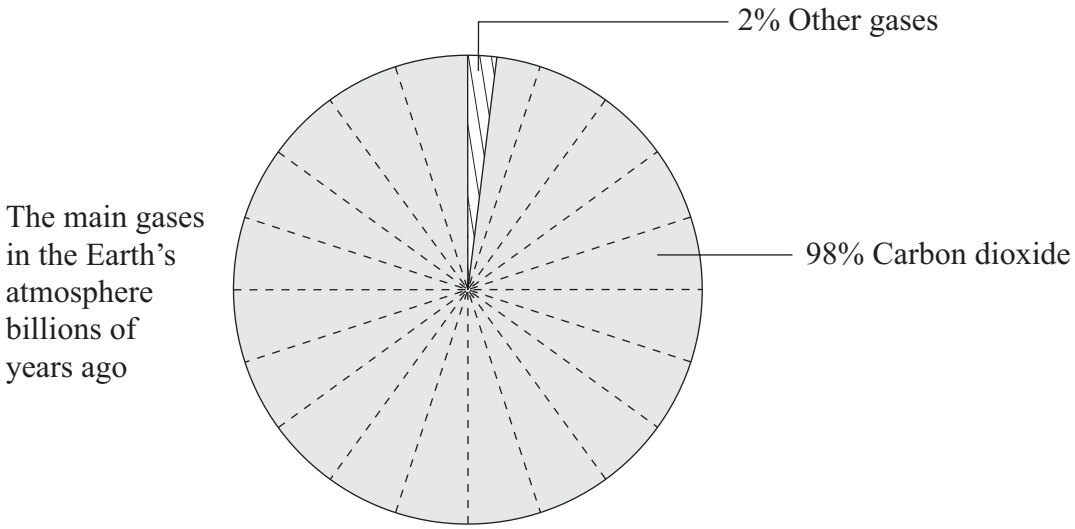
.....

(2 marks)

5

Turn over for the next question

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



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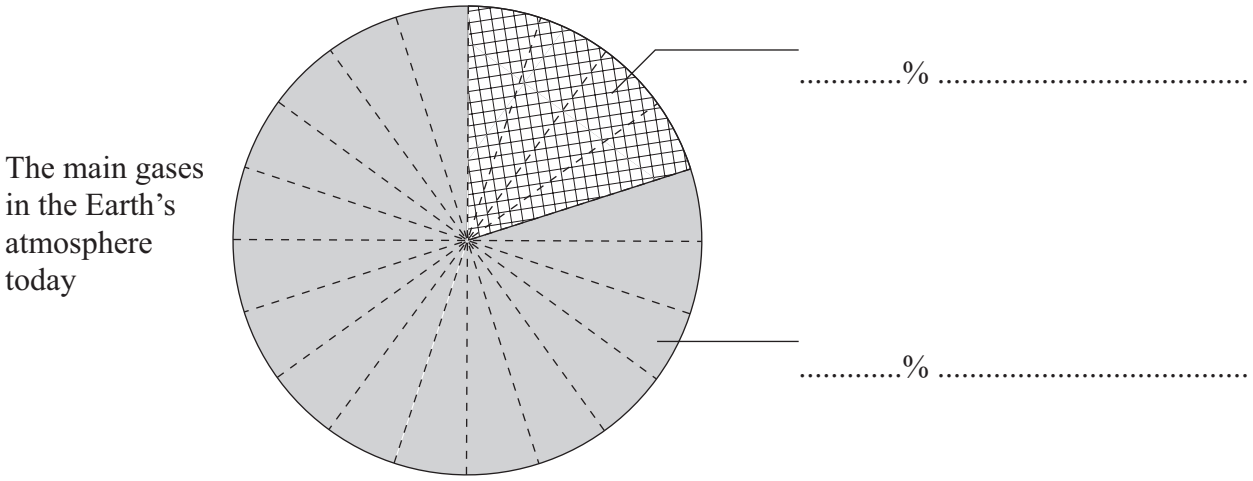


(2 marks)

(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.

.....

.....

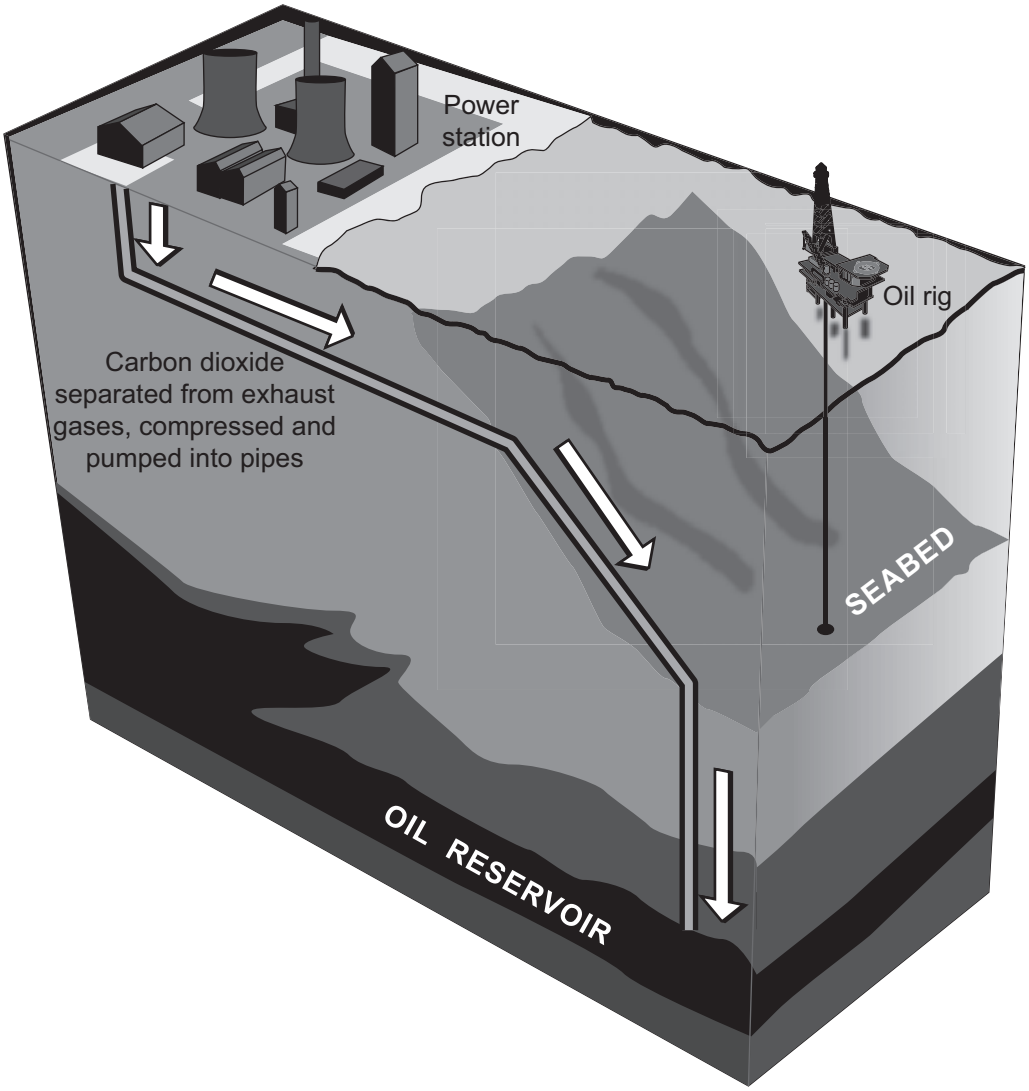
.....

.....

(2 marks)

Question 2 continues on the next page

(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

3 Many everyday items are made from iron.

(a) Haematite is an *ore* of iron. Haematite contains iron oxide, Fe_2O_3.

(i) What is the meaning of the term *ore*?

.....

.....

(1 mark)

(ii) Iron can be produced by reacting iron oxide with carbon in a blast furnace.

What type of reaction produces the iron?

.....

.....

(1 mark)

(iii) The word equation for this reaction is:

iron oxide + carbon → iron + carbon dioxide

Complete and balance the symbol equation for this reaction.

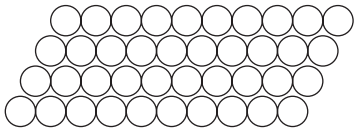
.....Fe_2O_3 + ...C → ..... + ...

(2 marks)

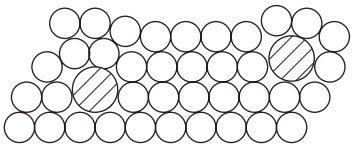
Question 3 continues on the next page

(b) Pure iron is relatively soft and not very strong.

The iron from the blast furnace is very hard and brittle. It contains about 4 % carbon and is used as cast iron.



Pure iron



Cast iron

Explain the differences in the properties of pure iron and cast iron by referring to the diagrams.

.....

.....

.....

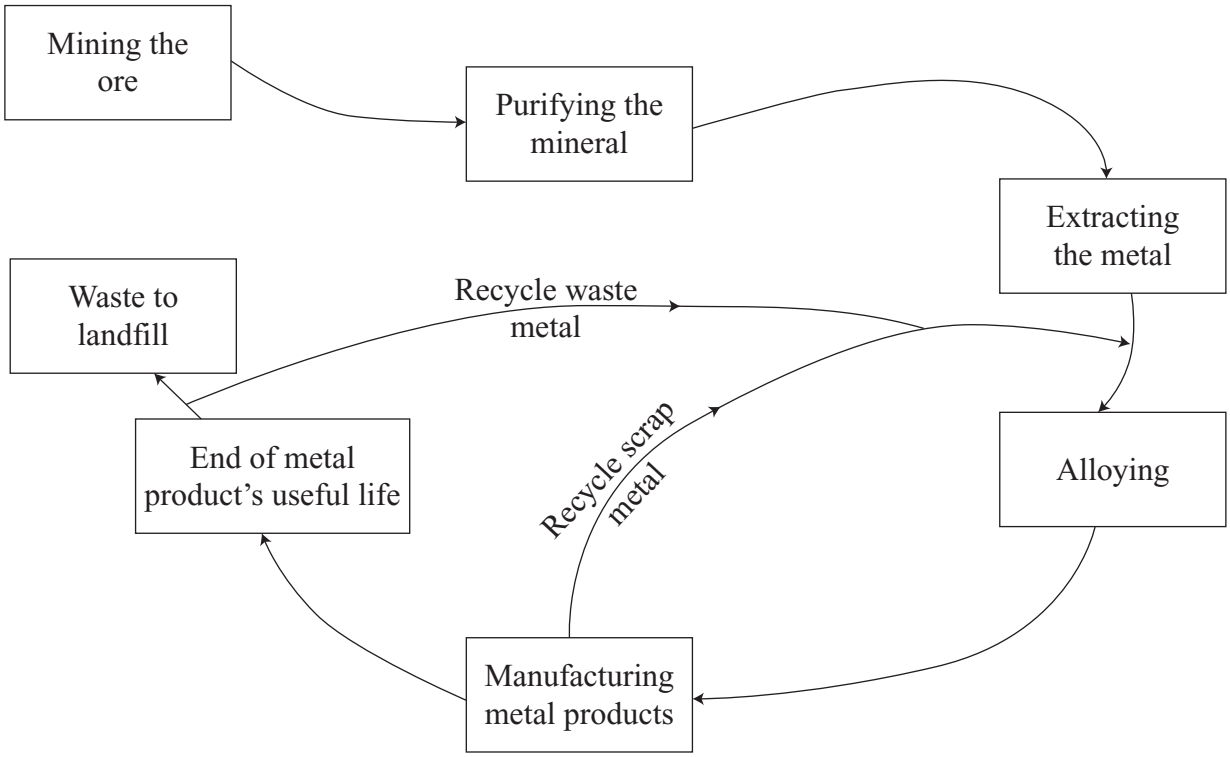
.....

.....

.....

(3 marks)

(c) The diagram shows the way in which iron is extracted, used and recycled.



Explain why the recycling of iron is necessary for sustainable development.

.....

.....

.....

.....

.....

.....

(3 marks)

10

4 This information was taken from a label on a packet of crisps.

Main ingredients:
Potatoes, vegetable oil, Worcester sauce flavour, colourings, flavourings, salt.

Nutritional information (per 100 g):

Energy	2040 kJ
Protein	6.5 g
Carbohydrate	55 g
of which sugars	3 g
Fat	27 g
of which saturates	9 g
unsaturates	18 g
Fibre	4.5 g
Sodium	1.2 g

(a) Saturated fats are linked to heart problems. In order to claim that their crisps are healthy, the manufacturer keeps the proportion of saturated fats low.

(i) What type of fat contains double carbon carbon bonds?

.....

(1 mark)

(ii) The colour of bromine water is orange.

What is seen when bromine water is shaken with:

an unsaturated fat .....

a saturated fat? .....

(2 marks)

(iii) Unsaturated vegetable oils can be hardened to make them useful as spreads.

Describe how unsaturated vegetable oils are hardened.

.....

.....

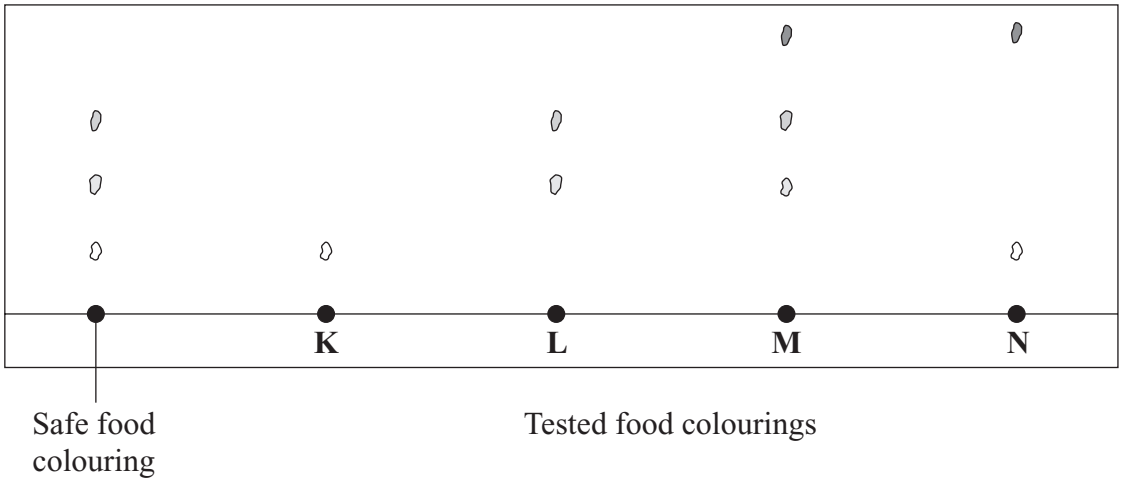
.....

.....

(2 marks)

(b) The crisp manufacturer had to remove these crisps from sale because they contained Worcester sauce flavour. The Worcester sauce flavour was found to contain the artificial colouring called Sudan 1, which is known to cause cancer.

The diagram shows how the dyes in the colourings were detected and identified.



(i) What is the name of the process that is used to detect and identify the dyes in colourings?

.....

(1 mark)

(ii) Which food colouring, **K**, **L**, **M** or **N**, is made up of a single dye?

.....

(1 mark)

(iii) Which of the food colourings **K**, **L**, **M** and **N** are safe to use?

.....

(1 mark)

(iv) Explain how you can tell that each of the five food colourings is different.

.....

.....

.....

.....

(2 marks)

10

5 Crude oil is a mixture of mostly alkanes.

(a) Crude oil is separated into useful fractions by fractional distillation.

(i) Describe and explain how the mixture of alkanes is separated by fractional distillation.

.....

.....

.....

.....

.....

.....

.....

(3 marks)

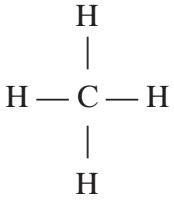
(ii) The table gives the name and formula for each of the first three alkanes.

Complete the table to show the formula of butane.

Name of alkane	**Formula**
Methane	CH_4
Ethane	C_2H_6
Propane	C_3H_8
Butane	

(1 mark)

(b) The structural formula of methane, CH_4, is:

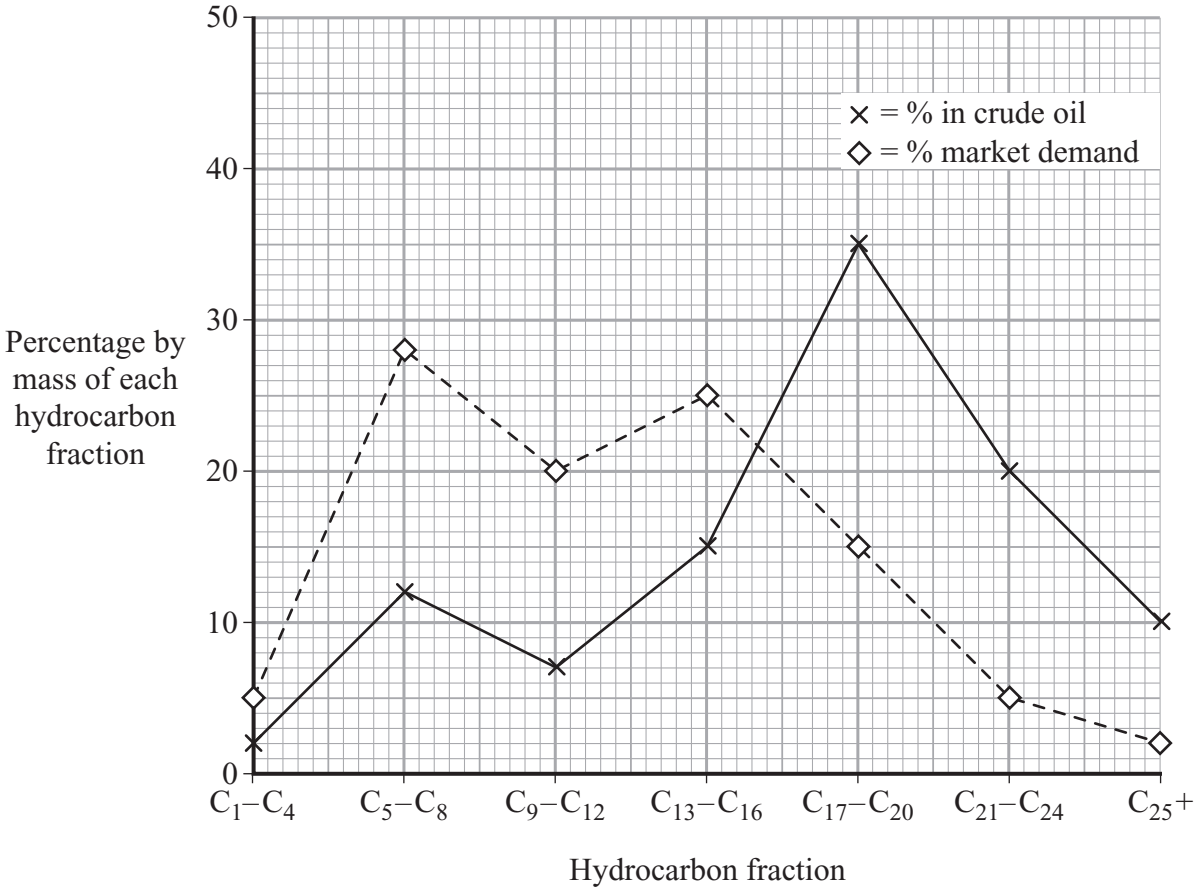


Draw the structural formula of propane, C_3H_8

(1 mark)

Question 5 continues on the next page

(c) The relative amounts of and the market demand for some hydrocarbons from the fractional distillation of crude oil are shown in the graph.



(i) Why is the market demand for the $C_5–C_8$ fraction higher than the market demand for the $C_{21}–C_{24}$ fraction?

.....

.....

(1 mark)

(ii) Cracking is used to break down large hydrocarbon molecules into smaller hydrocarbon molecules.

Complete the symbol equation by writing in the formula of the other hydrocarbon.

$C_{20}H_{42} \rightarrow C_{16}H_{34} + 2$ .....

(1 mark)

(iii) The C_5-C_8 fraction has low supply and high market demand.

Suggest **three** ways in which the oil industry could overcome this problem.

1 .....

.....

2 .....

.....

3 .....

.....

(3 marks)

10

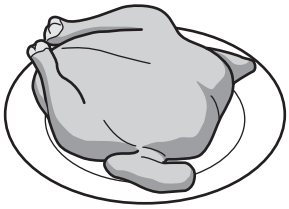
END OF QUESTIONS

1 This question is about cooking.

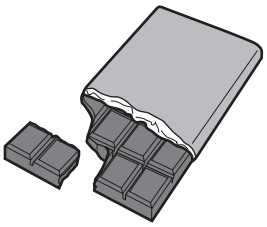
(a) Look at the list of foods.

apple

chicken

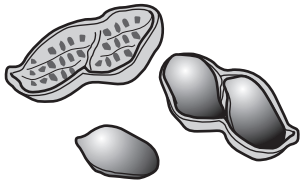


chocolate bar

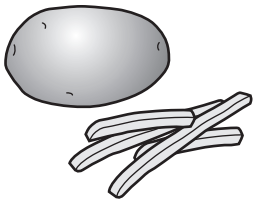


crisps

peanut



potato



Write down the **two** foods that need to be cooked before we can eat them.

Choose from the list.

answer ..... and ..... [2]

(b) **(i)** Eggs are usually cooked before they are eaten.

One method of cooking is frying.

Write down one **other** way of cooking an egg.

..... [1]

(ii) Write down **two** changes that happen when an egg is cooked.

1 .....

.....

2 .....

..... [2]

[Total: 5]

2 Some perfumes contain smelly chemicals called esters.

Esters can be made by reacting two types of chemical together.

(a) Complete this **word** equation about making esters.

alcohol + ... → ester + ... [2]

(b) Cosmetics are tested before they are used on humans.

In some countries cosmetics are still tested on animals before they are used on humans.

Write about the testing of cosmetics.

Your answer should include

- why cosmetics need to be tested
- one advantage of testing on animals
- one disadvantage of testing on animals.

.....

.....

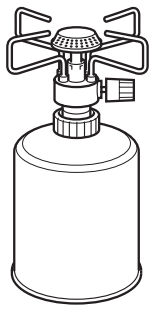
.....

.....

..... [3]

[Total: 5]

3 Propane is a gas used in camping stoves.



The formula of propane is C_3H_8.

Propane reacts with oxygen to make carbon dioxide and water.

(a) (i) How many **elements** are there in propane, C_3H_8?

..... [1]

(ii) How many **atoms** are there in one molecule of propane, C_3H_8?

..... [1]

(b) Propane reacts with oxygen to make carbon dioxide and water.

Look at the word equation for this reaction.

propane + oxygen → carbon dioxide + water

One of the four substances in the equation is an **element**.

Which one?

Choose from the list.

propane

oxygen

carbon dioxide

water

answer ..... [1]

(c) The oxygen supply to the flame is not enough.

The flame changes colour from blue to yellow.

The flame now contains a black solid and carbon monoxide gas.

(i) What is the name of the black solid?

..... [1]

(ii) Why is carbon monoxide gas dangerous?

..... [1]

[Total: 5]

4 This question is about plastics.

(a) Look at the table.

It shows the properties of some plastics.

	property			
plastic	**flexibility**	**hardness**	**ease of colouring**	**melting point in °C**
A	very flexible	soft	easy	367
B	rigid	soft	not easy	200
C	rigid	hard	not easy	874
D	very flexible	soft	very easy	178

(i) A plastic part of an electric toaster must not melt.

Which plastic has the **highest** melting point?

Choose from **A**, **B**, **C** or **D**.

answer ..... [1]

(ii) Plastic **B** is polystyrene.

Write down one use for polystyrene.

..... [1]

(b) Many plastics are **non-biodegradable**.

Write down what is meant by non-biodegradable.

.....

..... [1]

(c) Disposal of waste plastics causes problems.

One of these problems is litter.

Write about **other** problems of disposing of plastics.

.....

.....

..... [2]

[Total: 5]

[Turn over

5 Stowmarket Synthetics make an oil paint.

This oil paint contains a pigment and a solvent.

(a) What is the job of the solvent in the paint?

..... [1]

(b) The pigment gives the oil paint a colour.

What type of pigment changes colour when it is heated or cooled?

Choose from the list.

colloid

natural

phosphorescent

synthetic

thermochromic

answer ..... [1]

(c) What type of pigment glows in the dark?

Choose from the list.

colloid

natural

phosphorescent

synthetic

thermochromic

answer ..... [1]

[Total: 3]

6 Air is a mixture of many gases.

Carbon monoxide, sulfur dioxide and oxides of nitrogen are pollutants sometimes found in air.

(a) Write down the name of one gas found in **non-polluted** air.

..... [1]

(b) Sulfur dioxide causes acid rain.

One environmental problem caused by acid rain is that it corrodes metals.

Write about **other** environmental problems caused by acid rain.

.....

.....

..... [2]

(c) Nitrogen monoxide is made in a car engine.

It can be removed from the exhaust gases of a car by a catalytic converter.

In a catalytic converter nitrogen monoxide reacts with carbon monoxide.

Carbon dioxide and nitrogen are made.

Write down the **word** equation for the reaction in the catalytic converter.

..... [1]

(d) The catalyst in a catalytic converter has a large surface area.

The reaction between nitrogen monoxide and carbon monoxide is very fast.

Explain why.

Use ideas about particles.

.....

..... [1]

[Total: 5]

7 Metals are a very useful type of material.

Steel is an alloy. It is a mixture of iron and carbon.

(a) Look at this list of metals.

brass

copper

lead

mercury

solder

Two of the metals are alloys.

Which two?

..... and ..... [2]

(b) Look at the table.

It shows some information about four metals.

metal	melting point in °C	density in g/cm^3	relative strength (1 is very weak)	relative hardness (1 is very soft)
aluminium	660	2.7	11	2.8
copper	1085	8.9	33	3.0
iron	1538	7.9	20	4.5
titanium	1668	4.5	40	6.0

(i) Which metal is the **hardest**?

..... [1]

(ii) Which metal has the **lowest** density?

..... [1]

(iii) Iron corrodes quickly in moist air.

This is called rusting.

Aluminium does not corrode in moist air.

Explain why.

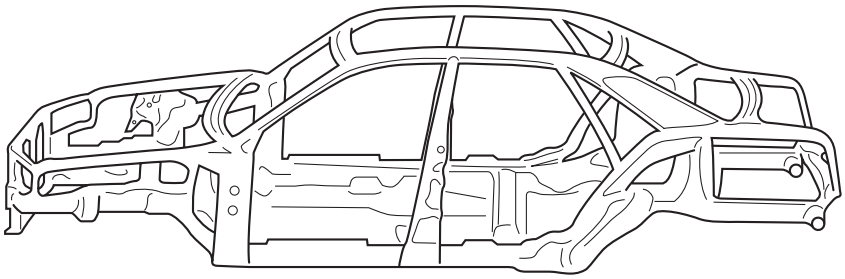
.....

.....

..... [2]

(iv) Steel is an alloy that contains mostly iron.

Look at the diagram. It shows a car body.



Aluminium or steel can be used to make a car body.

One advantage of aluminium is that it will not corrode in moist air.

Describe **another** advantage and a disadvantage of using aluminium instead of steel to make a car body.

Information in the table may help you answer this question.

advantage of using aluminium .....

.....

disadvantage of using aluminium .....

..... [2]

(c) Aluminium and steel are both recycled.

One reason is to save money.

Suggest **one** other reason for recycling.

.....

..... [1]

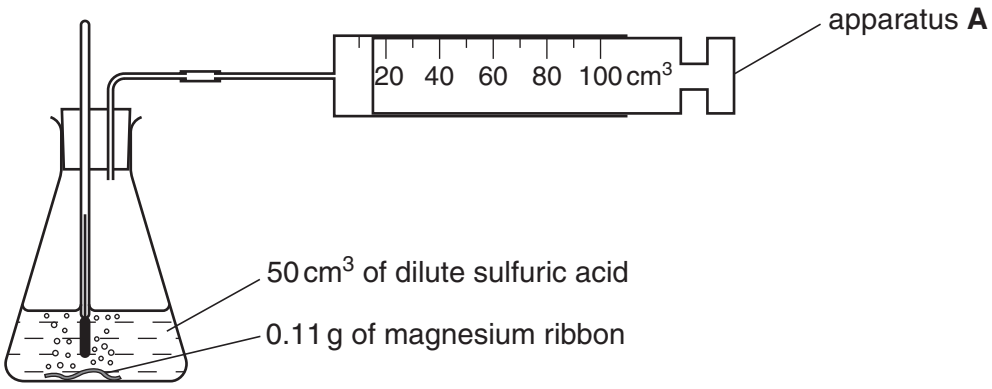
[Total: 9]

[Turn over

8 Blessy and Anu investigate the reaction between magnesium and dilute sulfuric acid.

This reaction makes hydrogen and magnesium sulfate.

Look at the apparatus they use.



(a) What is the name of apparatus **A**?

..... [1]

(b) Blessy and Anu do four experiments.

They do each experiment using acid at a different temperature.

Each time they use

- 50 cm^3 of dilute sulfuric acid
- 0.11 g of magnesium.

They measure the time it takes to collect 100 cm^3 of hydrogen.

Look at their results.

temperature of acid in °C	**time to collect 100 cm^3 of hydrogen in seconds**
20	36
30	18
40	9
50	5

(i) At what temperature was the time taken to collect 100 cm^3 of hydrogen the **longest**?

..... °C [1]

(ii) What happens to the **rate** of reaction as the temperature **increases**?

..... [1]

[Total: 3]

END OF QUESTION PAPER

1 Some perfumes contain smelly chemicals called esters.

Esters can be made by reacting two types of chemical together.

(a) Complete this **word** equation about making esters.

alcohol + ... → ester + ... [2]

(b) Cosmetics are tested before they are used on humans.

In some countries cosmetics are still tested on animals before they are used on humans.

Write about the testing of cosmetics.

Your answer should include

- why cosmetics need to be tested
- one advantage of testing on animals
- one disadvantage of testing on animals.

.....

.....

.....

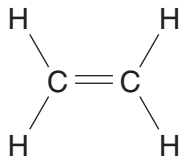
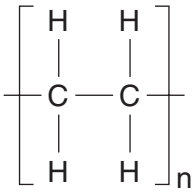
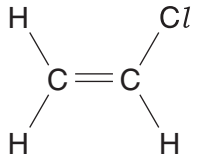
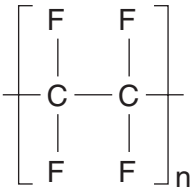
.....

..... [3]

[Total: 5]

2 Addition polymers are made by joining lots of monomer molecules together.

(a) Look at the table. It shows the structures of some monomers and polymers.

monomer	polymer
	
	
	

Complete the table. [2]

(b) Ethene, C_2H_4, contains only carbon and hydrogen atoms.

What is the name given to compounds that only contain hydrogen and carbon?

..... [1]

(c) Ethene, C_2H_4, is unsaturated because it contains a double bond.

Describe a test to show that a compound is unsaturated.

Write down what you would **see**.

name of chemical used .....

what you would see ..... [2]

(d) Plastics contain polymer molecules.

Disposal of waste plastics causes problems. One of these problems is litter.

Write about **other** problems of disposing of plastics.

.....

.....

..... [2]

[Total: 7]

[Turn over

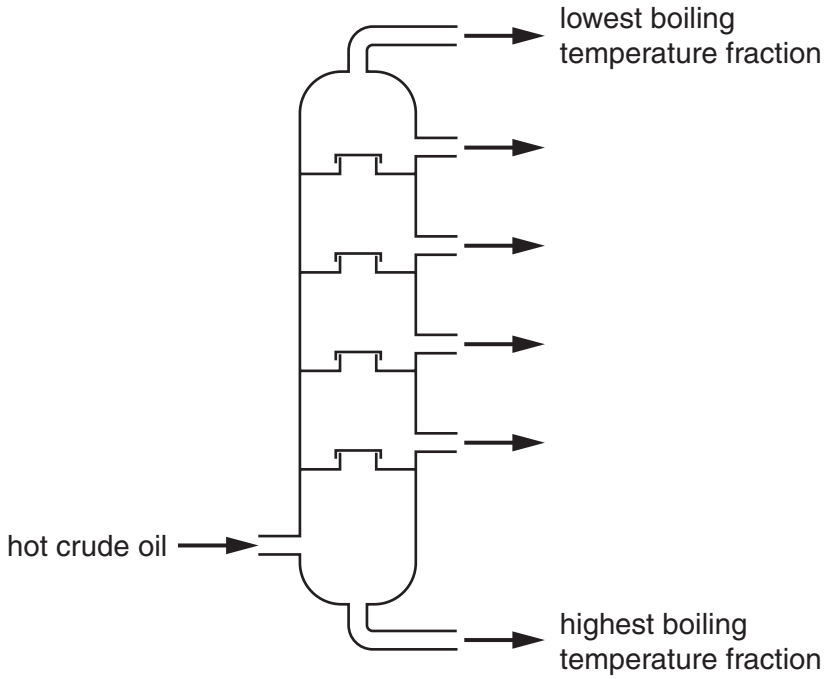
3 Fractional distillation separates crude oil, a mixture of hydrocarbons, into useful fractions.

Look at the diagram.

It shows a fractional distillation column.

During fractional distillation hydrocarbons with low boiling points 'exit' from the top of the column.

Hydrocarbons with high boiling points 'exit' from the bottom.



(a) The boiling point of a hydrocarbon is linked to its molecular size and to intermolecular forces.

(i) What is meant by intermolecular forces?

.....

..... [1]

(ii) What is the relationship between molecular size of a hydrocarbon and the strength of its intermolecular forces?

.....

..... [1]

(iii) What is the relationship between the strength of intermolecular forces and boiling point?

.....

..... [1]

(b) One of the hydrocarbons in camping gas is propane, C_3H_8.

Propane burns in a plentiful supply of oxygen, O_2.

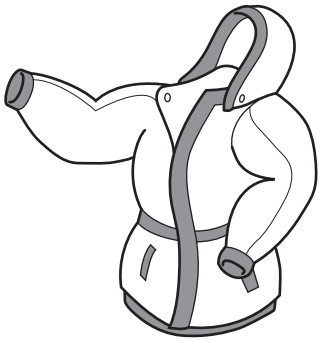
Carbon dioxide and water are formed.

Write a balanced **symbol** equation for this reaction.

..... [2]

[Total: 5]

4 Waterproof coats can be made using nylon or Gore-Tex®.



Nylon and Gore-Tex® are polymers.

One property that makes nylon suitable for making coats is that it is lightweight.

(a) Write down **two** other properties that make nylon suitable for making coats.

1 .....

2 ..... [2]

(b) What advantage does Gore-Tex® have over nylon?

.....

..... [1]

[Total: 3]

5 Stowmarket Synthetics make an oil paint.

This paint contains an oil, a pigment and a solvent.

(a) Explain how an oil paint dries.

.....

..... [1]

(b) A thermochromic pigment changes colour when it is heated or cooled.

Describe one use of a thermochromic paint.

.....

..... [1]

(c) A phosphorescent pigment glows in the dark.

Describe how a phosphorescent pigment is able to glow in the dark.

.....

..... [1]

[Total: 3]

6 Clean air is a mixture of many gases including oxygen, nitrogen and carbon dioxide.

Carbon monoxide, sulfur dioxide and oxides of nitrogen are pollutants sometimes found in air.

Increased energy consumption can change the composition of air.

The air may then contain more atmospheric pollutants.

(a) Deforestation could change the composition of air. Explain how.

.....

.....

..... [2]

(b) Nitrogen monoxide is made in a car engine.

It can be removed from the exhaust gases of a car by a catalytic converter.

In a catalytic converter nitrogen monoxide reacts with carbon monoxide.

Carbon dioxide and nitrogen are made.

(i) Write down the **word** equation for the reaction in the catalytic converter.

..... [1]

(ii) The catalyst in a catalytic converter has a large surface area.

The reaction between nitrogen monoxide and carbon monoxide is very fast.

Explain why.

Use ideas about particles.

.....

..... [1]

[Total: 4]

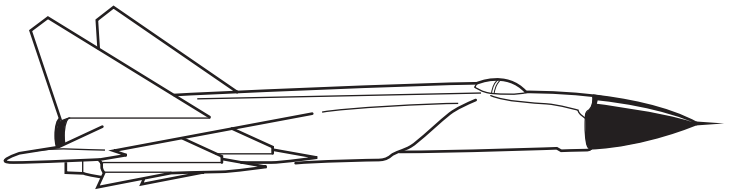
7 Metals are a very useful type of material.

Look at the table.

It shows some information about four metals.

metal	melting point in °C	density in g/cm^3	relative strength (1 is very weak)	relative hardness (1 is very soft)
aluminium	660	2.7	11	2.8
copper	1085	8.9	33	3.0
iron	1538	7.9	20	4.5
titanium	1668	4.5	40	6.0

(a) Look at this aeroplane.



Titanium is used to make this aeroplane.

Use information from the table to explain why.

.....

.....

..... [2]

(b) Iron corrodes quickly in moist air.

This is called rusting.

Aluminium does not corrode in moist air.

Explain why.

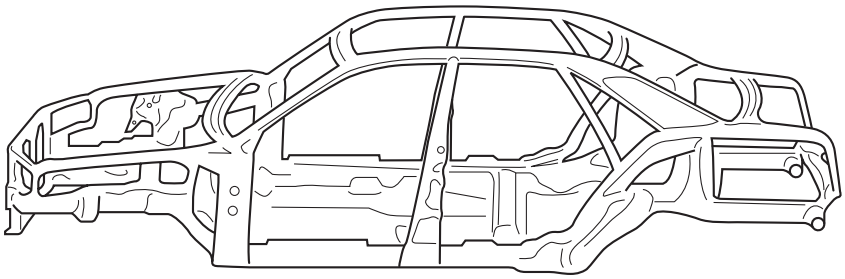
.....

.....

..... [2]

(c) Steel is an alloy that contains mostly iron.

Look at the diagram. It shows a car body.



Aluminium or steel can be used to make a car body.

One advantage of aluminium is that it will not corrode in moist air.

Describe **another** advantage and a disadvantage of using aluminium instead of steel to make a car body.

Information in the table may help you answer this question.

advantage of using aluminium .....

.....

disadvantage of using aluminium .....

..... [2]

[Total: 6]

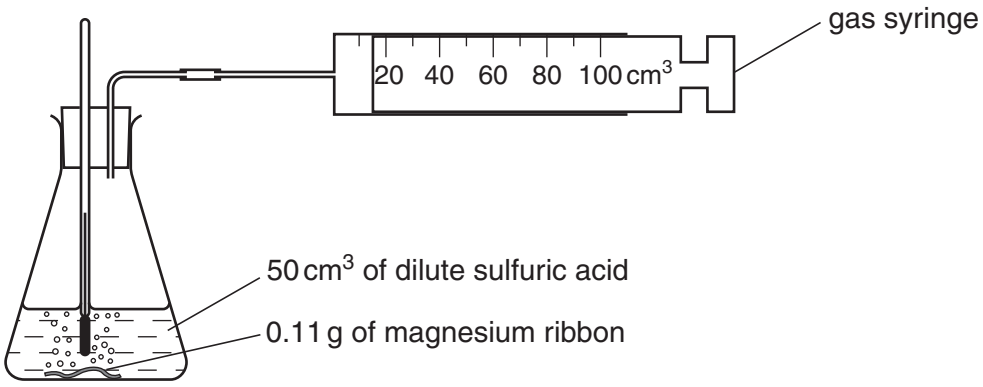
8 Blessy and Anu investigate the reaction between magnesium, Mg, and dilute sulfuric acid, H_2SO_4.

This reaction makes hydrogen, H_2, and magnesium sulfate, $MgSO_4$.

(a) Write the balanced **symbol** equation for this reaction.

..... [1]

(b) Look at the apparatus they use.



Blessy and Anu do four experiments.

They do each experiment using acid at a different temperature.

Each time they use

- 50 cm^3 of dilute sulfuric acid
- 0.11 g of magnesium.

They measure the time it takes to collect 100 cm^3 of hydrogen.

Look at their results.

temperature of acid in °C	**time to collect 100 cm^3 of hydrogen in seconds**
20	36
30	18
40	9
50	5

(i) Describe and explain what happens to the rate of reaction as the temperature increases.

Use ideas about collisions between particles.

.....

.....

..... [2]

(ii) Another way to change the rate of reaction is to increase the concentration of the sulfuric acid.

Describe and explain what happens to the rate of reaction.

Use ideas about collisions between particles.

.....

.....

..... [2]

[Total: 5]

9 The lithosphere is the cold rigid outer part of the Earth.

It is made up of large tectonic plates which float on the mantle.

These plates move very slowly.

Describe how the tectonic plates are able to move.

Use a labelled diagram to help you answer.

.....

.....

.....

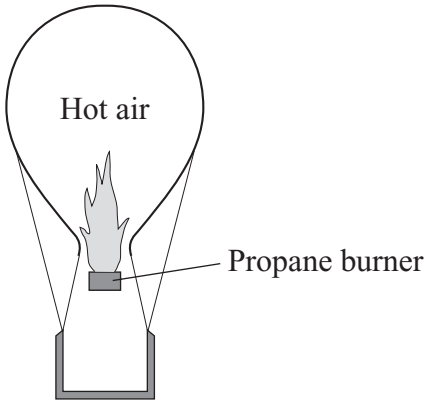
..... [2]

[Total: 2]

END OF QUESTIONS

Answer **all** questions in the spaces provided.

1 Hot air balloons burn hydrocarbons to heat the air.



(a) The hot air contains these gases:

nitrogen, N_2
oxygen, O_2
argon, Ar
carbon dioxide, CO_2
water vapour, H_2O

(i) Argon is an *element*.

What is an *element*?

.....

.....

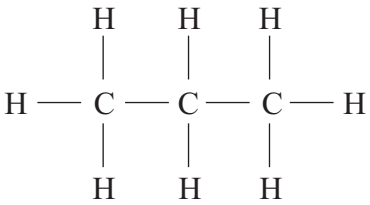
(1 mark)

(ii) Name **one** other gas in the hot air that is also an element.

.....

(1 mark)

(b) Propane, C_3H_8, can be represented as:



Use the correct words from the box to complete the sentences.

bond	carbon	compound	element	mixture

(i) Propane is a ..... and is made up of atoms of hydrogen and ..... .

(2 marks)

(ii) Each line between the atoms in propane represents a chemical ..... .

(1 mark)

5

Turn over for the next question

2 There are six main groups of food additives.

(a) Use the correct food additive from the box to complete the sentences below.

acidity regulators	**antioxidants**	**colours**
emulsifiers	**flavourings**	**preservatives**

(i) To make orange drinks look orange we would add ..... .

(1 mark)

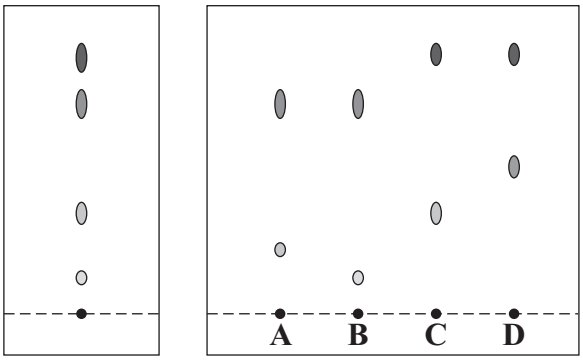
(ii) To improve the coating ability of salad creams we would add ..... .

(1 mark)

(iii) To make the food 'stay fresh' as long as possible we would add ..... .

(1 mark)

(b) Chromatography was carried out on a sample of soft drinks to check that they contained only colours that were safe. This is the result.



Safe colours Colours from the soft drinks

What conclusions about the safety of the colours in the soft drinks **A**, **B**, **C** and **D** can be made from the results shown by chromatography?

.....

.....

.....

.....

(2 marks)

5

Turn over for the next question

3 High amounts of cholesterol in the blood can cause heart disease.

- Eating saturated fat increases the amount of cholesterol in blood.
- Eating monounsaturated fat does not increase the amount of cholesterol in blood.
- Eating polyunsaturated fat decreases the amount of cholesterol in blood.

(a) The amounts of saturated fat and polyunsaturated fat in different types of margarine are shown in the table.

Type of margarine	Description	Saturated fat, g per 100 g margarine	Polyunsaturated fat, g per 100 g margarine
W	Hard margarine from animal and vegetable oils	30	14
X	Soft margarine from animal and vegetable oils	27	16
Y	Hard margarine from vegetable oils only	30	10
Z	Soft margarine from vegetable oils only	26	18

Which type of margarine, **W**, **X**, **Y** or **Z**, would you consider best to use to lower blood cholesterol?

Explain your answer.

The best type of margarine to use is ..... .

Explanation .....

.....

.....

(2 marks)

(b) Use the correct words from the box to complete the sentences.

higher	**hydrogen**	**lower**
oxygen	**saturated**	**unsaturated**

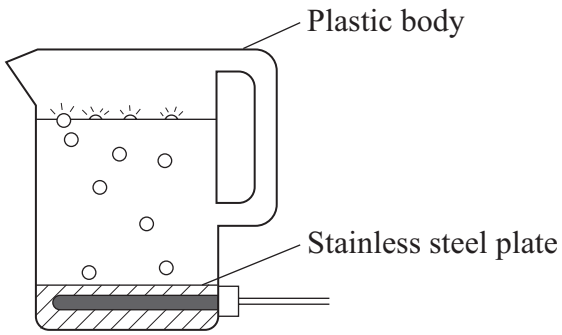
(i) Animal and vegetable oils that contain ..... fats can be hardened.
(1 mark)

(ii) When oils are hardened with ..... gas, a chemical change takes place, producing margarine which has a ..... melting point than the original oil.
(2 marks)

5

Turn over for the next question

4 Plastics are used to make many everyday items, such as the body of the kettle.



(a) Complete the sentences by drawing a ring around the correct words.

(i) The plastic is made from many small molecules called

catalysts
monomers
polymers

.

(1 mark)

(ii) Propene is produced by cracking some of the fractions that are

separated from

crude oil
limestone
metal ores

.

(1 mark)

(b) After a few years the kettle no longer worked.

- Some parts of the kettle are made of plastic.
- Some parts of the kettle are made of stainless steel.
- The owner of the kettle disposed of it in a landfill site.

Consider these statements.

Suggest **three** reasons why the kettle should **not** be disposed of in a landfill site.

1 .....

.....

2 .....

.....

3 .....

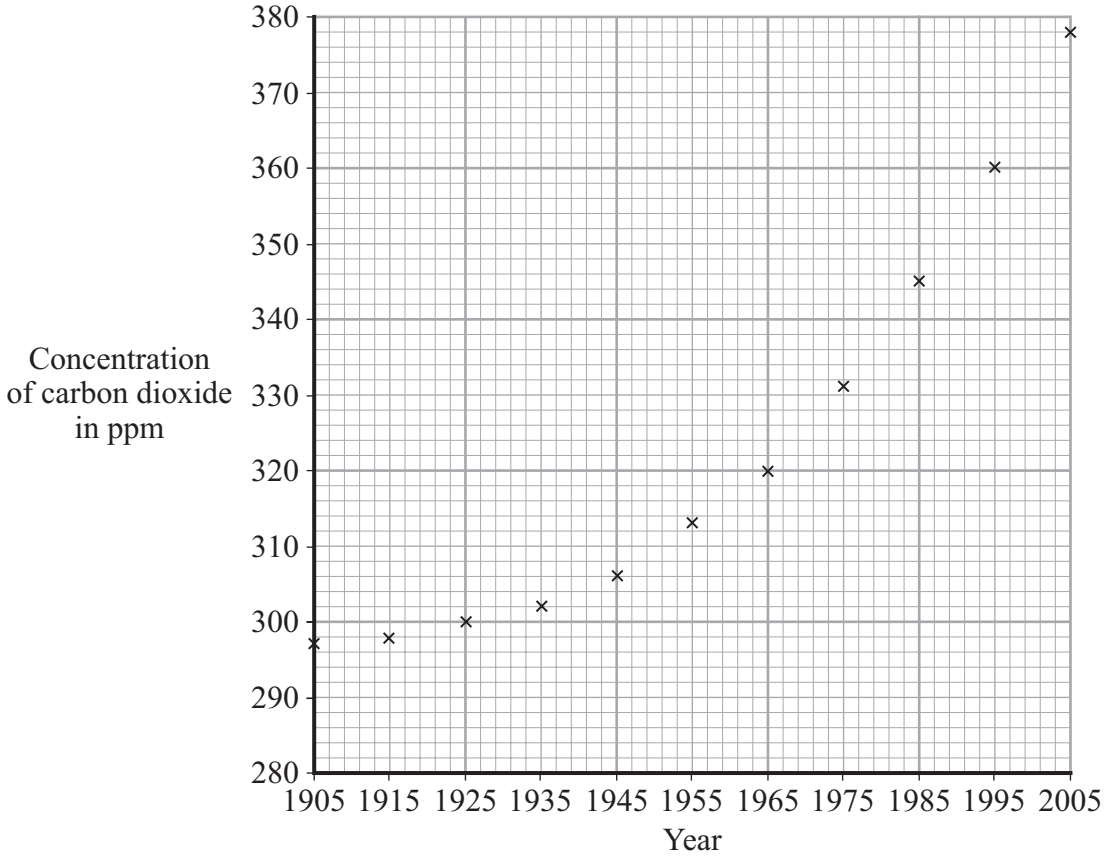
.....

(3 marks)

5

Turn over for the next question

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)

(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.

.....

.....

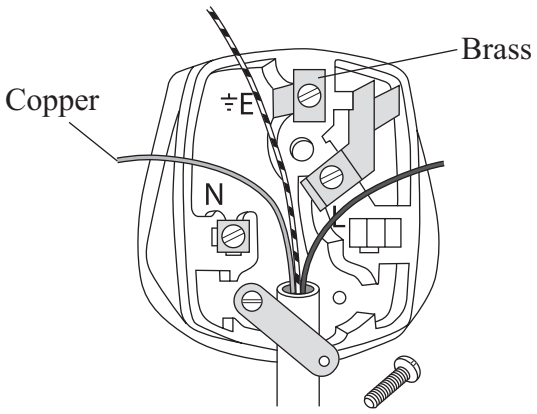
.....

.....

(2 marks)

5

6 Copper metal is used for electric wires.
An alloy of copper, called brass, is used for pins and terminals of electric plugs.



(a) Copper metal is relatively soft and flexible.

Give another reason why copper is used for electric wires.

.....

.....

(1 mark)

(b) Brass is an *alloy*.

What is an *alloy*?

.....

.....

(1 mark)

Question 6 continues on the next page

(c) Open-cast mining of copper ore makes a very large hole.

(i) Suggest **one** environmental problem that is caused by open-cast mining of copper ore.

.....

.....

(1 mark)

(ii) Some copper ores contain copper sulfide, CuS.
Copper sulfide is heated in air to produce copper and sulfur dioxide.

$$CuS + O_2 \rightarrow Cu + SO_2$$

Suggest **one** environmental problem caused by heating copper sulfide in air.

.....

.....

(1 mark)

(d) The amount of copper-rich ores is estimated to last only a few more years.
New houses need several kilometres of copper wire.

(i) Explain why the need to use so much copper will cause a problem in the future.

.....

.....

(1 mark)

(ii) Suggest **two** ways in which society could overcome this problem.

1 .....

.....

2 .....

.....

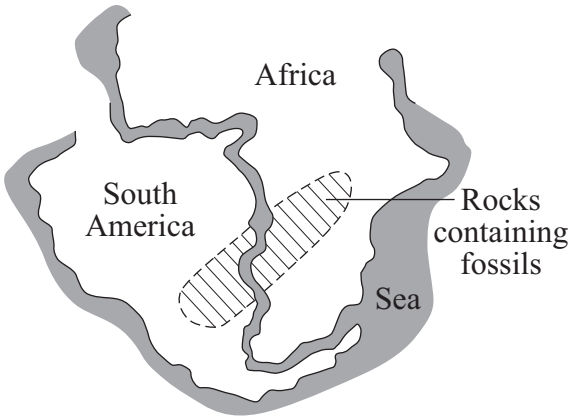
(2 marks)

7

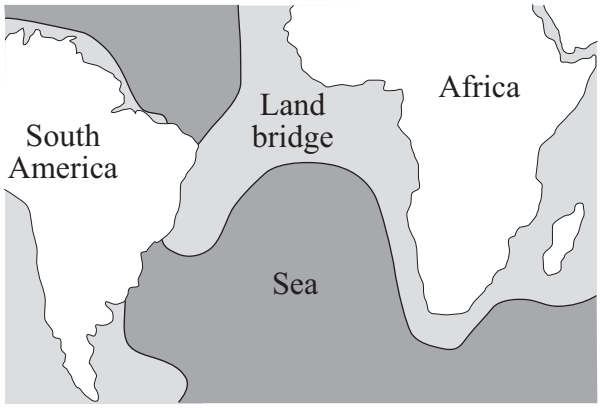
Turn over for the next question

7 A map of the world shows that the outline of South America looks as if it would fit into the west coast of Africa.

- Alfred Wegener in 1920 suggested his idea that the continents had been joined together but then slowly drifted apart.



- Other scientists in 1920 said that the continents were fixed on solid Earth and had been joined by a land bridge.



Modern South American animals are different from modern African animals.
Most fossils of animals found in South America and Africa are exactly the same.

(a) Consider the information above.

(i) What evidence gave Wegener the idea that the continents of South America and Africa had been joined?

.....

.....

(1 mark)

(ii) Suggest **two** reasons why the other scientists in 1920 thought that Wegener was wrong.

1 .....

.....

2 .....

.....

(2 marks)

(b) Complete the sentences by writing in the correct words.

Recent evidence has supported Wegener's idea.

The Earth's ..... and the upper part of the mantle are now thought to be composed of tectonic plates.

Heat released by radioactive processes causes convection currents within the Earth's ..... . These convection currents cause the plates to move a few centimetres per ..... .

(3 marks)

6

Turn over for the next question

8 Soda-lime glass is made by heating, to above 1500 °C, a mixture of:

soda (sodium carbonate), Na_2CO_3

limestone (calcium carbonate), $CaCO_3$

sand (silicon dioxide), SiO_2

(a) (i) Which element do all of these compounds contain?

.....

(1 mark)

(ii) Explain what the formula Na_2CO_3 shows about the compound.

.....

.....

.....

.....

(2 marks)

(b) Calcium carbonate breaks down when heated to above 1500 °C.

(i) Write a word equation to show what happens.

..... → ..... + ...

(2 marks)

(ii) What is the name of this type of chemical reaction?

.....

(1 mark)

(c) The melting point of soda-lime glass is about 750 °C.
The raw materials for making soda are limestone and common salt (sodium chloride).
There are almost unlimited amounts of the raw materials available to manufacture soda-lime glass.

From the information given, what is the most important reason for recycling soda-lime glass?

.....

.....

(1 mark)

7

END OF QUESTIONS