Candidate Name	Centre Number					Candidate Number				
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GCSE

SCIENCE (Double Award)

UNIT 2: (Double Award) CHEMISTRY 1
HIGHER TIER

SAMPLE ASSESSMENT MATERIALS

(1 hour 15 minutes)

For Examiner's use only		
Question	**Maximum Mark**	**Mark Awarded**
1.	**9**	
2.	**6**	
3.	**7**	
4.	**6**	
5.	**5**	
6.	**6**	
7.	**10**	
8.	**11**	
Total	**60**	

ADDITIONAL MATERIALS
In addition to this paper you will require a calculator.

INSTRUCTIONS TO CANDIDATES
Use black ink or black ball-point pen. Do not use gel pen. Do not use 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.

INFORMATION FOR CANDIDATES
The number of marks is given in brackets at the end of each question or part-question.
Question **8(a)** is a quality of extended response (QER) question where your writing skills will be assessed.

Answer **all** *questions*.

1. (a) (i) Complete the following table that shows information about the atom of potassium. [2]

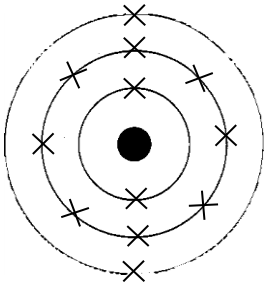
Element	Symbol	Number of protons	Number of neutrons	Number of electrons
potassium	$^{39}_{19}K$	……..	……	……

(ii) Use the Periodic Table of Elements to give the element

I. in Group 2 and Period 2 ..... [1]

II. which has electronic structure 2,8,6. ……. [1]

(iii) The diagram below shows the electronic structure of an element in the Periodic Table.



Using **X** to represent an electron, draw a similar style diagram to show the electronic structure of the element which lies directly **above** this one in the Periodic Table. [1]

(b) (i) The chemical formula of aluminium nitrate is $Al(NO_3)_3$. Give the number of nitrogen atoms in the formula $Al(NO_3)_3$. [1]

……

(ii) Give the chemical formula of potassium carbonate. [1]

……

(c) Boron has two isotopes, $^{11}_{5}\mathrm{B}$ and $^{10}_{5}\mathrm{B}$.

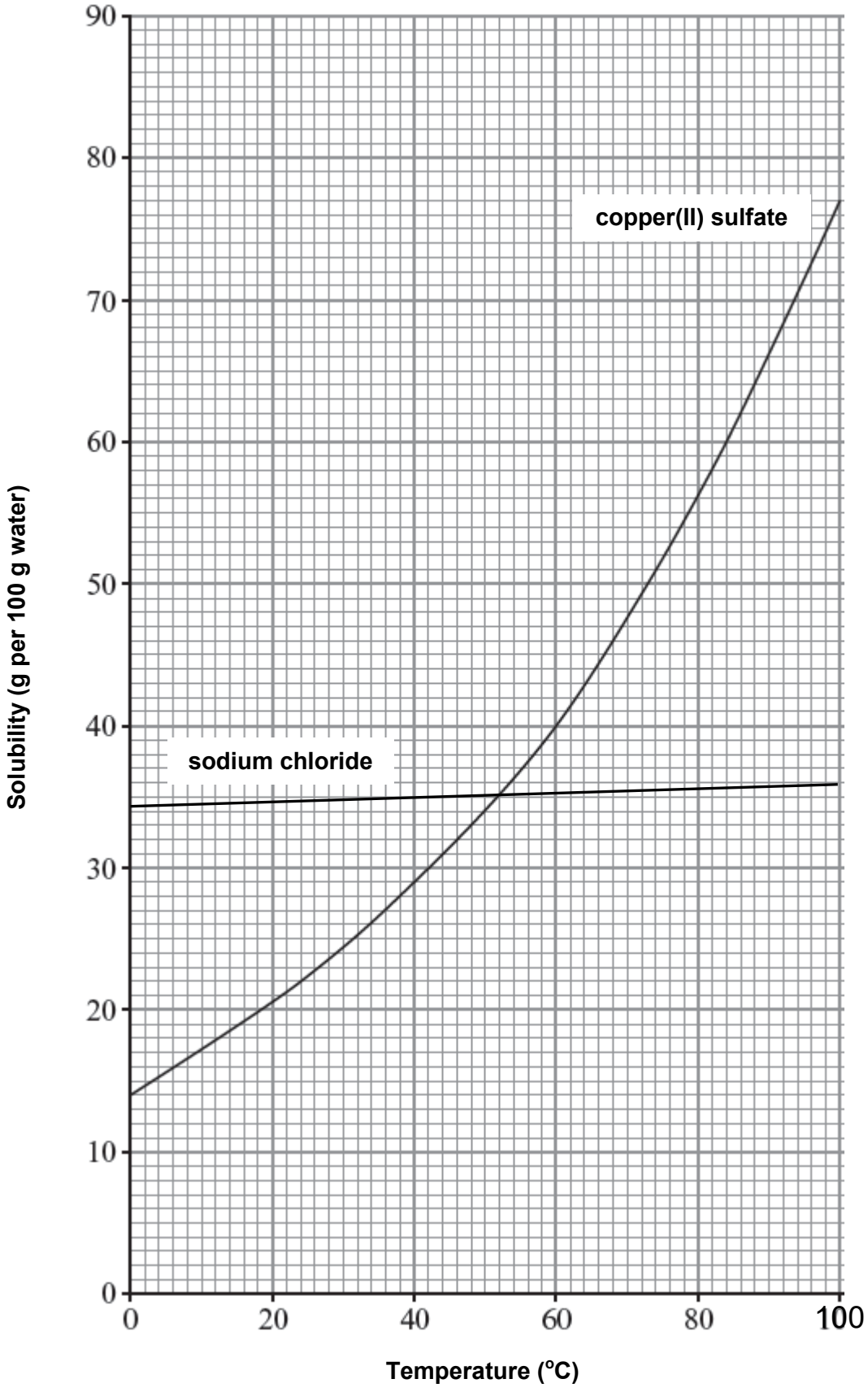
In terms of particles, give **one** similarity and **one** difference between the **nuclei** of these two boron atoms. [2]

Similarity ……....

Difference ……..

9

2. The graphs below show the solubilities of sodium chloride and copper(II) sulfate in water at different temperatures.



(a) Compare how the solubilities of copper(II) sulfate and sodium chloride change as temperature increases. [3]

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(b) Calculate the mass of solid copper(II) sulfate that forms when a saturated solution in 50 g of water at 80 °C cools to 40 °C. [2]

Mass = ……. g

(c) State why the temperature scale on solubility graphs generally ranges from 0 °C to 100 °C. [1]

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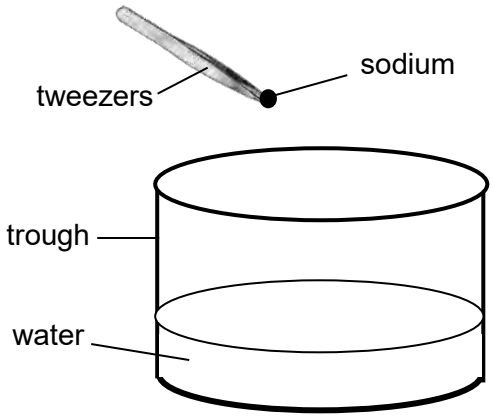
3. (a) A small piece of sodium is added to water.



(i) Describe **one** observation which shows that sodium lies below lithium but above potassium in Group 1. [1]

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(ii) Complete and balance the symbol equation for the reaction between sodium and water. [2]

$2Na + 2H_2O \longrightarrow$ …….. + ……

(b) The equation below shows the reaction between sodium and oxygen.

$$4Na + O_2 \longrightarrow 2Na_2O$$

0.46 g of sodium was burned in excess oxygen.

$A_r(O) = 16$ $A_r(Na) = 23$

(i) Calculate the number of moles in 0.46 g of sodium. [1]

Moles of sodium = ……

(ii) Use the given symbol equation and your answer to part (i) to find the number of moles of sodium oxide formed from 0.46 g of sodium. [1]

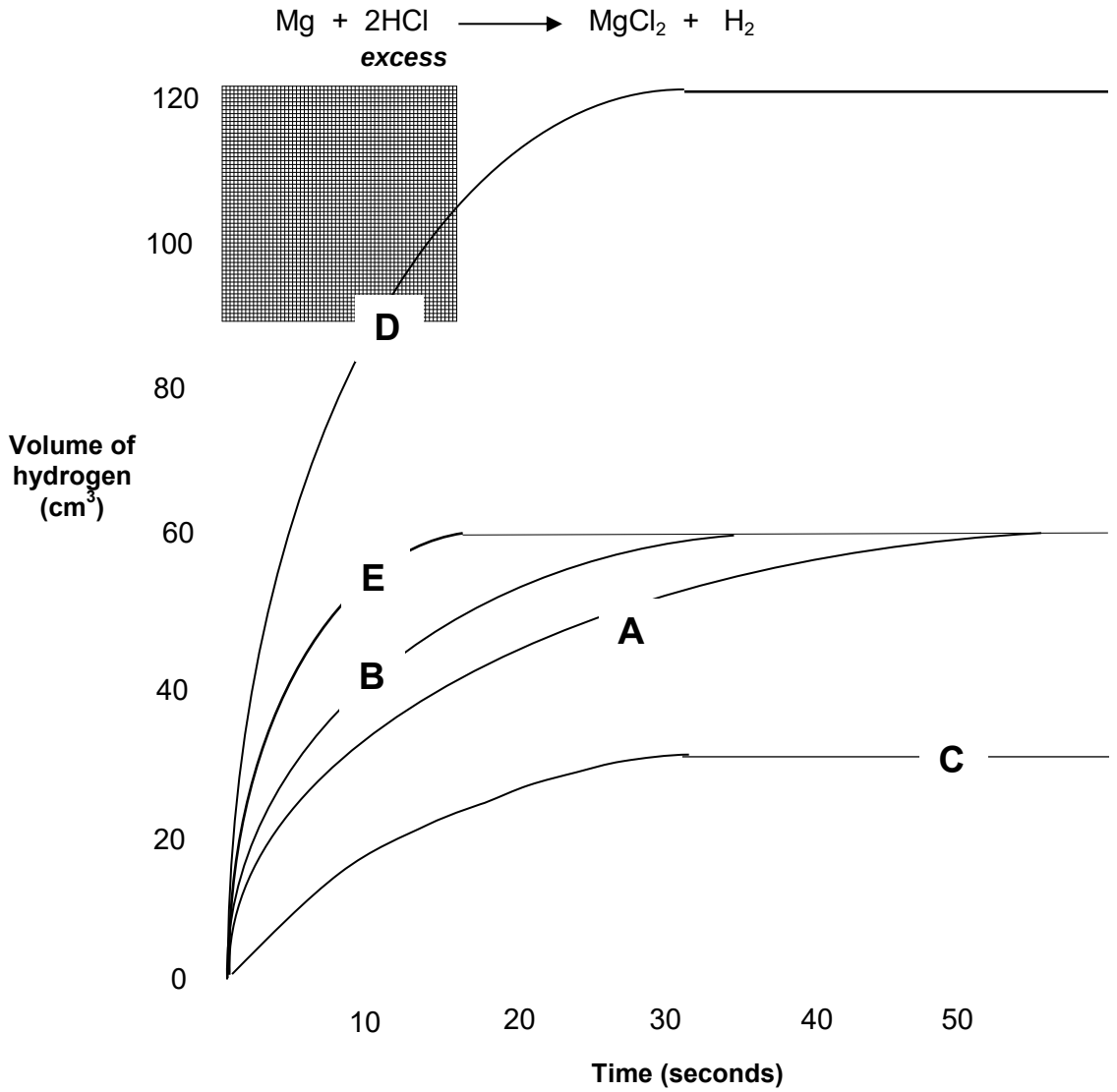
…….

(iii) Use your answer from part (ii) to calculate the mass of sodium oxide formed. [2]

Mass of sodium oxide ……. g

7

4. Graph **A** below, shows the volume of hydrogen formed during the reaction between 0.06g of magnesium ribbon and ***excess*** dilute hydrochloric acid at 20 °C.



(a) State which of graphs **B**, **C**, **D** and **E** represents the reaction using 0.06 g of magnesium ribbon and excess hydrochloric acid at **40 °C**. Explain your choice. [4]

Graph …….

Explanation ……

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(b) State which of graphs **B**, **C**, **D** and **E** represents the reaction using **0.12 g** of magnesium ribbon and excess hydrochloric acid at 20 °C. Explain your choice. [2]

Graph …….

Explanation ……

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5. A group of students were given three water samples labelled **A**, **B** and **C**.

They were told that one was temporary hard water, one was permanent hard water and one distilled water, but they were not told which was which.

Describe an investigation you would carry out using soap solution to identify each sample. [5]

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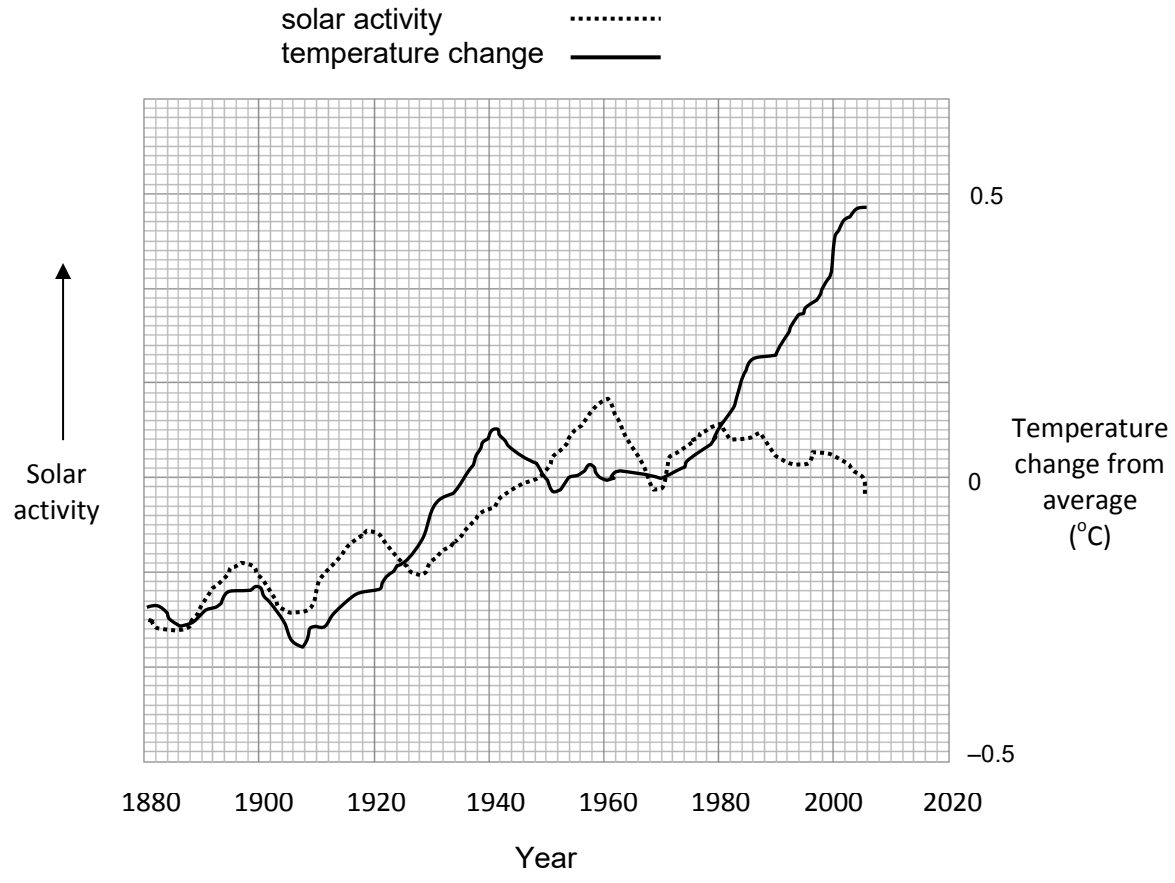
6. (a) During the last 250 years the level of carbon dioxide in the atmosphere has slowly increased. See Table 1.

Most scientists believe the increase in the concentration of carbon dioxide in the atmosphere has resulted in global warming.

	Year					
	1750	**1800**	**1850**	**1900**	**1950**	**2000**
Concentration of carbon dioxide in the atmosphere (% by volume)	0.0278	0.0282	0.0288	0.0297	0.0310	0.0368
Average global temperature (°C)	13.3	13.4	13.4	13.6	13.8	14.4

Table 1

However, some scientists believe that changes in solar activity i.e. changes in the brightness and warmth of the sun, is the cause of global warming.
Graph 1 shows the changes in solar activity and atmospheric temperatures since 1880.



Graph 1

(i) Using the information in Graph 1 discuss whether the evidence supports the argument that solar activity is the cause of global warming. [2]

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(ii) Use the data in Table 1 to show that the **rate** of increase of carbon dioxide levels in the atmosphere is rising. [2]

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(b) In Antarctica, scientists have drilled down two miles below the surface and brought up samples of ice which are hundreds of thousands of years old. These samples are called ice cores and contain trapped air bubbles.

Describe how these ice cores can be used in the study of global warming. [2]

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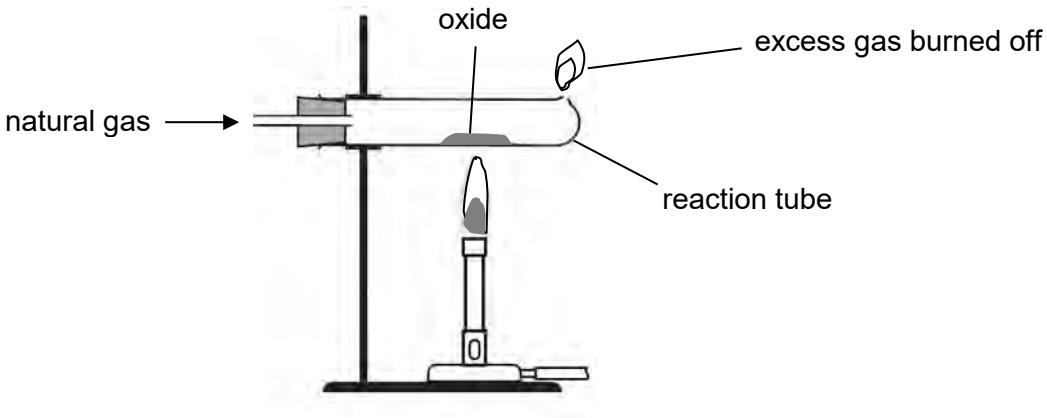
7. Four groups of students carried out an investigation to find the chemical formula of an oxide of copper. Each group was given a different known mass of the oxide. Each group carried out the same procedure.

Natural gas was passed over the heated oxide using the apparatus below.

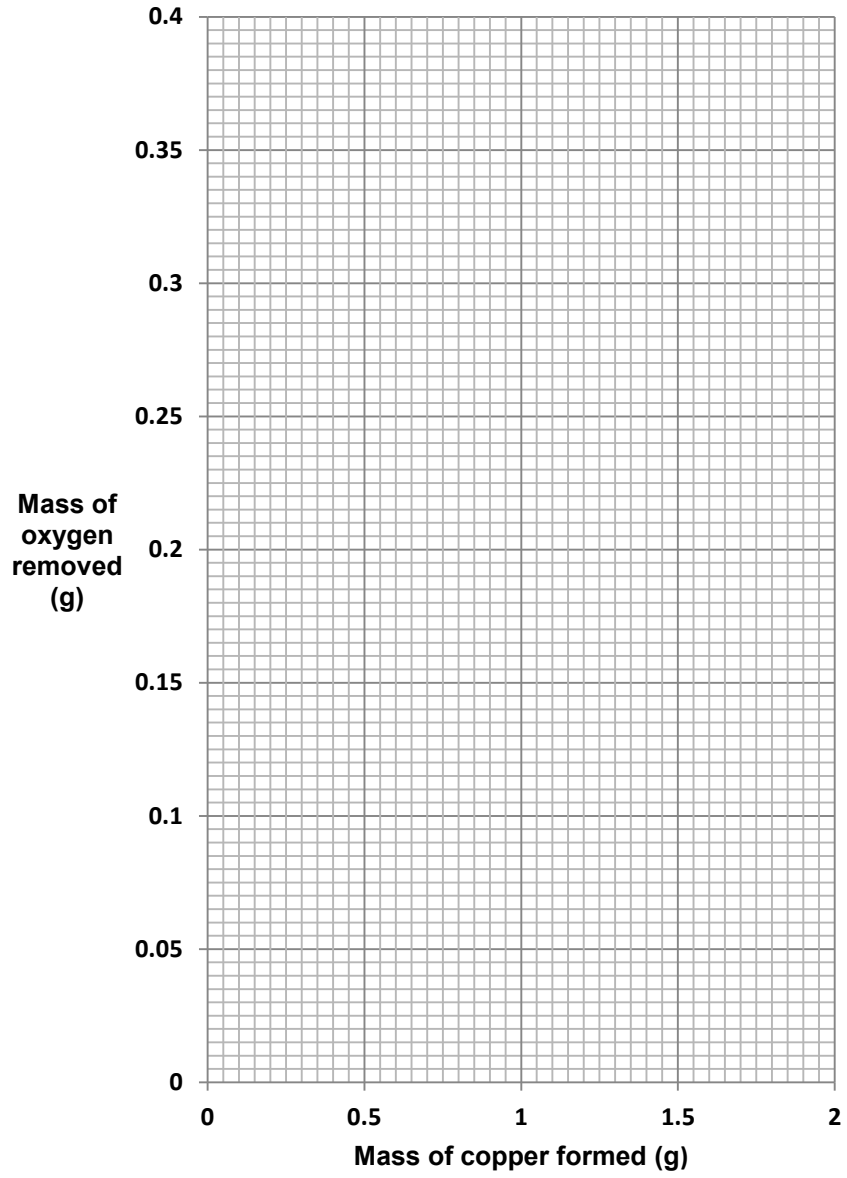


The reaction tube and oxide was weighed before heating and again at 5 minute intervals until the mass remained constant.

Their results are shown below.

Group	Mass of oxide used (g)	Mass of copper formed (g)	Mass of oxygen removed (g)
1	0.50	0.39	0.11
2	1.00	0.81	0.20
3	1.50	1.20	0.30
4	2.00	1.63	0.37

(a) On the grid plot the mass of copper formed against the mass of oxygen removed. Draw a suitable line starting at the origin (0,0). [3]



(b) (i) Use your graph to predict the mass of oxygen removed to form 1.00 g of copper. [1]

Mass of oxygen = …….. g

(ii) Using the masses of copper and oxygen from part (i), calculate the simplest formula of the oxide of copper. [2]

A_r(O) = 16 A_r(Cu) = 63.5

Simplest formula …….……

(c) State and explain **two** ways the design of the experiment helped the students obtain accurate results. [4]

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10

8. (a) Group 1 metals react with Group 7 non-metals to form halide compounds.

Group 1
lithium
sodium
potassium

Group 7
fluorine
chlorine
bromine

Explain, in terms of electronic structure, which Group 1 and Group 7 elements, from the tables above, would react together the most violently.

[6 QER]

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(b) Silver nitrate solution can be used to detect the presence of aqueous halide ions.

(i) Give the observations made when silver nitrate solution is added in turn to solutions containing chloride ions, bromide ions and iodide ions. [2]

Ion	Observation
chloride	……..……..
bromide	……..……..
iodide	……..……..

(ii) When silver nitrate solution is added to calcium chloride solution a white precipitate is formed.

Write the balanced **symbol** equation for this reaction. [3]

…….. + …….. ⟶ …….. + ……..

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END OF PAPER

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+}		

Avogadro's number, $L = 6 \times 10^{23}$

PERIODIC TABLE OF ELEMENTS

1	2											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: