Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4462/02

S16-4462-02

SCIENCE A/CHEMISTRY

CHEMISTRY 1
HIGHER TIER

A.M. FRIDAY, 17 June 2016

1 hour

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

4462
020001

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 that assessment will take into account the quality of written communication used in your answer to questions **4** and **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.

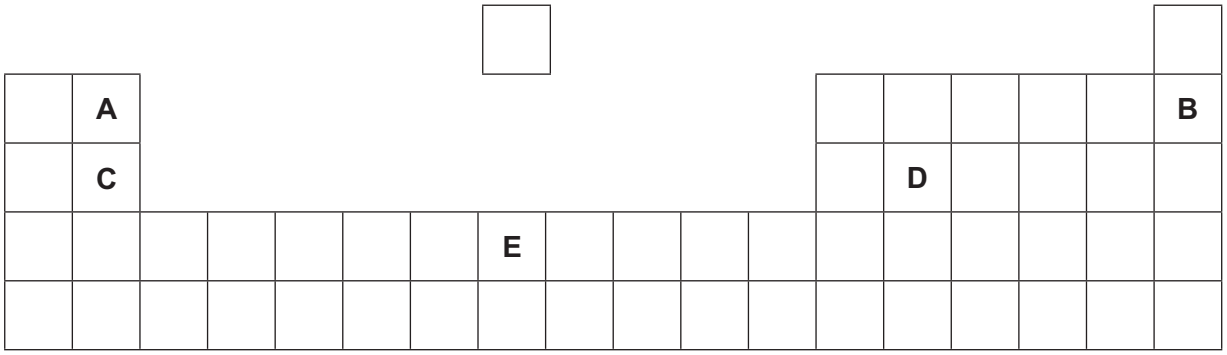
JUN1644620201

Examiner only

Answer **all** *questions.*

1. *(a)* The following diagram shows an outline of the Periodic Table.

The letters shown are NOT the chemical symbols of the elements



(i) Give the group and period of the element labelled **C**. [2]

Group ..... Period .....

(ii) Give the **letter** of the element which has **both** metallic and non-metallic properties. Give the reason for your choice. [2]

Letter .....

Reason .....

.....

(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]

.....

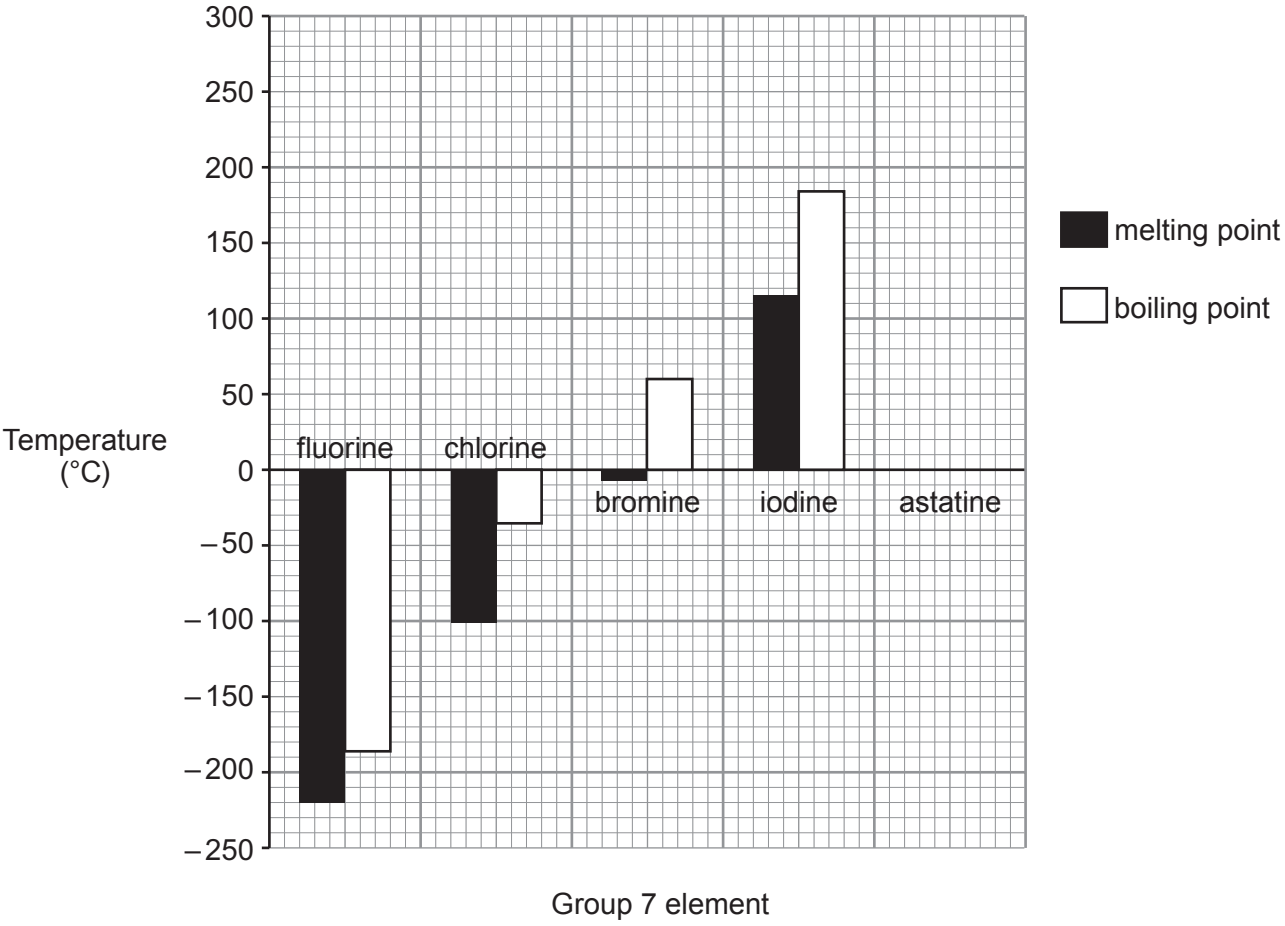
(ii) Give the chemical formula of lithium carbonate. [1]

.....

6

Examiner only

2. The bar charts below show the melting points and boiling points of Group 7 elements.



Use the information in the bar charts to answer parts *(a)*-*(d)*.

(a) Describe the trend, if any, in the melting point going down the group. [1]

.....

(b) Name the element which has the **lowest** melting point. [1]

.....

(c) Using the same key, draw bars on the grid above to predict the approximate values for the melting point **and** boiling point of astatine. [2]

(d) Give the name of the element which is **liquid** at −70 °C. [1]

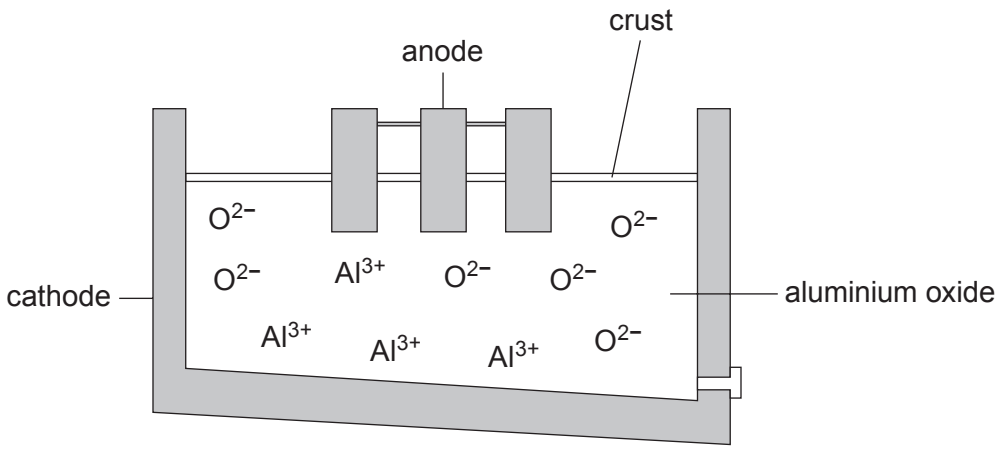
.....

5

4462 020003

Examiner only

3. *(a)* The diagram below shows an electrolysis cell used in the extraction of aluminium.



(i) Give the state (solid, liquid or gas) of the aluminium oxide during this process. [1]

.....

(ii) Explain the movement of Al^{3+} and O^{2-} ions during the process. [3]

.....

.....

.....

.....

(b) State **one** property of aluminium that is **unusual** compared to most other metals. Give a use which relies on this property. [1]

Property .....

Use .....

Examiner only

(c) Scandium is added to aluminium alloys to increase their strength.

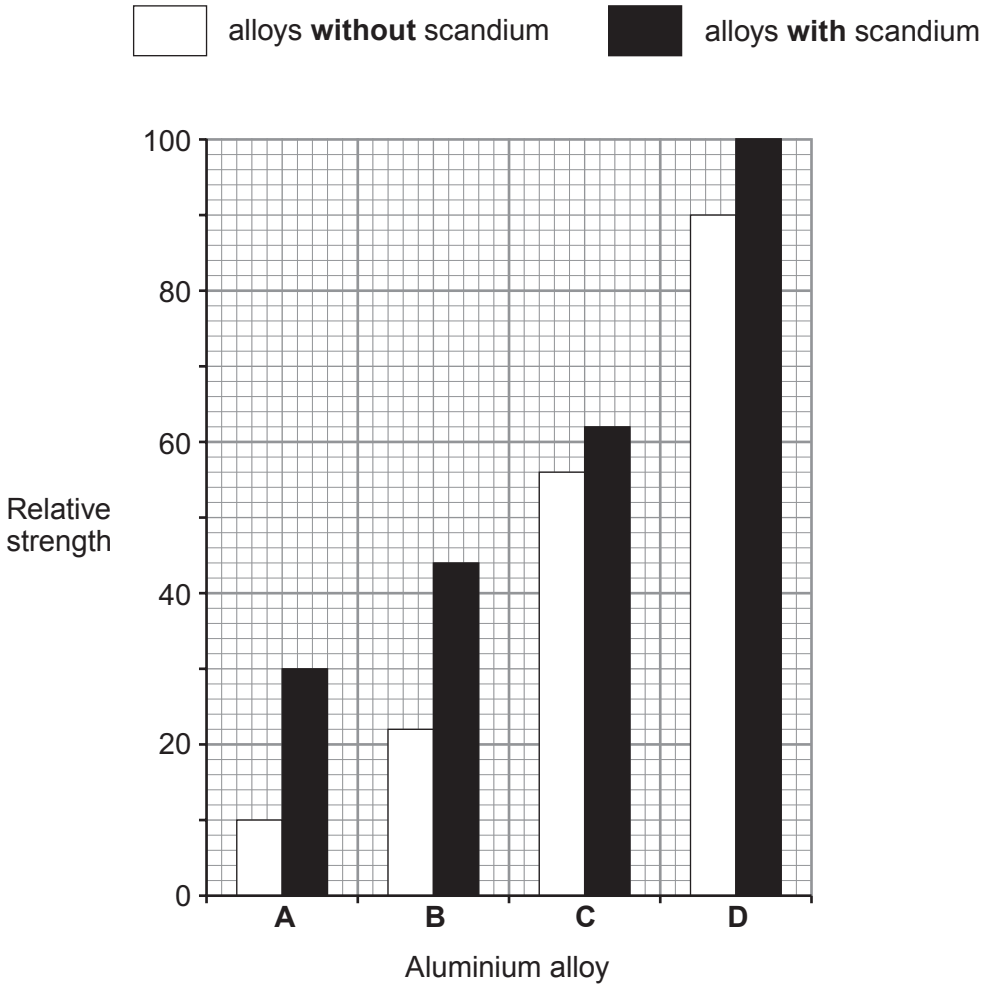
The graph below shows the relative strength of aluminium alloys, **A**-**D**, with and without added scandium.

Give the **letter** of the aluminium alloy where the relative strength is **increased** by 100 % when scandium is added. Use data from the graph to explain your choice. [2]

Letter .....

Reason .....

.....



4462 020005

7

Examiner only

4. Describe the benefits and drawbacks associated with the **recycling** of plastic household waste. [6 QWC]

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

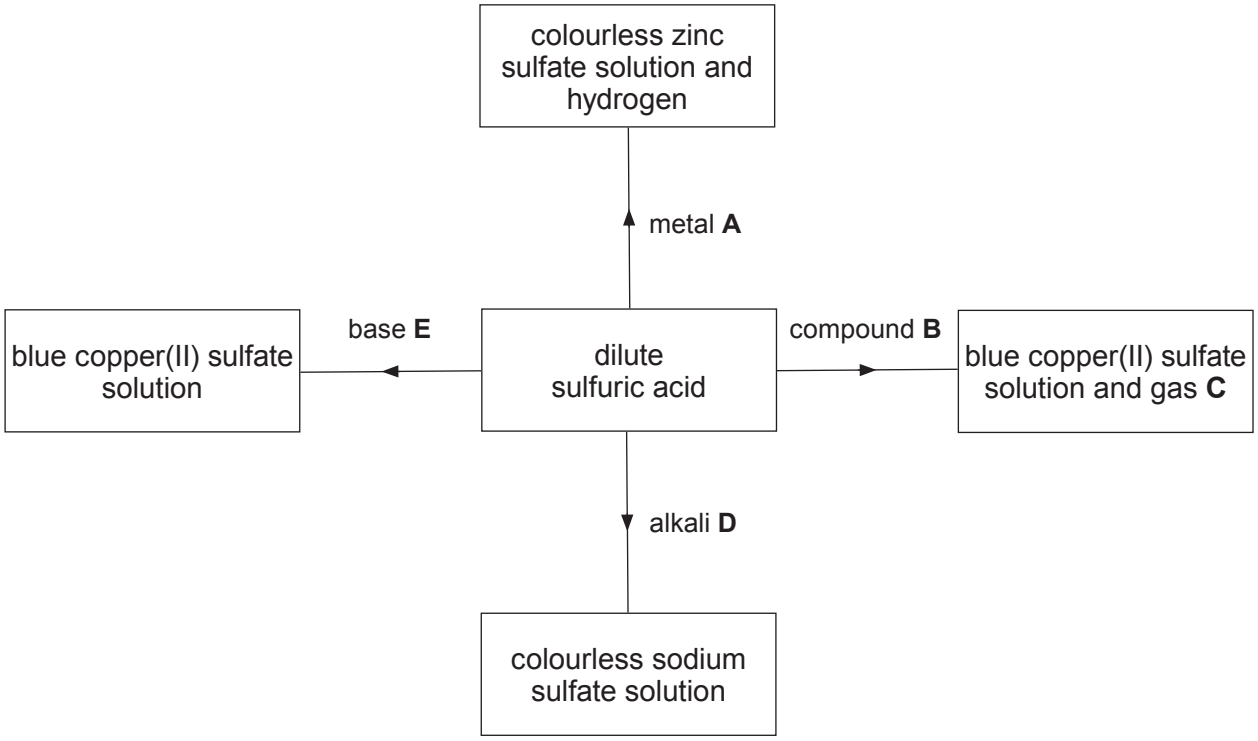
.....

.....

6

Examiner only

5. *(a)* The diagram below shows some reactions of dilute sulfuric acid.



Give the names of each of the substances **A** to **E**. [5]

A .....

B .....

C .....

D .....

E .....

(b) Give the chemical formula of ammonium sulfate. [1]

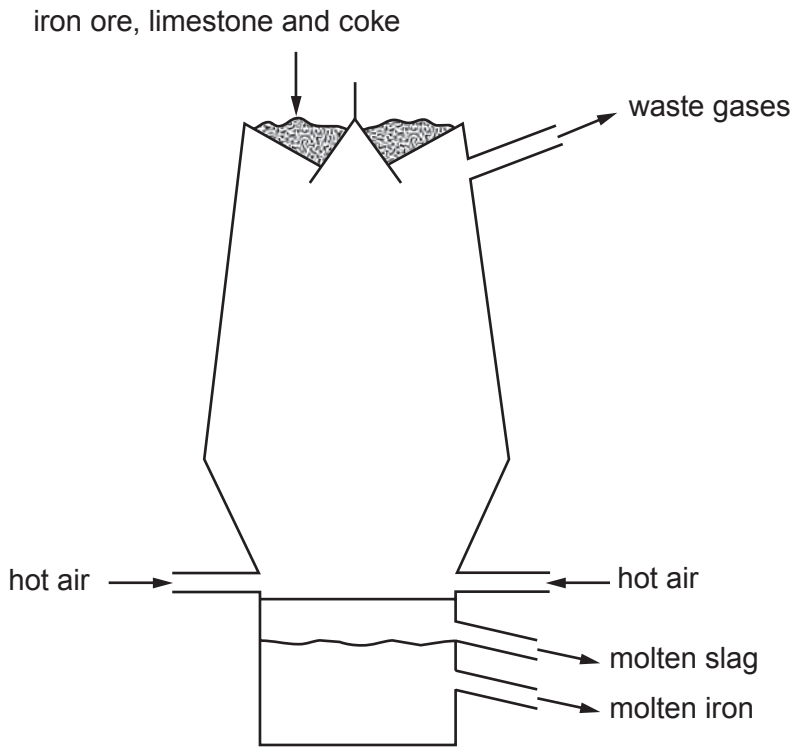
.....

6

4462 020007

Examiner only

6. Iron is extracted from its ore in the blast furnace.



(a) Explain the functions of coke in the extraction of iron from iron(III) oxide. [3]

.....

.....

.....

.....

.....

Examiner only

(b) (i) One of the reactions occurring in the furnace is shown below. Balance this equation. [1]

(ii) The reaction in part (i) shows the processes of oxidation and reduction.

State which of the substances shown in the above equation is reduced and which is oxidised. Explain your answers. [2]

Substance reduced ..... Substance oxidised .....

Explanation .....

.....

(c) Most of the iron produced is converted into an alloy called steel before use. State what is meant by an *alloy*. [1]

.....

4462 020009

7

Examiner only

7. *(a)* Silver can be recovered from photographic solutions using iron. This reaction can be demonstrated in the laboratory by adding iron filings to a beaker containing silver nitrate solution. A grey solid forms and the solution turns a pale green colour.

Explain the reaction taking place in the beaker. [3]

.....

.....

.....

.....

.....

.....

(b) Nano-silver has become widely used in everyday life. Explain **one** disadvantage of using nano-silver in sports clothing. [2]

.....

.....

.....

5

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Examiner only

8. When magnesium powder is heated with copper(II) oxide a violent reaction occurs. The equation for this reaction is given below:

$$Mg + CuO \longrightarrow MgO + Cu$$

(a) 4.0 g of magnesium oxide is formed when 2.4 g of magnesium reacts with 8.0 g of copper(II) oxide. Assuming both reactants are used up during the reaction and that no product is lost, calculate the mass of copper that forms. Explain your answer in terms of atoms. [2]

Mass of copper = ... g

Explanation .....

.....

(b) The table below shows the mass of copper formed when different masses of magnesium were heated with 8.0 g of copper(II) oxide.

Mass of magnesium used (g)	Mass of copper formed (g)
0.05	0.14
0.10	0.27
0.15	0.40
0.20	0.53
0.25	0.66

(i) Plot the results from the table on the grid opposite and draw a suitable line. [3]

(ii) Describe the relationship between the mass of magnesium used and the mass of copper formed. [2]

.....

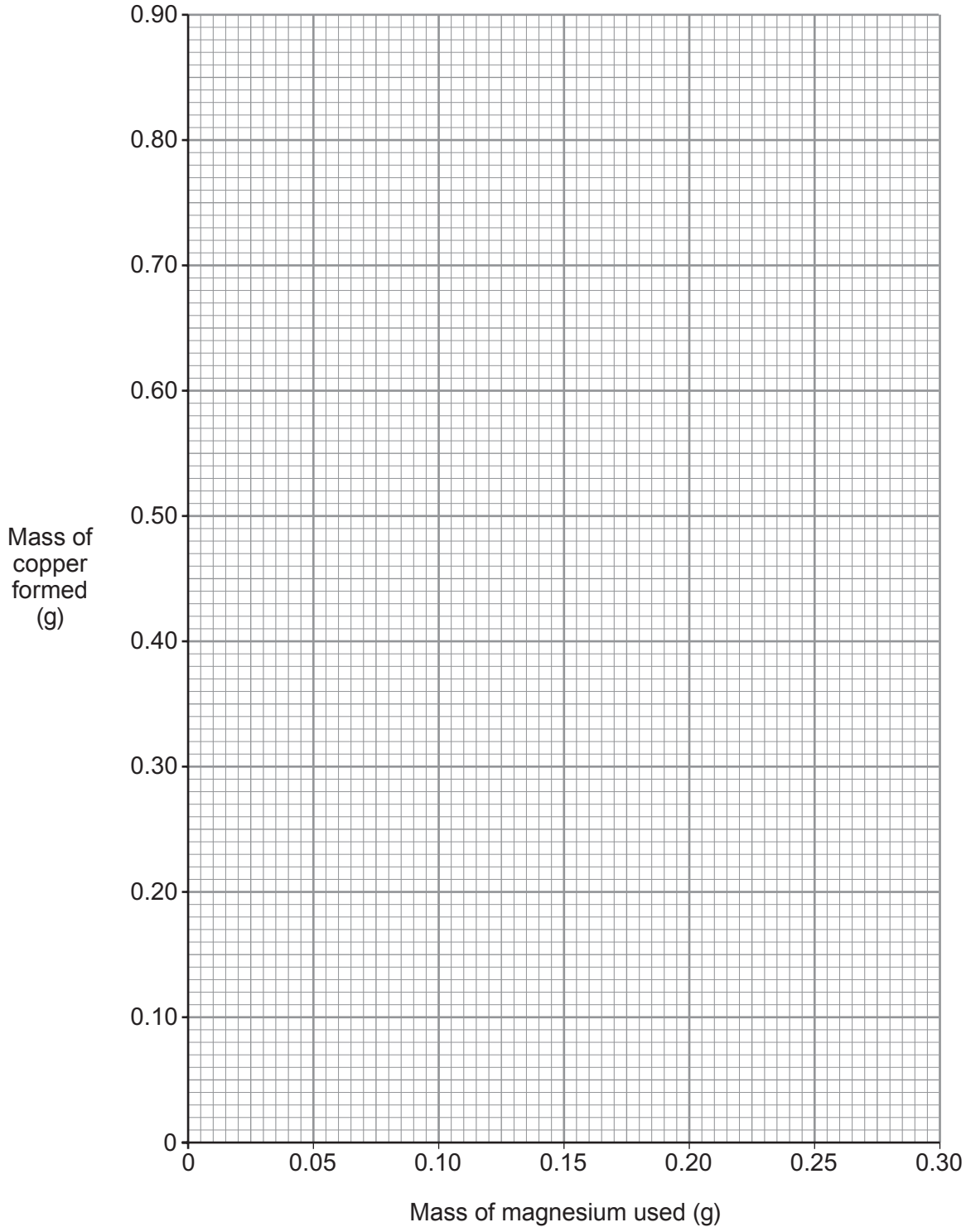
.....

.....

(iii) Use your graph to find the mass of copper formed when 0.30 g of magnesium is used. [1]

Mass of copper = ... g

Examiner only

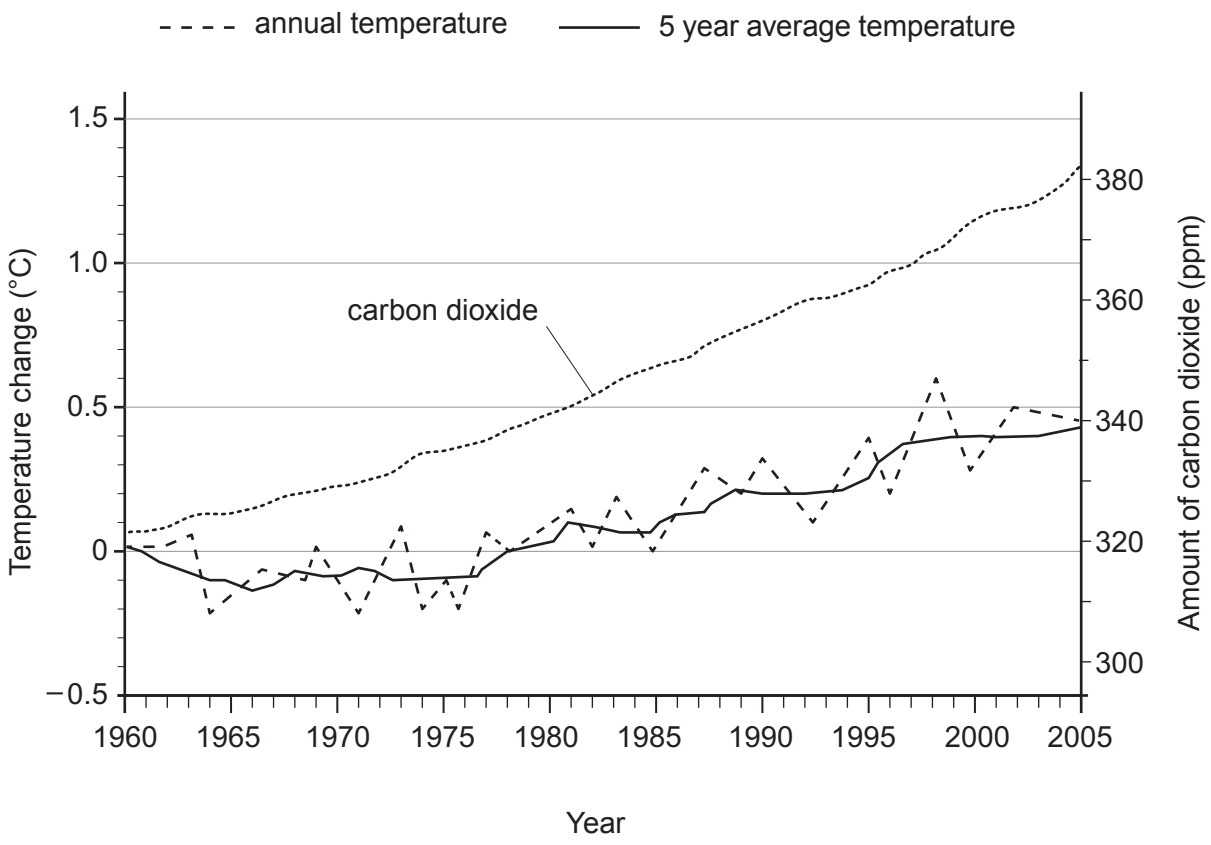


8

Turn over.

Examiner only

9. *(a)* The graphs below show the changes in carbon dioxide levels and atmospheric temperature between 1960 and 2005.



Describe how the evidence from the graphs can be used to support and to oppose the statement: [2]

"Global warming is caused by releasing carbon dioxide into the atmosphere."

Support .....

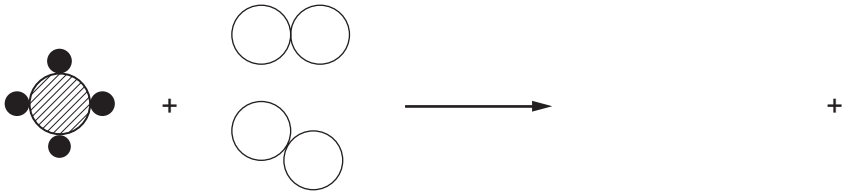
.....

Oppose .....

.....

Examiner only

(b) Natural gas is mainly methane, CH_4. Complete the equation for its combustion in air by drawing diagrams to represent **all** the molecules formed. [2]



4

Examiner only

10. Use the information from the table below to evaluate the potential of hydrogen as a replacement for petrol and diesel to fuel cars.

Your answer should include **both** advantages and disadvantages. [6 QWC]

	Hydrogen	Petrol and diesel
Raw material	water	crude oil
Production method	electrolysis	fractional distillation
Combustion product(s)	water	carbon dioxide and water
State at room temperature and atmospheric pressure	gas	liquid
Storage	thick steel containers	petrol tanks

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

END OF PAPER

6

BLANK PAGE

PLEASE DO NOT WRITE ON THIS PAGE

Question number	Additional page, if required. Write the question number(s) in the left-hand margin.

Examiner only

FORMULAE FOR SOME COMMON IONS

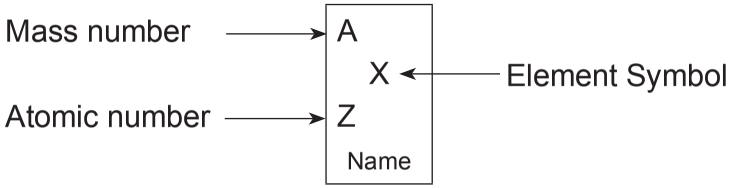
POSITIVE IONS		NEGATIVE IONS	
Name	**Formula**	**Name**	**Formula**
Aluminium	Al^{3+}	Bromide	Br^{-}
Ammonium	NH_4^{+}	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^{-}
Calcium	Ca^{2+}	Fluoride	F^{-}
Copper(II)	Cu^{2+}	Hydroxide	OH^{-}
Hydrogen	H^{+}	Iodide	I^{-}
Iron(II)	Fe^{2+}	Nitrate	NO_3^{-}
Iron(III)	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

20

Group 1	2											3	4	5	6	7	0
																	$^{4}_{2}$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:



20