Surname	Centre Number	Candidate Number
Other Names		0

New GCSE

4462/01

SCIENCE A
FOUNDATION TIER
CHEMISTRY 1

A.M. TUESDAY, 12 June 2012

1 hour

Suitable for Modified Language Candidates

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**6**	
2.	**6**	
3.	**6**	
4.	**6**	
5.	**5**	
6.	**7**	
7.	**5**	
8.	**5**	
9.	**8**	
10.	**6**	
Total	**60**	

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ADDITIONAL MATERIALS

In addition to this paper you will need a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen.

Write your name, centre number and candidate number in the spaces at the top of this page.

Answer **all** questions.

Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

The number of marks is given in brackets at the end of each question or part-question.

You are reminded that assessment will take into account the quality of written communication used in your answer to question **10**.

The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.

Examiner only

Answer **all** *questions.*

1. *(a)* The table below shows the physical properties of some elements.

Element	Melting point (°C)	Boiling point (°C)	Density (g/cm^3)
cobalt	1495	2870	8.9
iodine	114	184	4.9
tungsten	3422	5550	19.3
tin	232	2870	7.3
sulfur	113	445	2.1

Use only the information in the table above to answer parts (i) and (ii).

(i) Give **two** reasons why tungsten is classified as a metal. [2]

.....

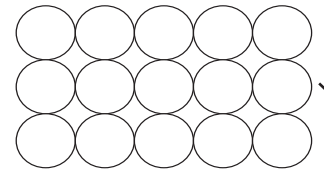
.....

(ii) Which element might be difficult to classify as either a metal or a non-metal? Give the reason for your choice of element. [2]

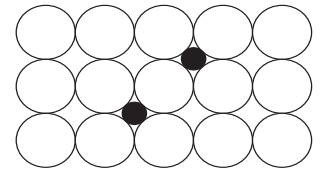
.....

.....

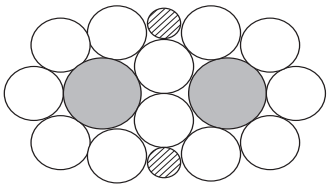
(b) The diagrams below show the arrangement of atoms in a pure metal and in some alloys. Use the key to identify individual atoms.
Draw a line between each arrangement of atoms and the correct description for that substance. [2]
One has been done for you.



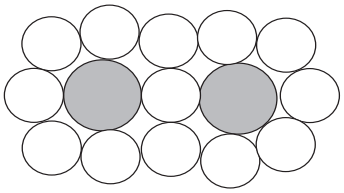
it is a carbon steel alloy



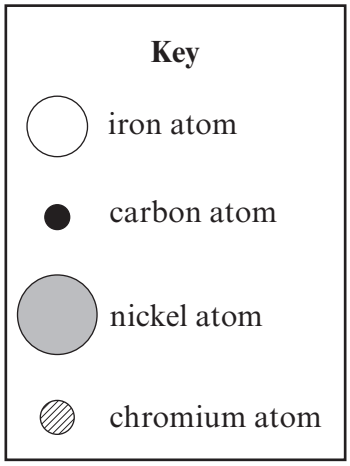
it is a pure metal



it is an alloy that contains only two metals

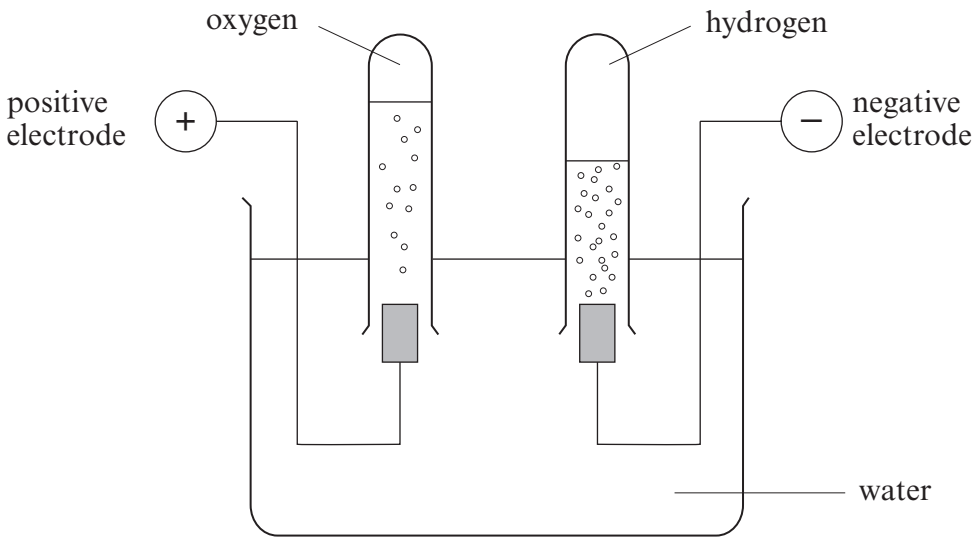


it is the alloy that contains the largest number of different metals



Examiner only

2. *(a)* The diagram shows how water can be broken down into its elements using an electric current.



(i) What is the meaning of the term electrolysis? Use the information given above. [1]

.....

(ii) Name the electrolyte in this experiment. [1]

.....

(iii) How does the information in the diagram show that the formula of water is H_2O? [2]

.....

.....

(b) The overall equation for the electrolysis of water is:

$$2H_2O \longrightarrow 2H_2 + O_2$$

This equation can also be represented by the following diagram:

Which substance in the equation is a compound? Give your reason. [2]

.....

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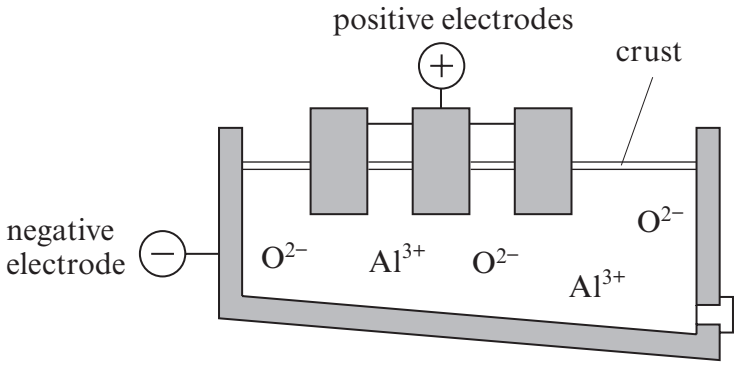
Examiner only

3. *(a)* The diagram below shows the apparatus used for the extraction of aluminium from molten aluminium oxide. When it melts, aluminium oxide releases aluminium ions, Al^{3+}, and oxide ions, O^{2-}.



(i) Show the direction of movement of all the ions when the current is switched on. Draw an arrow from the formula of each ion in the diagram. [2]

(ii) Balance the symbol equation for the overall reaction occurring. [1]

$$\square\ Al_2O_3 \longrightarrow \square\ Al + \square\ O_2$$

(iii) The reaction occurring at the cathode is:

$$Al^{3+} + 3e^- \longrightarrow Al$$

Use the equation to describe how aluminium ions, Al^{3+}, form aluminium atoms, Al. [1]

.....

(b) The table below shows some properties of aluminium, iron and copper.

	Electrical conductivity	Density (g/cm^3)	Resistance to corrosion
aluminium	very good	2.7	good
iron	good	7.8	poor
copper	very good	8.9	poor

Which metal is used to make over-head power cables? Give the reason why. [2]

.....

.....

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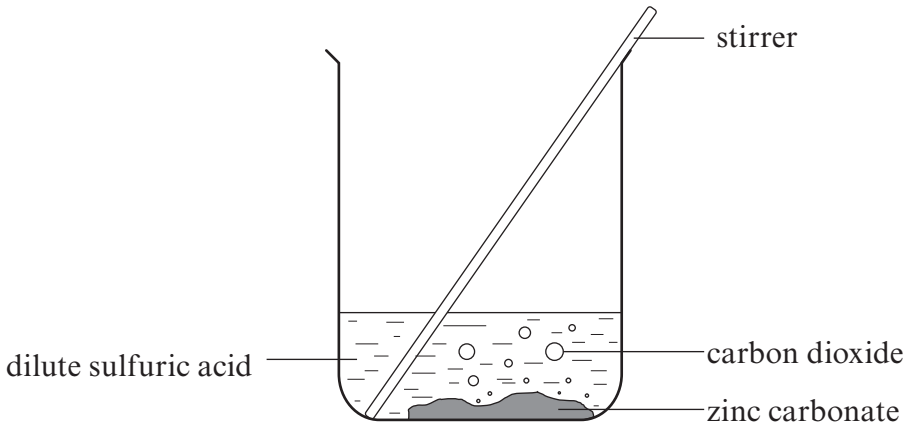
Turn over.

Examiner only

4. *(a)* A pupil was asked to make a sample of zinc sulfate crystals from zinc carbonate.

He added *excess* zinc carbonate to dilute sulfuric acid. He stirred continuously, until no more reacted.



(i) Describe the next two steps the pupil should carry out to obtain a sample of zinc sulfate crystals. [2]

.....

.....

.....

(ii) The gas produced when zinc carbonate and dilute sulfuric acid react is carbon dioxide. Describe the test the pupil would carry out to show that the gas is carbon dioxide. Include the observation he would make. [1]

.....

(iii) Zinc carbonate is not available. Give the name of another **compound** which the pupil could have reacted with dilute sulfuric acid to make zinc sulfate. [1]

.....

(b) The chemical formula of sulfuric acid is H_2SO_4.

(i) How many sulfur atoms are present in the formula H_2SO_4? ..... [1]

(ii) Give the **total** number of atoms shown in the formula. [1]

.....

6

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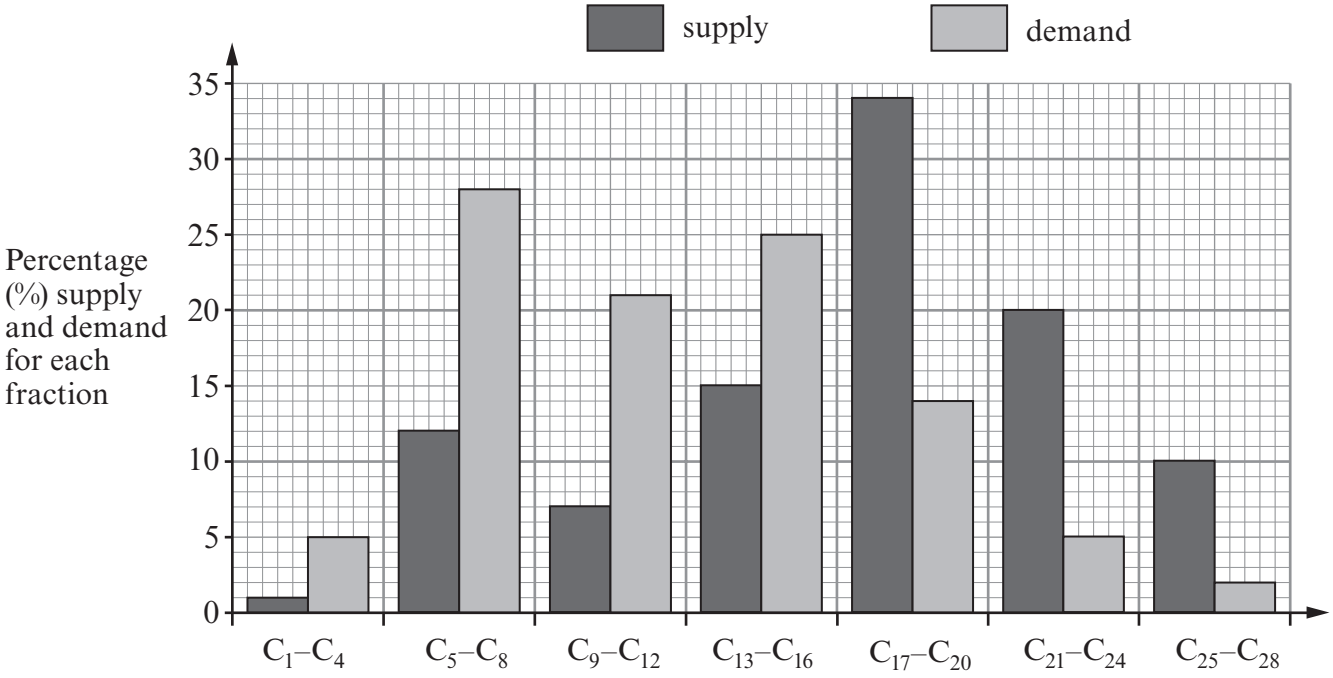
Examiner only

5. *(a)* Crude oil is a mixture of hydrocarbon compounds. Crude oil can be separated into simpler mixtures called fractions. Each fraction contains hydrocarbons of similar chain lengths.

The bar chart below shows the relative 'supply' and 'demand' for some fractions.



Use the bar chart to answer parts (i) and (ii).

Give the fraction which has

(i) a *supply* of 15% and a *demand* of 25%, ... [1]

(ii) a *demand* three times greater than the *supply*. ..... [1]

(b) Oil companies have developed a process for obtaining the smaller more useful hydrocarbons from the larger ones.

electrolysis	**cracking**	**displacement**	**polymerisation**

What is the name given to this process? Choose from the box above. [1]

.....

(c) Crude oil is the raw material for the manufacture of plastics. Plastics are widely used in everyday life. Wales was the first region in the UK to introduce charging for plastic carrier bags.

Give **two** reasons why the Welsh Government has introduced a charge for plastic carrier bags. [2]

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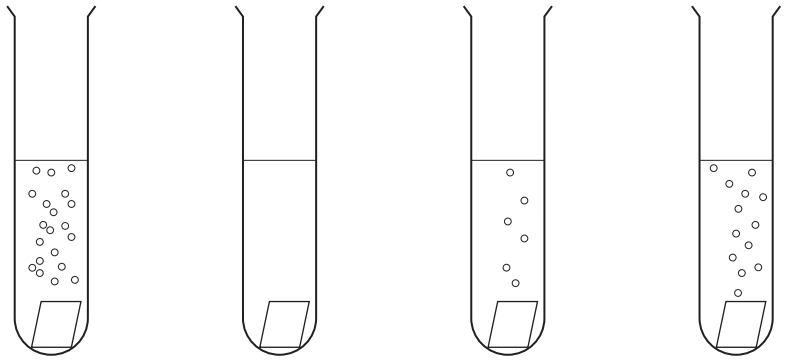
Examiner only

6. *(a)* A group of pupils were investigating the effects of acid rain. They decided to look at the effect of dilute sulfuric acid on metals used in the building industry.

The metal samples were cleaned to give a shiny surface.
The pupils tested the metals by adding dilute acid to each of the cleaned metal samples.
The test tubes below show the observations the pupils made during the investigation.

∘ = bubble of a colourless gas which 'pops' when tested with a lighted splint



aluminium copper iron zinc

(i) Use the observations made during the reactions. List the metals in order of their reactivity. Give the reason for your choice. [2]

Most reactive .....

.....

.....

Least reactive .....

Reason .....

(ii) Complete the **word** equation below:

iron + sulfuric acid ⟶ ..... + ... [1]

(iii) Why is sulfuric acid used in this investigation and not other acids? [1]

.....

(iv) The statements below describe some of the consequences of atmospheric pollution.

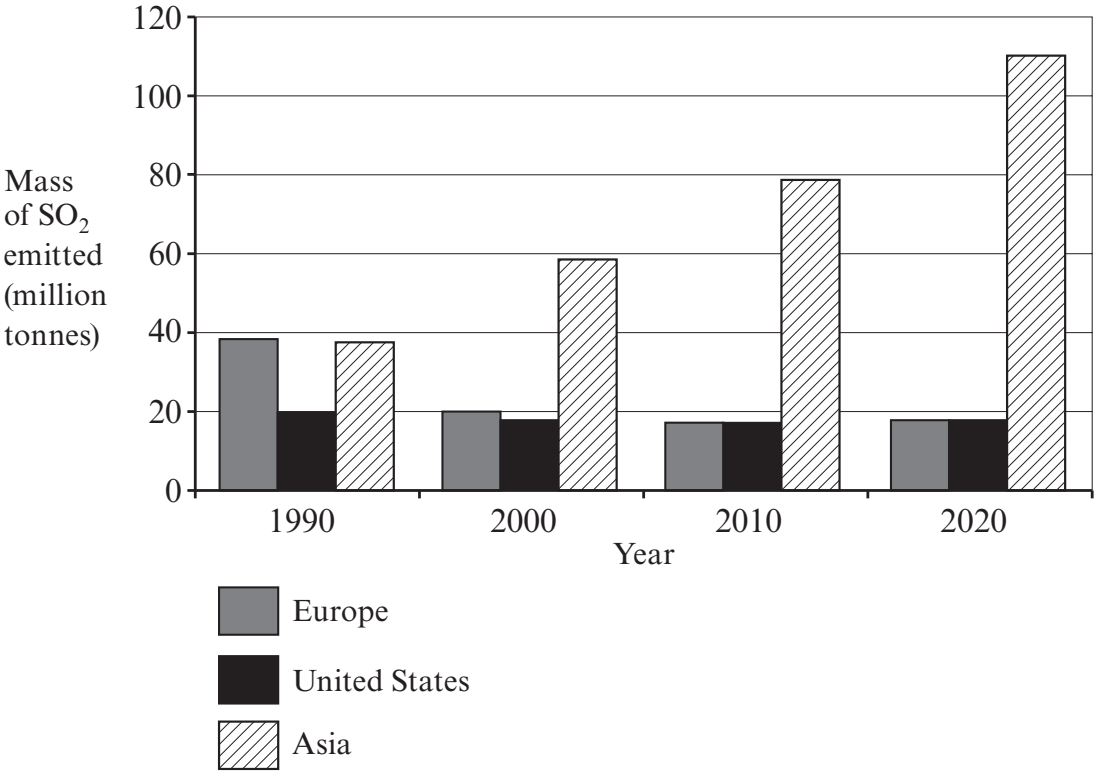
1. damage to marble statues
2. forests destroyed
3. increase in atmospheric temperature
4. sea levels increase

Choose the statements which are the consequences of acid rain. [1]

.....

Examiner only

(b) The bar chart below shows the mass of sulfur dioxide emitted from Europe, the United States and Asia in 1990, 2000 and 2010. It also shows the predicted emissions for 2020.



(i) Use the graph. Describe the trend (change) in sulfur dioxide emissions in Europe between 1990 and 2010. [1]

.....

(ii) Why are sulfur dioxide emissions in Asia predicted to continue to increase until 2020? [1]

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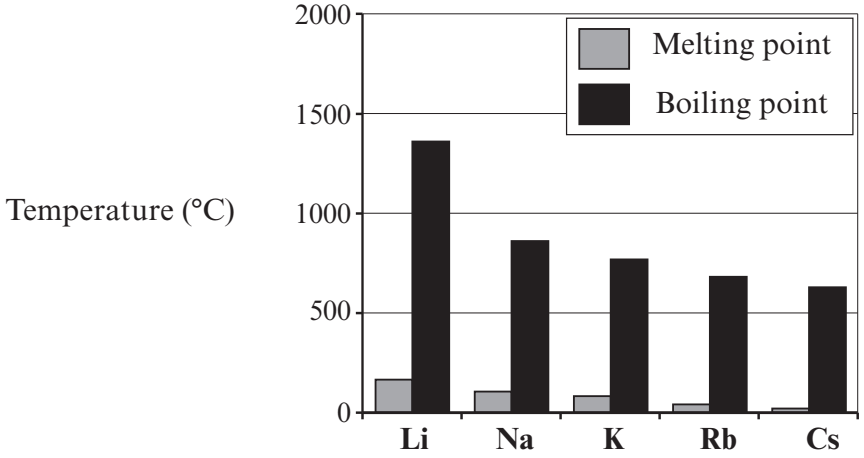
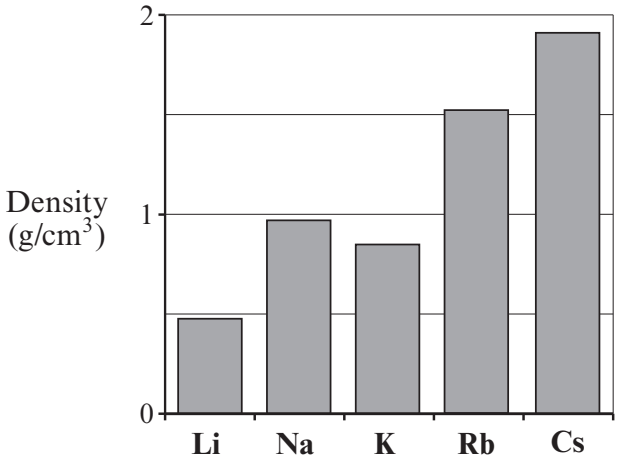
7

Examiner only

7. The graphs below show the trends in melting points, boiling points and densities of Group 1 elements.





Use the information in the graphs. Answer the following questions.

(a) Describe the trends in the melting points and densities of the elements going **down** the group. [2]

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.....

(b) Give the name of the element which has a property which does not fit a trend. [1]

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(c) The table below shows the boiling points of Group 1 elements.

Group 1 element	Boiling point (°C)
lithium	1340
sodium	880
potassium	780
rubidium	690
caesium	670

Francium lies below caesium in Group 1.
Estimate a value for the boiling point of francium. Give your reasoning. [2]

Value ..... °C

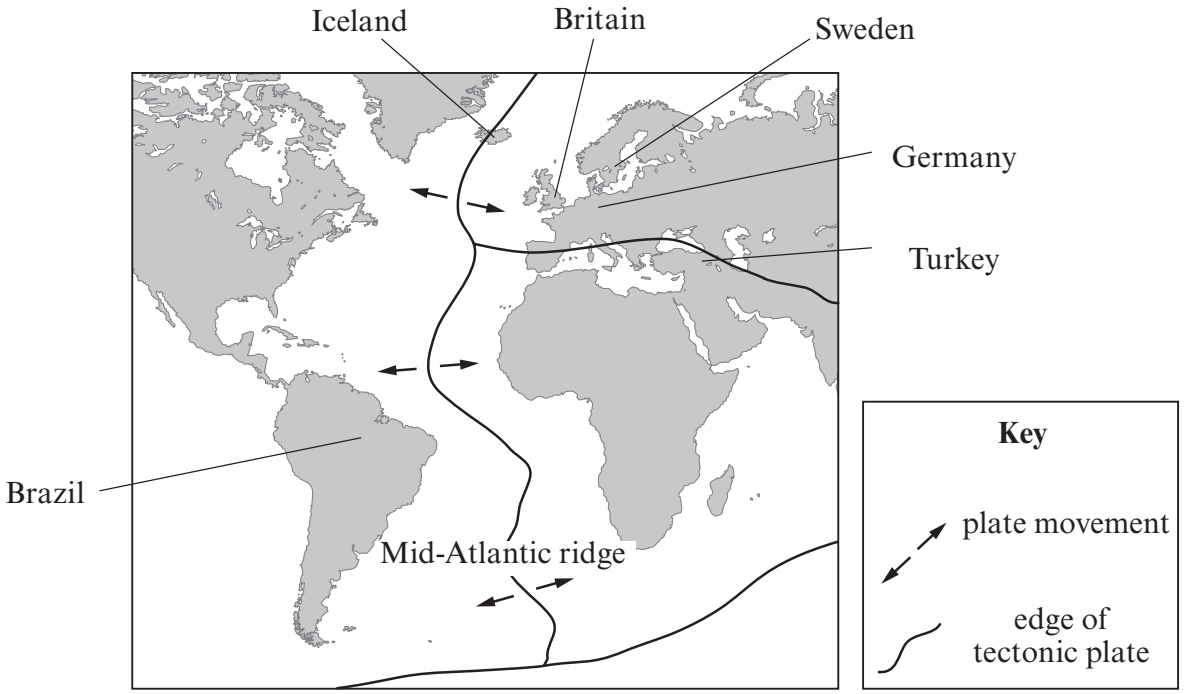
Reason for value .....

.....

5

Examiner only

8. The map below shows some information about tectonic plates.



(a) Look at the countries labelled on the map above. Which country would you expect to have the **most** volcanic eruptions? Give a reason for your choice of country. [2]

.....

.....

(b) Wegener's theory of continental drift was not accepted by other scientists until several years after his death in 1930. In 1960 parts of the ocean floor were surveyed, at various distances from a plate boundary. The data below shows the age of the rocks.

Distance from the plate boundary (km)	500	1000	1500	2000	2500
Age of rock (millions of years)	24	46	71	90	113

(i) Describe the pattern in the results. [1]

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(ii) Use the data. What conclusions can be drawn about what is happening at the plate boundary? [2]

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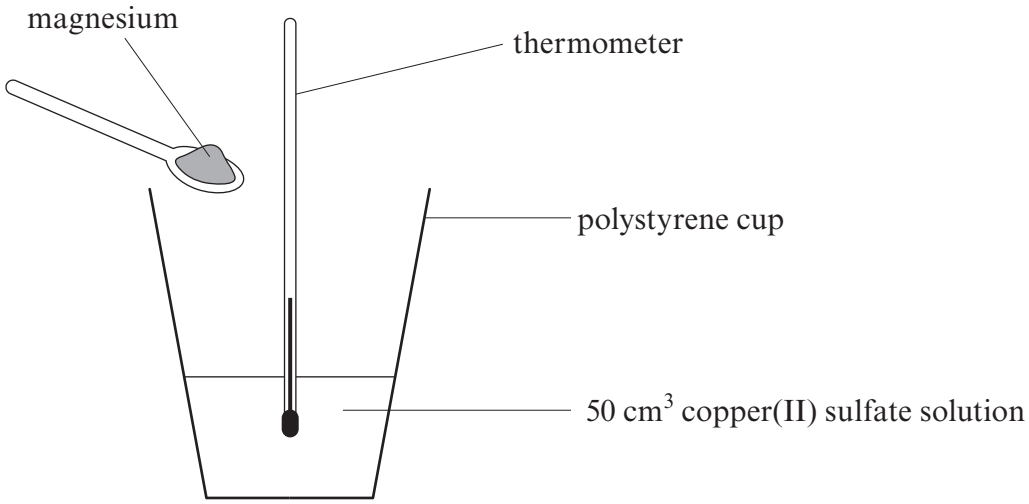
Examiner only

9. Increasing amounts of powdered magnesium were added to 50 cm^3 of copper(II) sulfate solution in a polystyrene cup. This is shown in the diagram below. Four pupils investigated the temperature change which occurred.



- In the first experiment, each pupil weighed 0.2 g of magnesium.
- The pupils then measured out 50 cm^3 of copper(II) sulfate solution into a polystyrene cup. They recorded the temperature of the solution.
- The pupils then added the magnesium to the solution. They swirled the polystyrene cup and recorded the maximum temperature rise.
- They repeated the experiment using 0.4, 0.6, 0.8 and 1.0 g of magnesium powder. They used a new 50 cm^3 of copper(II) sulfate solution each time.

The table below shows the results recorded**.**

Mass of magnesium powdered (g)	Maximum temperature rise (°C)				
	Pupil **A**	Pupil **B**	Pupil **C**	Pupil **D**	Mean
0.2	3.5	3.5	3.7	3.7	3.6
0.4	6.0	5.9	6.1	6.0	6.0
0.6	7.8	8.2	8.0	8.0	8.0
0.8	9.1	9.0	3.0	8.9	9.0
1.0	8.8	9.2	8.9	9.1	9.0

Examiner only

(a) (i) **Circle** the odd result **not** used in calculating one of the mean temperature rises. [1]

(ii) Suggest **one** possible cause for this odd result. [1]

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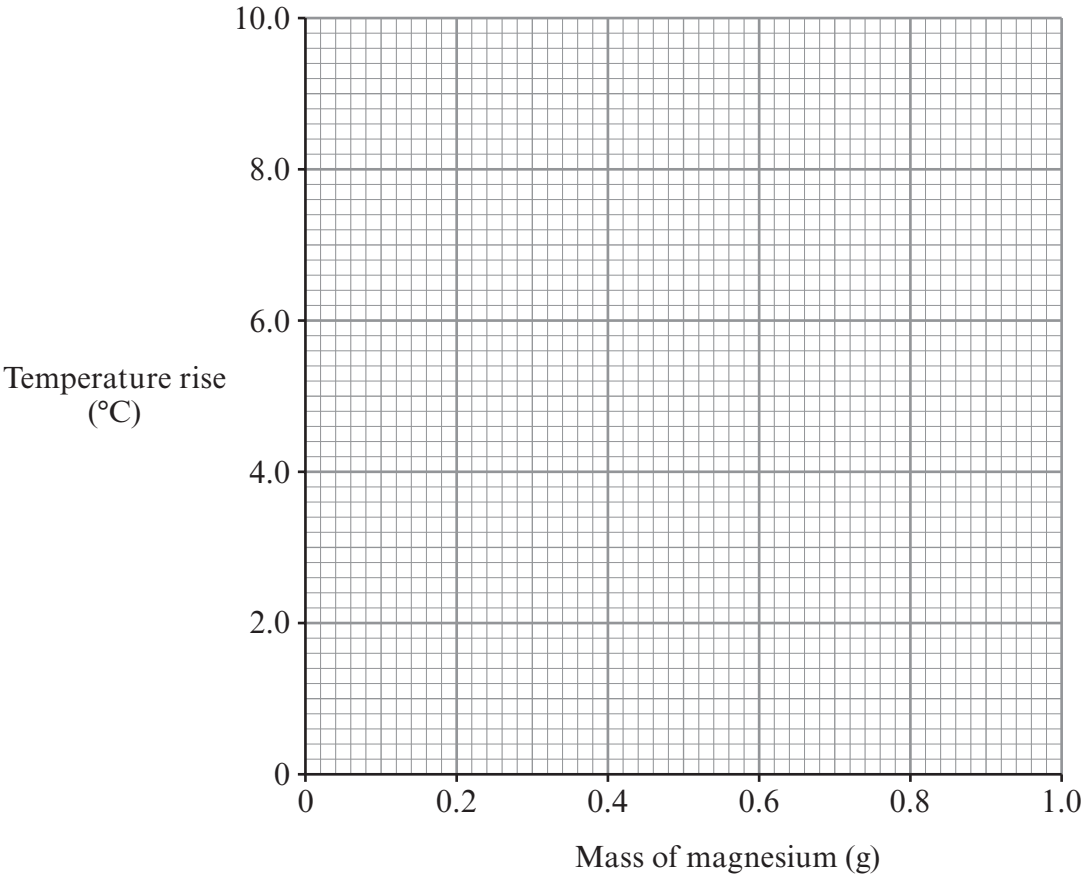
(b) Use the grid provided. Plot the mean temperature rise against the mass of magnesium added. Draw a line of best fit starting at the origin (0,0). [3]



(c) Why must the line of best fit be drawn to the origin (0,0)? [1]

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(d) Use your graph. Find the smallest mass of magnesium needed to react with **all** the copper(II) sulfate. Give the reason for your answer. [2]

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8

Turn over.

Examiner only

10. Most scientists believe that the increase in the level of carbon dioxide in the atmosphere during the last 150 years has resulted in global warming.

Briefly describe and explain your understanding of the term 'global warming'. [6 QWC]

In your answer you should refer to

- its cause(s)
- its consequence(s)
- what can be done to reduce its impact

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6

FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^{+}	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^{+}		
Silver	Ag^{+}		
Sodium	Na^{+}		
Zinc	Zn^{2+}		

Turn over.

PERIODIC TABLE OF ELEMENTS

1	2	Group										3	4	5	6	7	0
								$^{1}_{1}$H Hydrogen									$^{4}_{2}$He Helium
$^{7}_{3}$Li Lithium	$^{9}_{4}$Be Beryllium											$^{11}_{5}$B Boron	$^{12}_{6}$C Carbon	$^{14}_{7}$N Nitrogen	$^{16}_{8}$O Oxygen	$^{19}_{9}$F Fluorine	$^{20}_{10}$Ne Neon
$^{23}_{11}$Na Sodium	$^{24}_{12}$Mg Magnesium											$^{27}_{13}$Al Aluminium	$^{28}_{14}$Si Silicon	$^{31}_{15}$P Phosphorus	$^{32}_{16}$S Sulfur	$^{35}_{17}$Cl Chlorine	$^{40}_{18}$Ar Argon
$^{39}_{19}$K Potassium	$^{40}_{20}$Ca Calcium	$^{45}_{21}$Sc Scandium	$^{48}_{22}$Ti Titanium	$^{51}_{23}$V Vanadium	$^{52}_{24}$Cr Chromium	$^{55}_{25}$Mn Manganese	$^{56}_{26}$Fe Iron	$^{59}_{27}$Co Cobalt	$^{59}_{28}$Ni Nickel	$^{64}_{29}$Cu Copper	$^{65}_{30}$Zn Zinc	$^{70}_{31}$Ga Gallium	$^{73}_{32}$Ge Germanium	$^{75}_{33}$As Arsenic	$^{79}_{34}$Se Selenium	$^{80}_{35}$Br Bromine	$^{84}_{36}$Kr Krypton
$^{86}_{37}$Rb Rubidium	$^{88}_{38}$Sr Strontium	$^{89}_{39}$Y Yttrium	$^{91}_{40}$Zr Zirconium	$^{93}_{41}$Nb Niobium	$^{96}_{42}$Mo Molybdenum	$^{99}_{43}$Tc Technetium	$^{101}_{44}$Ru Ruthenium	$^{103}_{45}$Rh Rhodium	$^{106}_{46}$Pd Palladium	$^{108}_{47}$Ag Silver	$^{112}_{48}$Cd Cadmium	$^{115}_{49}$In Indium	$^{119}_{50}$Sn Tin	$^{122}_{51}$Sb Antimony	$^{128}_{52}$Te Tellurium	$^{127}_{53}$I Iodine	$^{131}_{54}$Xe Xenon
$^{133}_{55}$Cs Caesium	$^{137}_{56}$Ba Barium	$^{139}_{57}$La Lanthanum	$^{179}_{72}$Hf Hafnium	$^{181}_{73}$Ta Tantalum	$^{184}_{74}$W Tungsten	$^{186}_{75}$Re Rhenium	$^{190}_{76}$Os Osmium	$^{192}_{77}$Ir Iridium	$^{195}_{78}$Pt Platinum	$^{197}_{79}$Au Gold	$^{201}_{80}$Hg Mercury	$^{204}_{81}$Tl Thallium	$^{207}_{82}$Pb Lead	$^{209}_{83}$Bi Bismuth	$^{210}_{84}$Po Polonium	$^{210}_{85}$At Astatine	$^{222}_{86}$Rn Radon
$^{223}_{87}$Fr Francium	$^{226}_{88}$Ra Radium	$^{227}_{89}$Ac Actinium															

Key: