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

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]

....

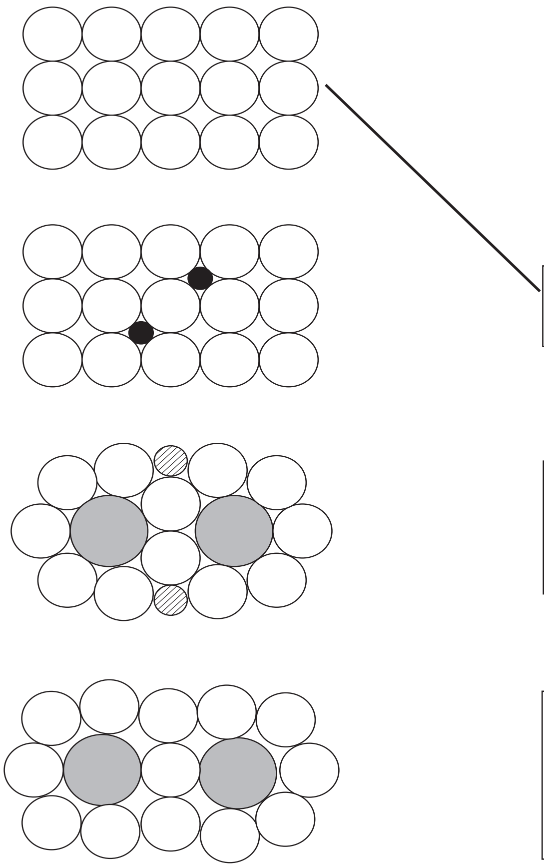
....

(ii) State 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.

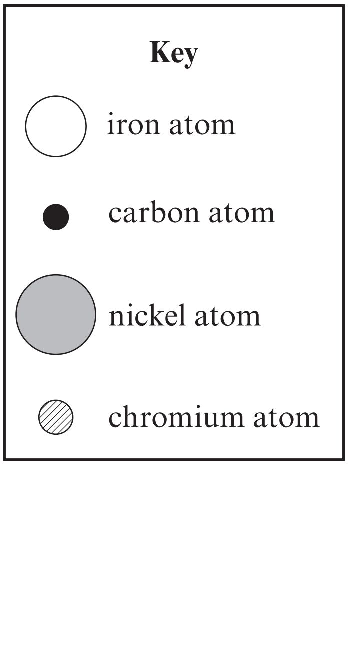


it is a carbon steel alloy

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



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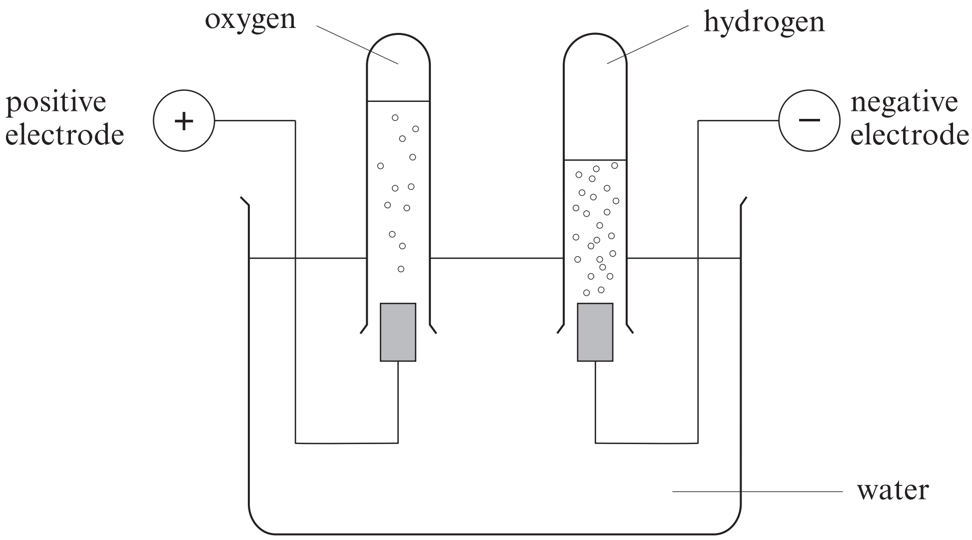
Examiner only

2. *(a)* A teacher demonstrated how water can be broken down into its elements using an electric current. She used the apparatus shown below.



(i) Use the information given above to state the meaning of the term electrolysis. [1]

....

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

....

(iii) State how the information in the diagram shows that the formula of water is H_2O. [2]

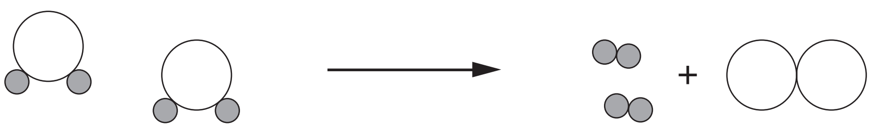
....

....

(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:



State, giving your reason, which substance in the equation is a compound. [2]

....

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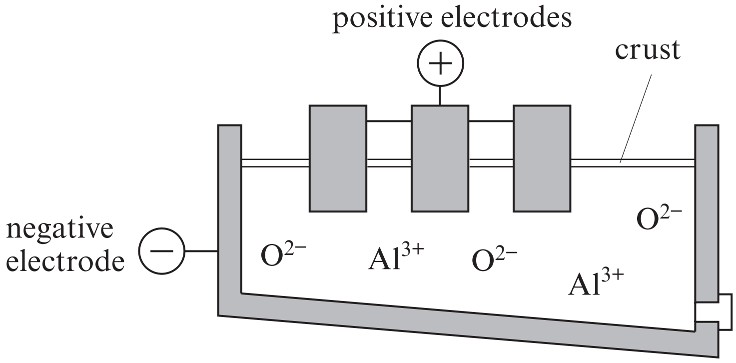
Examiner only

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



(i) By drawing an arrow from the formula of **each** ion in the diagram, show the direction of movement of all the ions when the current is switched on. [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

State, giving reasons, which metal is used to make over-head power cables. [2]

....

....

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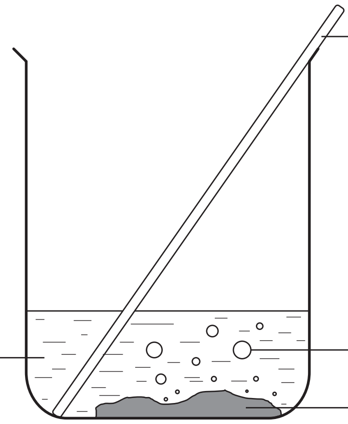
4. *(a)* A pupil was asked to make a sample of zinc sulfate crystals from zinc carbonate.

He added *excess* zinc carbonate to dilute sulfuric acid, stirring 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) If zinc carbonate had not been 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) State 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]

....

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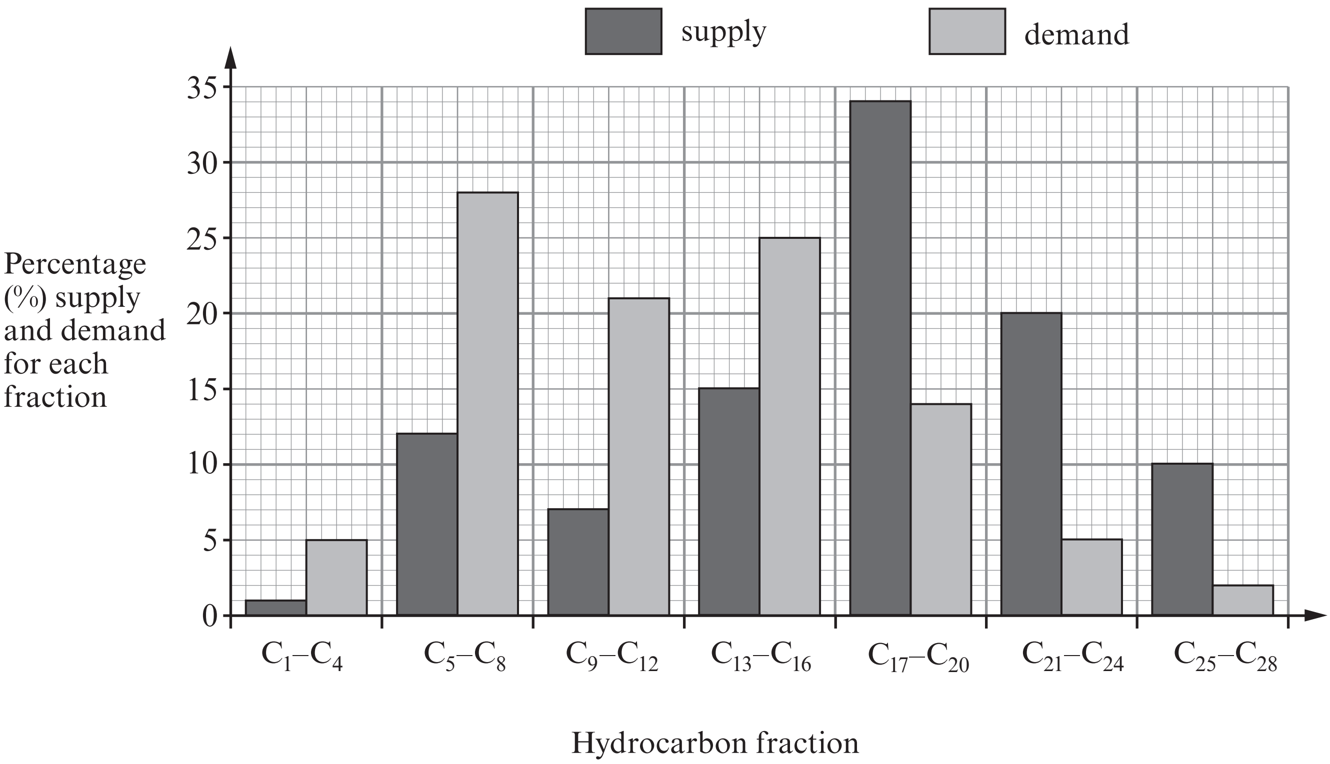
5. *(a)* Crude oil is a mixture of hydrocarbon compounds. Crude oil can be separated into simpler mixtures called fractions. Each fraction contains hydrocarbons of similar chain lengths.

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**

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

....

Examiner only

(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 'one-trip' plastic carrier bags.

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

....

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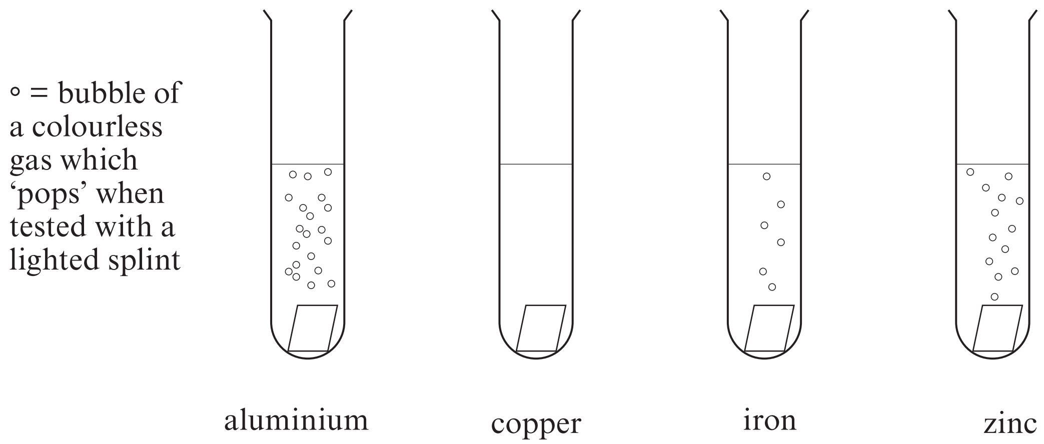
6. *(a)* A group of pupils were investigating the effects of acid rain. They decided to look at the effect of dilute sulfuric acid on metals used in the building industry.

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.



(i) Use the observations made during the reactions to list the metals in order of their reactivity and give the reason for your choice. [2]

Most reactive ....

....

....

Least reactive ....

Reason ....

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

iron + sulfuric acid ⟶ .... + ... [1]

(iii) Suggest why sulfuric acid was used in this investigation and not other acids. [1]

....

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

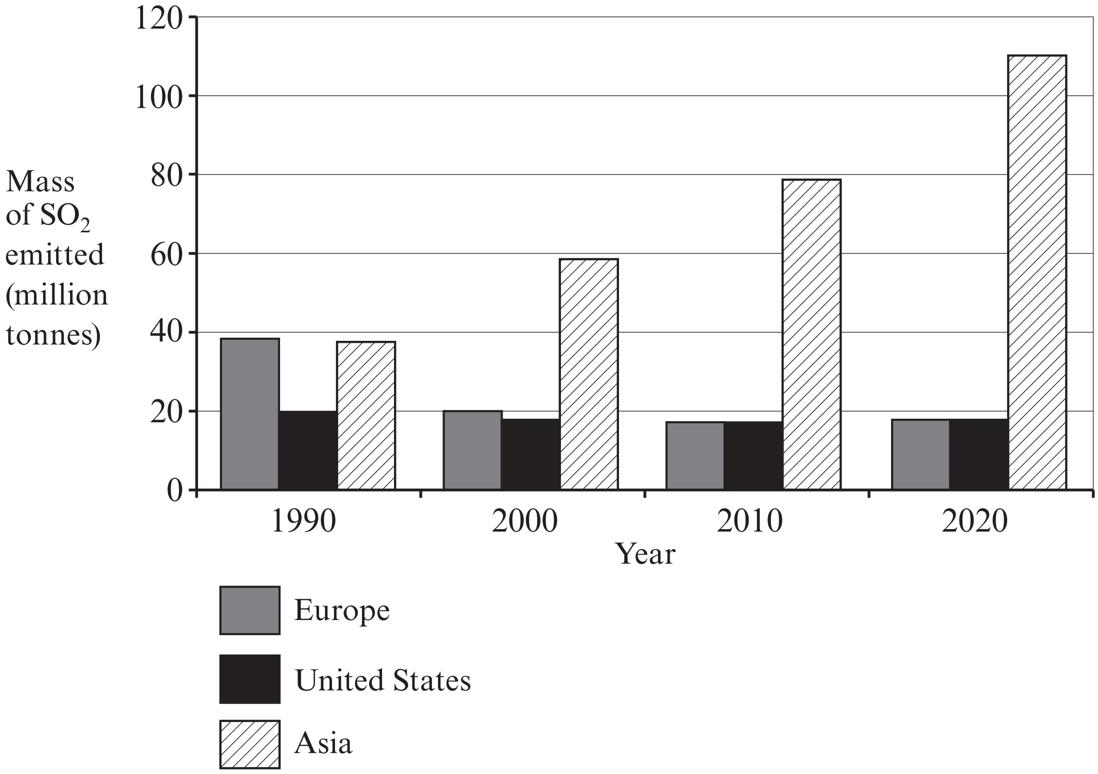
1. damage to marble statues
2. forests destroyed
3. increase in atmospheric temperature
4. sea levels increase

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 and the predicted emissions for 2020.



(i) Using the graph, describe the trend in sulfur dioxide emissions in Europe between 1990 and 2010. [1]

....

(ii) Suggest a reason why sulfur dioxide emissions in Asia are predicted to continue to increase until 2020. [1]

....

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7

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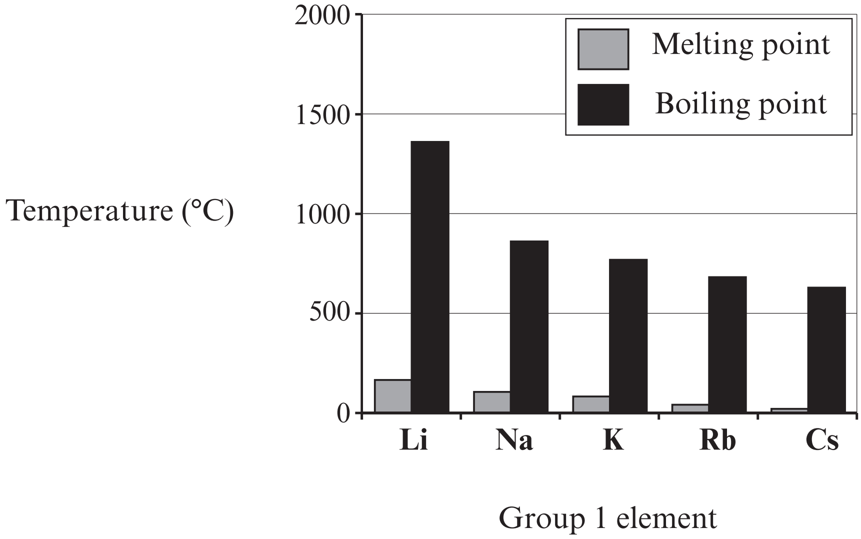
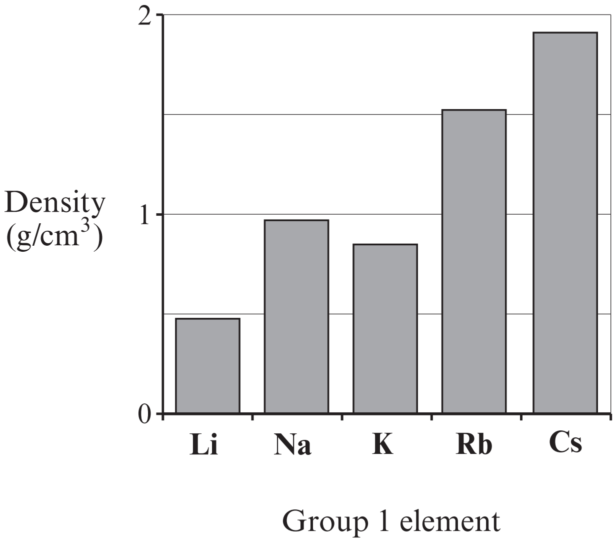
7. The graphs below show the trends in melting points, boiling points and densities of Group 1 elements.





Use the information in the graphs to answer the following questions.

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

....

....

(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, giving your reasoning, a value for the boiling point of francium. [2]

Value .... °C

Reason for value ....

....

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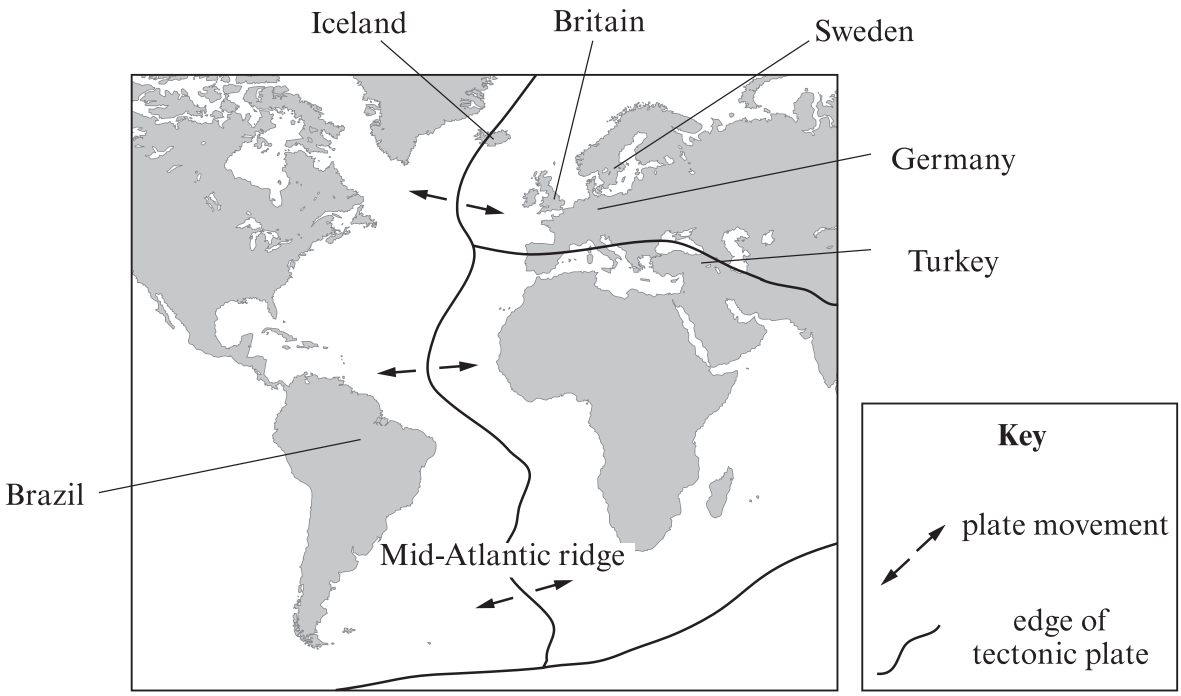
Examiner only

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



(a) Choose the country, labelled on the map above, in which you would 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]

....

(ii) Using the data, state what conclusions can be drawn about what is happening at the plate boundary. [2]

....

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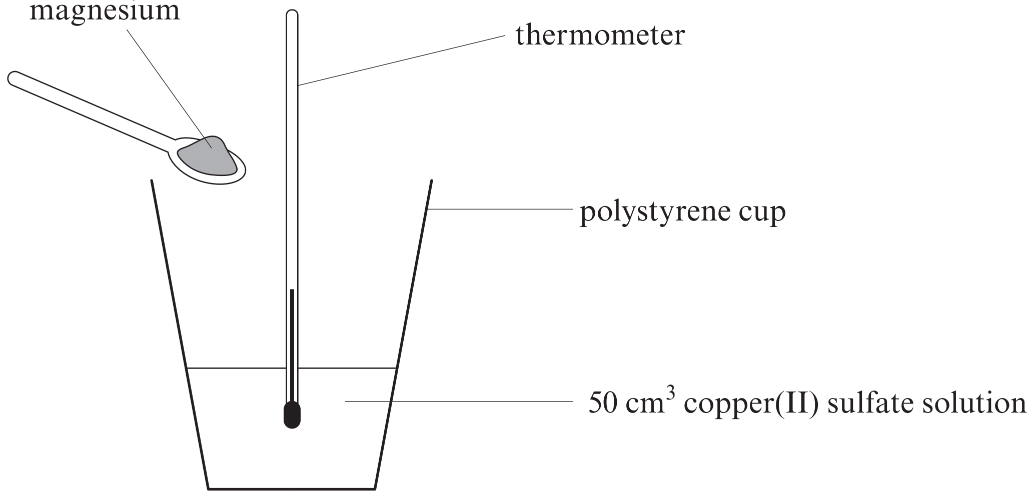
9. Four pupils investigated the temperature change which occurred when increasing amounts of powdered magnesium were added to 50 cm^3 of copper(II) sulfate solution in a polystyrene cup as shown in the diagram below.



- 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 and recorded the temperature of the solution.
- The pupils then added the magnesium to the solution, 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, using a new 50 cm^3 of copper(II) sulfate solution each time.

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

Mass of magnesium powder (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

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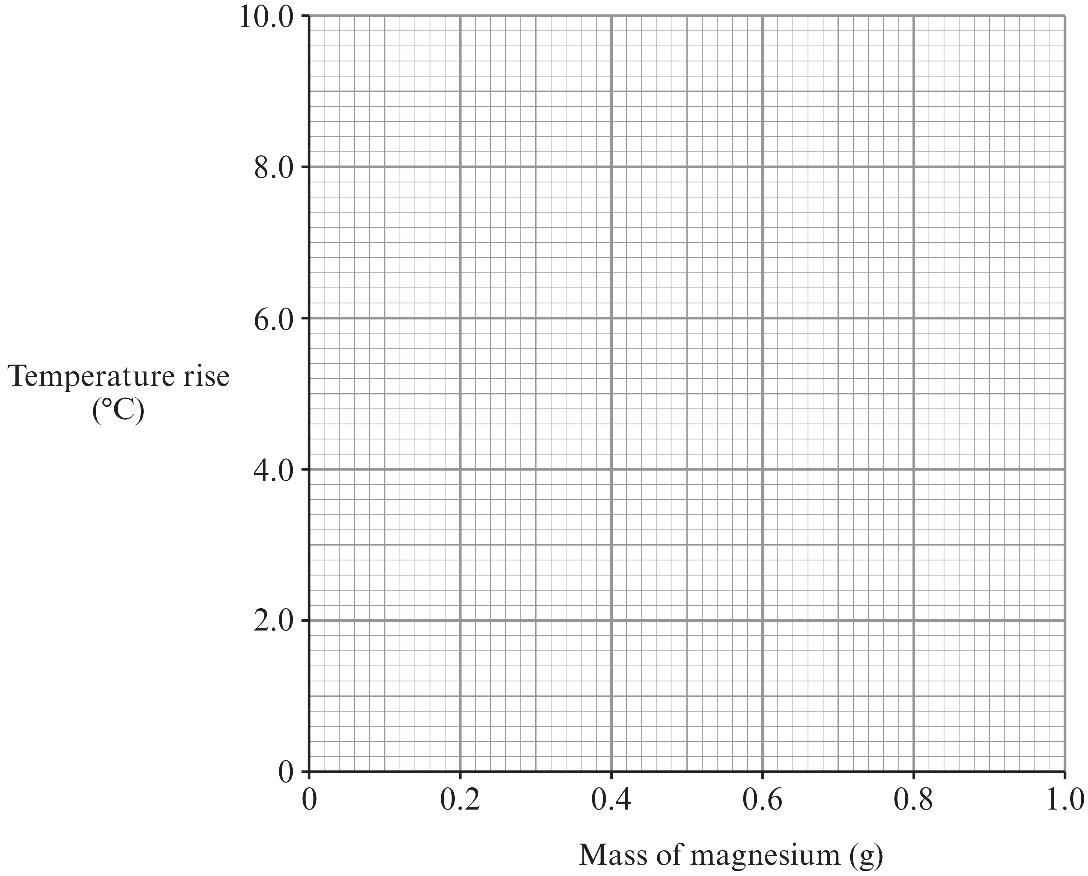
(a) (i) **Circle** the anomalous result **not** used in calculating one of the mean temperature rises. [1]

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

....

(b) Using 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) State why the line of best fit must be drawn to the origin (0,0). [1]

....

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

....

....

8

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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+}		

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: