

Surname	Centre Number	Candidate Number
Other Names		0



GCSE

4462/01



W16-4462-01

SCIENCE A/CHEMISTRY

CHEMISTRY 1

FOUNDATION TIER

P.M. TUESDAY, 12 January 2016

1 hour

For Examiner's use only		
Question	Maximum Mark	Mark Awarded
1.	6	
2.	6	
3.	8	
4.	6	
5.	10	
6.	7	
7.	11	
8.	6	
Total	60	

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. Do not use gel pen or correction fluid.

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.

If you run out of space, use the additional page(s) at the back of the booklet, taking care to number the question(s) correctly.

INFORMATION FOR CANDIDATES

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

You are reminded of the necessity for good English and orderly presentation in your answers.

Assessment will take into account the quality of written communication (QWC) in your answer to question **8**.

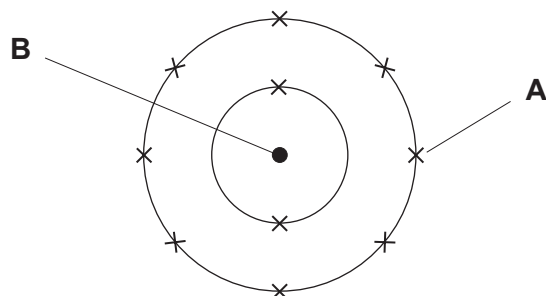
The Periodic Table is printed on the back cover of the examination paper and the formulae for some common ions on the inside of the back cover.



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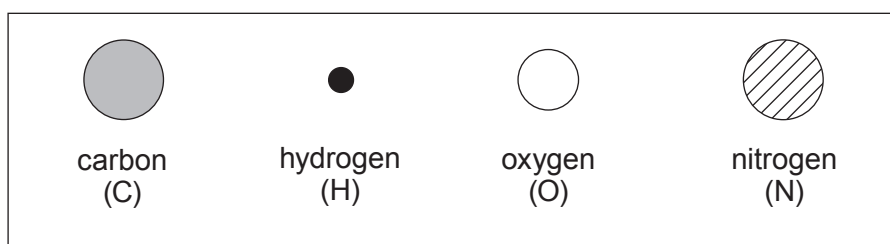
Answer all questions.

1. (a) The diagram below shows an atom of neon.



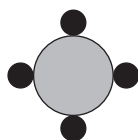
- (i) Name the particle labelled **A**. [1]
- (ii) Name the part labelled **B**. [1]

- (b) The following key represents atoms of some common elements.



Use the information in the key to answer parts (i) and (ii).

- (i) Give the chemical formula of the following molecule. [1]



Formula



(ii) Draw a diagram representing a molecule of nitrogen dioxide, NO_2 . [1]

(c) The chemical formula of potassium carbonate is K_2CO_3 .

(i) State how many carbon atoms are present in the formula, K_2CO_3 [1]

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



2. (a) A student was given three identical gas jars each containing a different gas. He carried out simple chemical tests to identify each of these gases. The results of these tests are given below.



gas X



gas Y



gas Z

Test	Observation		
	Gas X	Gas Y	Gas Z
put a glowing splint into the gas	relights	stops glowing	stops glowing
bubble gas through limewater	no change	no change	turns milky

Name gases X and Z.

Gas X

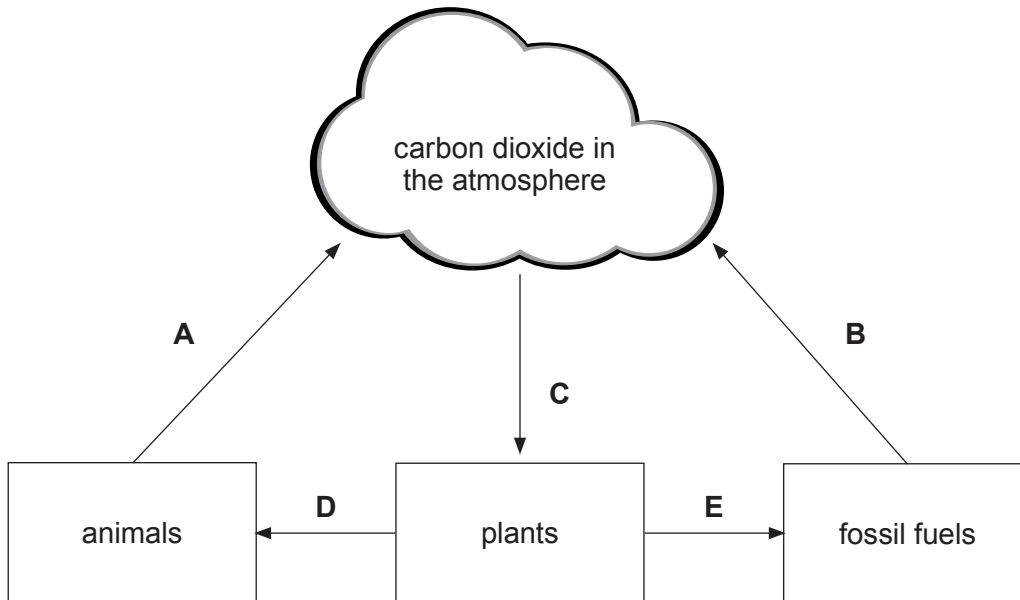
Gas Z

[2]



(b) Combustion, photosynthesis and respiration are three of the processes that take place in the carbon cycle.

The diagram below shows a simple carbon cycle.



(i) Give the letter, **A**, **B**, **C**, **D** or **E**, which indicates where each process is taking place.

Combustion

Photosynthesis

Respiration

[3]

(ii) An increased level of carbon dioxide in the Earth's atmosphere in recent years has resulted in an increase in the temperature of the atmosphere. Give the name for this change in temperature. [1]

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3. (a) A substance has the formula Li_2O .

(i) Name the substance. [1]

(ii) Name the **two** elements in the substance. [1]

..... and

(b) Two of the following statements are **incorrect**. Place a cross (✗) next to the **incorrect statements**. [2]

iodine, I_2 , is a compound

sodium bromide, NaBr , is a compound

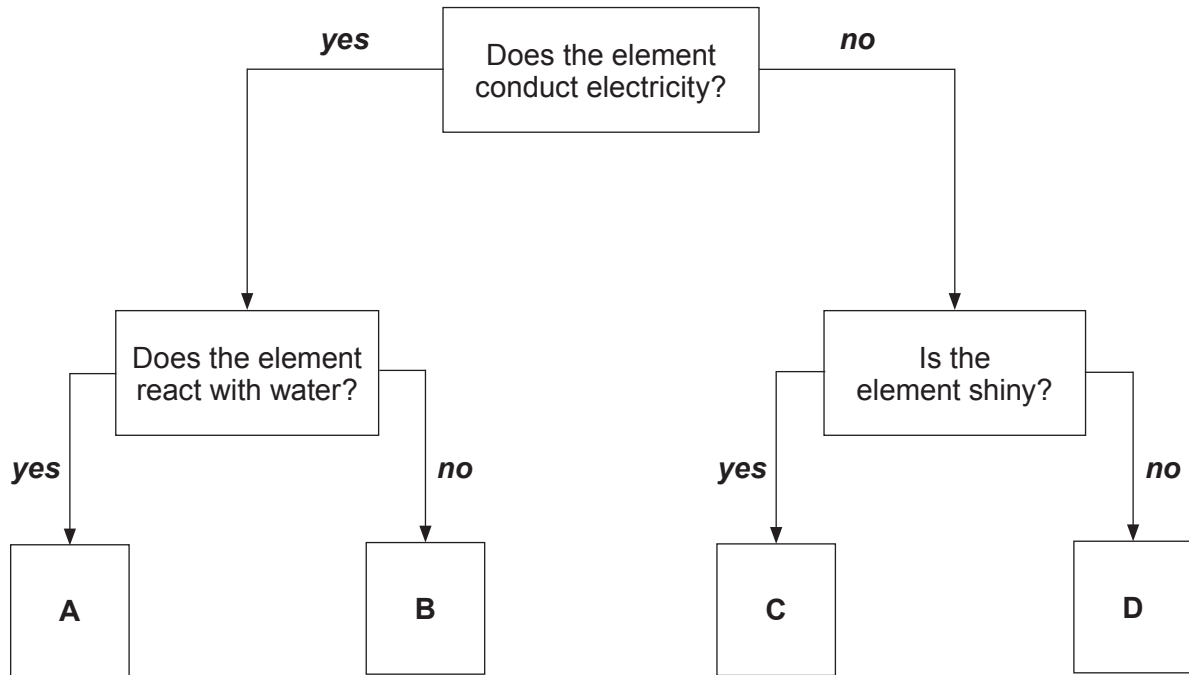
the symbol for iron is FE

calcium, Ca, is a metal

water, H_2O , is a compound



(c) The following key gives some information about four elements, **A**, **B**, **C** and **D**.



Use the information in the key to answer parts (i) and (ii).

(i) Explain which element, **A**, **B**, **C** or **D**, is a typical non-metal. [2]

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(ii) Explain which element, **A**, **B**, **C** or **D**, could be gold. [2]

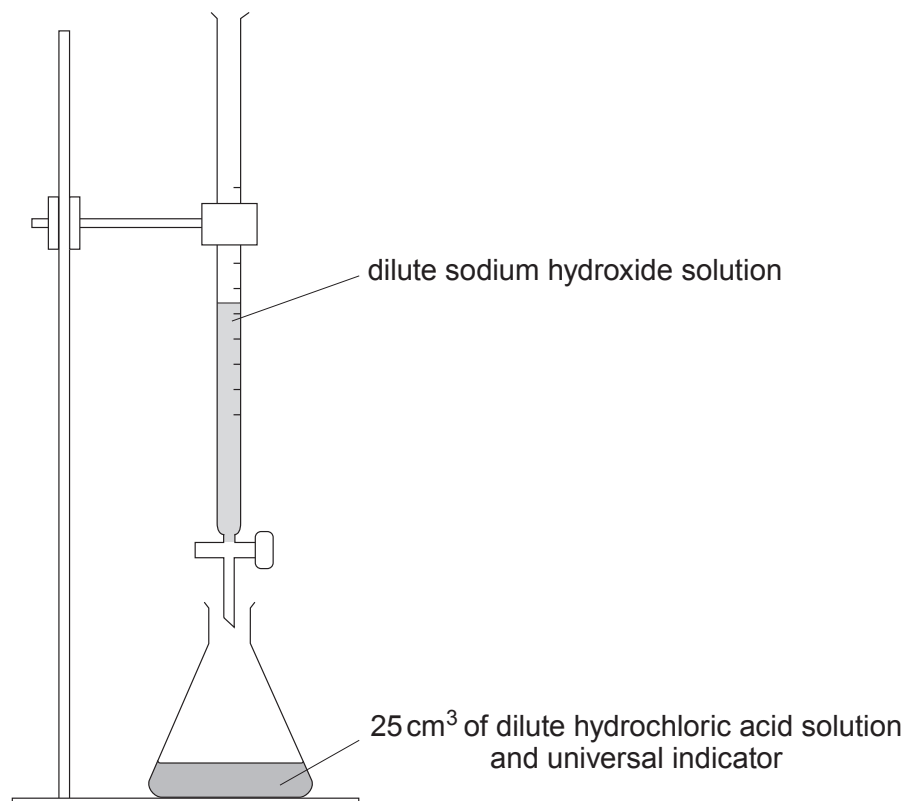
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4. A class of students was asked to carry out a neutralisation reaction as part of an experiment to prepare crystals of a salt. They carried out the first stage of the experiment using the apparatus shown below.



This stage of the experiment was carried out three times by five different groups. Their results are shown below.

Group	Volume of sodium hydroxide needed to neutralise the hydrochloric acid (cm ³)		
1	24.2	24.8	24.7
2	24.6	24.8	24.7
3	25.1	25.3	25.8
4	24.5	24.5	24.5
5	24.9	25.0	25.1

- (a) **Two** of the results in the table should **not** be used when calculating a mean value for each group. **Circle** these results. [1]



- (b) Universal indicator is used to identify when neutralisation has occurred.

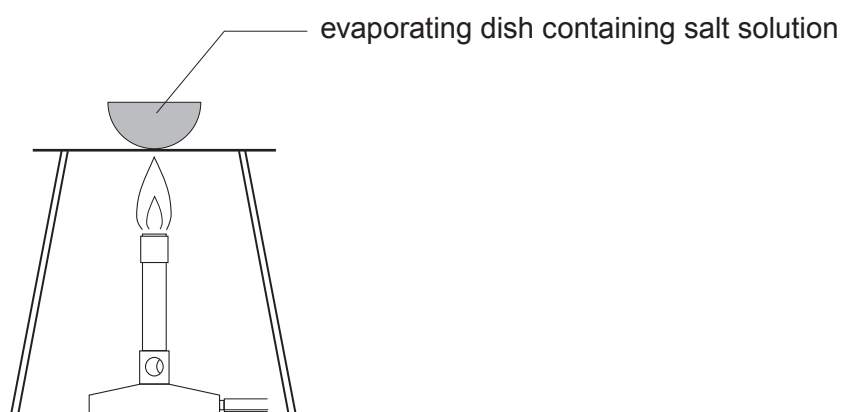
State how the pH will change as the reaction takes place and give the **colour** of the solution when neutral. [2]

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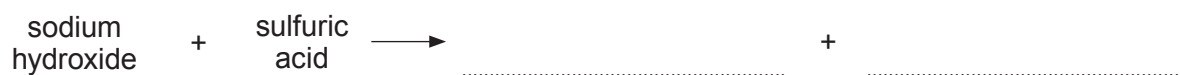
- (c) In the final stage of the experiment, the students used the following apparatus to crystallise their salt from a solution without universal indicator.



- (i) Name the colourless liquid removed during evaporation. [1]

- (ii) Give the **chemical** name for the salt formed. [1]

- (d) The experiment was repeated using sulfuric acid. Complete the **word** equation for the reaction. [1]



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

The table below shows information about some of the fractions.

Fraction	Boiling point range (°C)	Number of carbon atoms in hydrocarbon chain
petroleum gases	-160 to 25	1 – 4
petrol	20 to 100	4 – 12
naphtha	100 to 150	7 – 14
kerosene (paraffin)	150 to 250	11 – 15
diesel oil (gas oil)	250 to 350	15 – 19
lubricating oil	over 350	20 – 30

Use **only** the information in the table to answer parts (i)–(iii).

- (i) Name the fraction which contains the compound with
- I. a boiling point of 153 °C [1]
 - II. the formula C_5H_{12} [1]
- (ii) Give the number of carbon atoms that can be found in three different fractions. [1]
-
- (iii) State how the boiling point is related to the number of carbon atoms in the hydrocarbon chain. [1]
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(b) Plastics are used to make many everyday items including carrier bags.

The table below shows some of the options available to deal with used plastic carrier bags.

Option	
A	re-cycle them into pure plastic and remould
B	send them to landfill with other waste
C	burn them with other waste
D	re-use the bags

(i) Identify the **two** options which would **not** help to conserve oil reserves. State the environmental problem associated with each of these options. [4]

Option

Environmental problem

.....

Option

Environmental problem

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(ii) Apart from cost, give **two** reasons why polythene, rather than paper, is used for making carrier bags. [2]

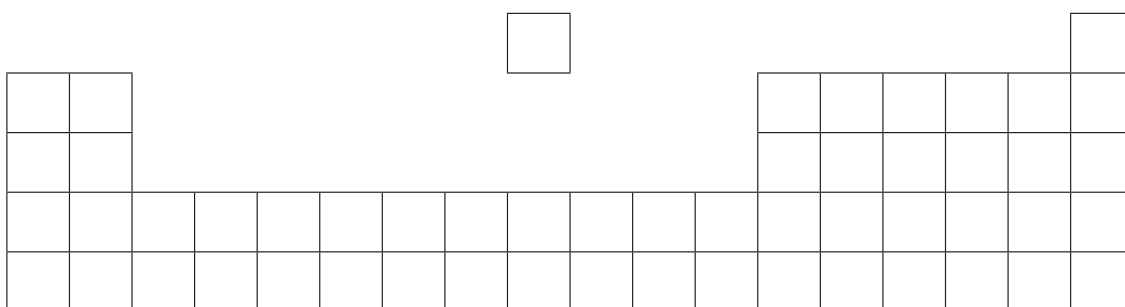
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6. (a) The following diagram shows an outline of part of the Periodic Table of Elements shown on the back page of this paper.



Place letters **X**, **Y**, and **Z** in the correct spaces on the diagram to show the following.

X – an element in Group 3

Y – the element with the smallest atomic number

Z – the element in Period 2 and Group 1

[3]

- (b) Mendeleev published the first accepted 'periodic table' in 1869. Give **one** similarity and **one** difference between his table and the Periodic Table we use today. [2]

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- (c) Give the formulae of the following compounds.

calcium oxide

magnesium hydroxide

[2]

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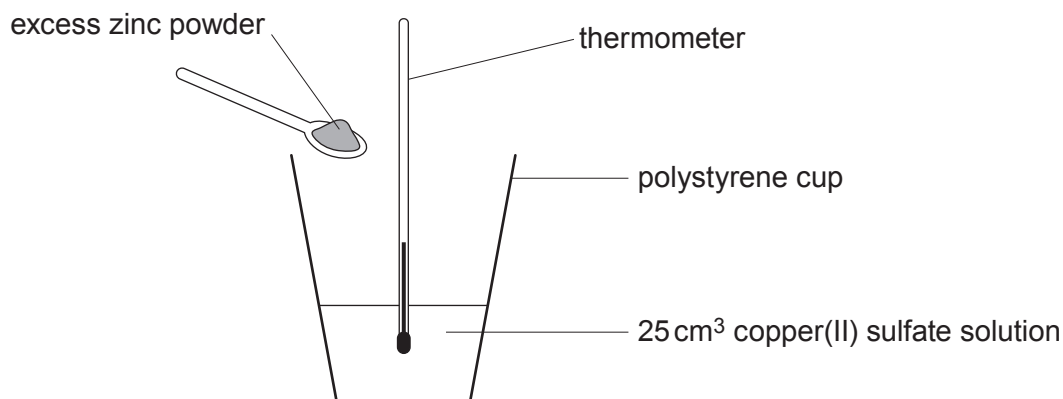


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7. A group of students used the following apparatus to carry out a displacement reaction between zinc powder and copper(II) sulfate solution.



Excess zinc was added to 25 cm³ of the copper(II) sulfate solution at room temperature. The temperature was recorded every 20 s. The results are shown in the table below.

Time after adding the zinc powder to the copper(II) sulfate solution (s)	Temperature of the reaction mixture (°C)		
	Result 1	Result 2	Mean
0	22.0	22.0	22.0
20	22.8	23.0	22.9
40	24.8	25.2	25.0
60	27.3		27.1
80	26.6	26.6	26.6
100	25.7	25.9	25.8
120	24.8	24.4	24.6

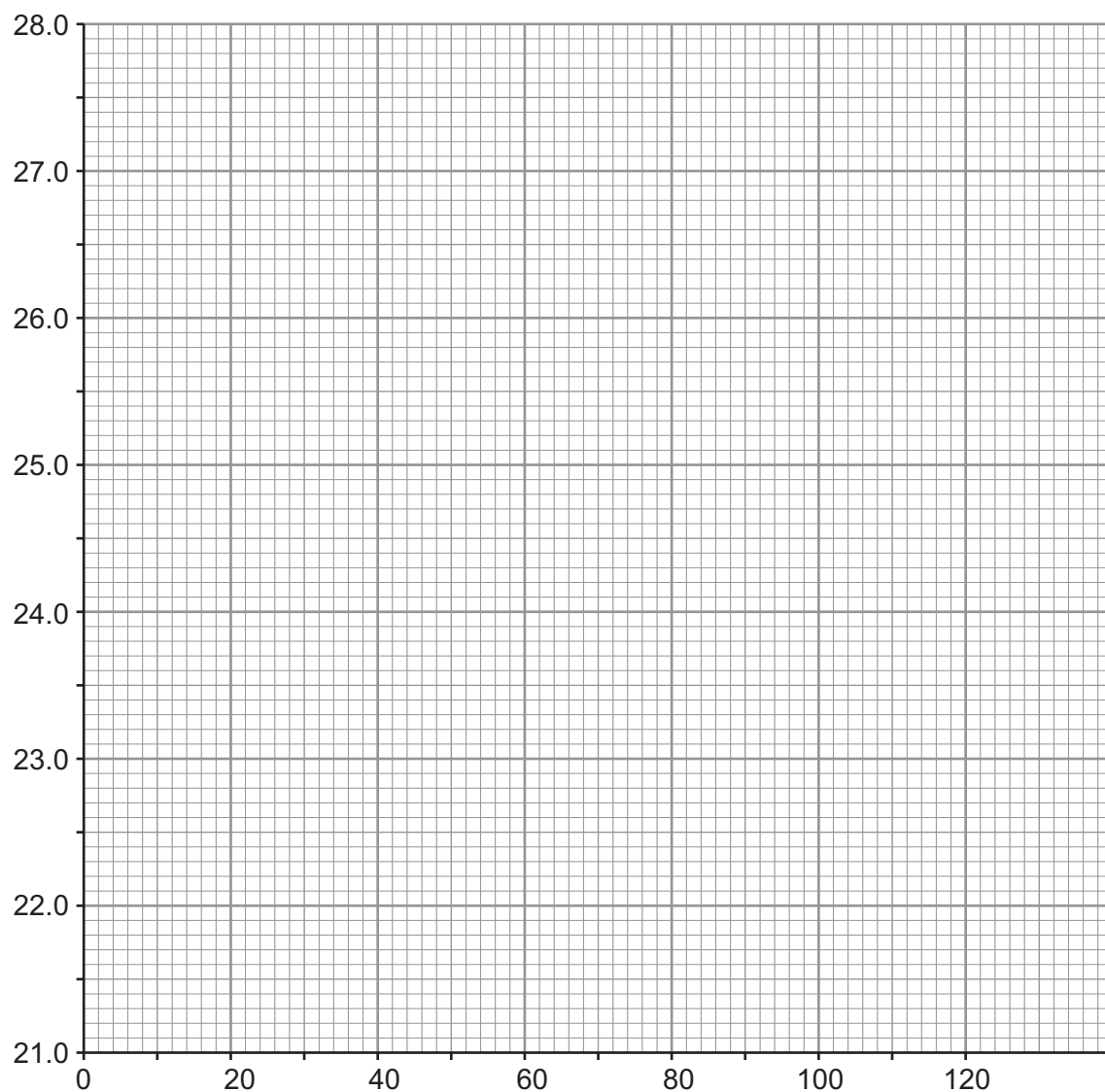
- (a) From the data in the table, calculate the missing result for 60 s that must have been used in working out the mean value. [1]

Temperature = °C



- (b) On the grid below plot the time after adding the zinc powder against the **mean** temperature of the reaction mixture and draw a suitable line. [3]

Mean temperature ($^{\circ}\text{C}$)



Time after adding zinc powder (s)

- (c) One of the students checked the thermometer reading 15 minutes later. State what the temperature would be at this point. Give a reason for your answer. [2]

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- (d) Explain why the results recorded in the table can be described as *repeatable*. [2]

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- (e) The maximum temperature recorded is not as high as expected. Give the main reason for this and suggest **one** way that this effect could be reduced. [2]

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- (f) Balance the following symbol equation that represents the displacement reaction that takes place between zinc and silver nitrate solution. [1]



8. Briefly outline the theory of plate tectonics and use this to describe what happens at **one** type of plate boundary. [6 QWC]

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END OF PAPER

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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 H Hydrogen

7 Li Lithium	9 Be Beryllium											19 F Fluorine	20 Ne Neon				
23 Na Sodium	24 Mg Magnesium											35 Cl Chlorine	40 Ar Argon				
39 K Potassium	40 Ca Calcium	45 Sc Scandium	48 Ti Titanium	51 V Vanadium	52 Cr Chromium	55 Mn Manganese	56 Fe Iron	59 Co Cobalt	59 Ni Nickel	64 Cu Copper	65 Zn Zinc	70 Ga Gallium	73 Ge Germanium	75 As Arsenic	79 Se Selenium	80 Br Bromine	84 Kr Krypton
86 Rb Rubidium	88 Sr Strontium	89 Y Yttrium	91 Zr Zirconium	93 Nb Niobium	96 Mo Molybdenum	99 Tc Technetium	101 Ru Ruthenium	103 Rh Rhodium	106 Pd Palladium	108 Ag Silver	112 Cd Cadmium	115 In Indium	119 Sn Tin	122 Sb Antimony	128 Te Tellurium	127 I Iodine	131 Xe Xenon
133 Cs Caesium	137 Ba Barium	139 La Lanthanum	179 Hf Hafnium	181 Ta Tantalum	184 W Tungsten	186 Re Rhenium	190 Os Osmium	192 Ir Iridium	195 Pt Platinum	197 Au Gold	201 Hg Mercury	204 Tl Thallium	207 Pb Lead	209 Bi Bismuth	210 Po Polonium	210 At Astatine	222 Rn Radon
223 Fr Francium	226 Ra Radium	227 Ac Actinium											207 Pb Lead	209 Bi Bismuth	210 Po Polonium	210 At Astatine	222 Rn Radon

Key:

