Surname	Centre Number	Candidate Number
Other Names		0

GCSE

4462/01

SCIENCE A/CHEMISTRY

CHEMISTRY 1
FOUNDATION TIER

A.M. THURSDAY, 12 June 2014

1 hour

Suitable for Modified Language Candidates

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

4462 010001

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.

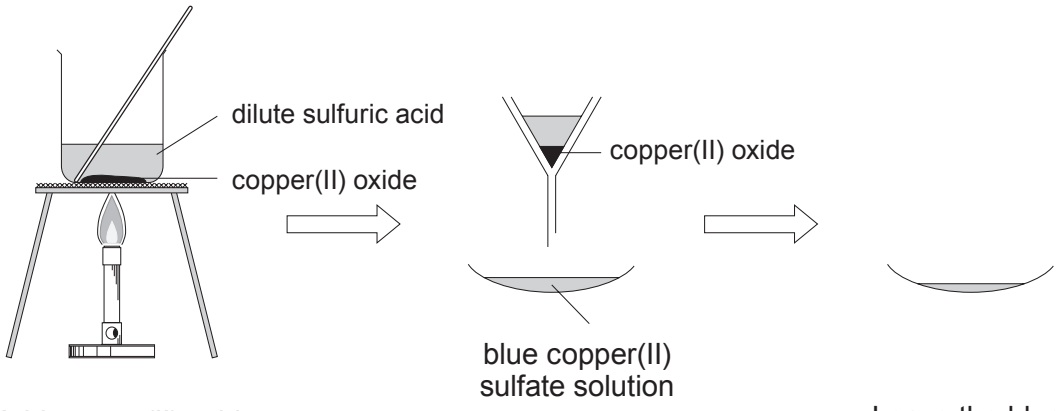
You are reminded that assessment will take into account the quality of written communication used in your answer to question **11**.

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. One method of preparing a salt is by reacting a base with a dilute acid. The information below shows the stages a pupil follows to make a salt.



Add copper(II) oxide to warm dilute sulfuric acid until **all** the acid has been used up, stirring continuously.

Stage **1**

Stage **2**

Leave the blue solution at room temperature for a few days.

Stage **3**

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

(a) State what the pupil can see when **all** the acid has been used up. [1]

.....

(b) (i) Name the process used in stage **2**. [1]

.....

(ii) Name the substance removed during stage **3**. [1]

.....

(c) (i) Give the name of the **base** used in this experiment. [1]

.....

(ii) Give the name of the **salt** formed in this experiment. [1]

.....

5

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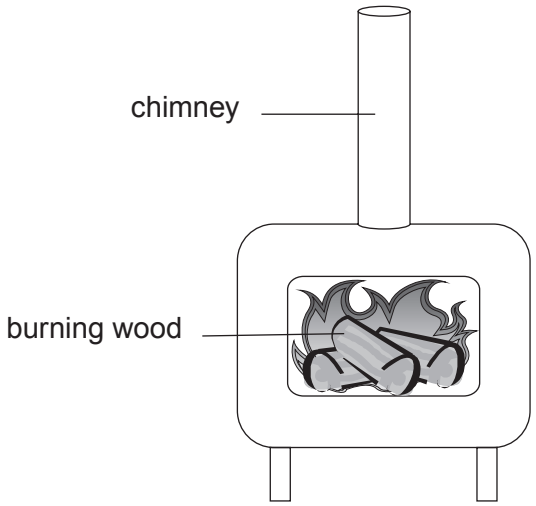
2. Wood burning stoves are popular. They are used instead of oil or natural gas to heat homes. The diagram below shows the main products produced when wood burns.



Main products

carbon, carbon dioxide, sulfur dioxide and water vapour

4462 010003

(a) Name the gas in the air that is needed for wood to burn. [1]

.....

(b) Choose from the list of the main products produced when wood burns:-

- the substance which causes acid rain, ...
- an element. ..... [2]

(c) Most scientists believe that increasing carbon dioxide levels in the atmosphere causes global warming. Explain why using wood as a fuel is said to be carbon-neutral. [3]

.....

.....

.....

.....

.....

6

Examiner only

3. *(a)* The box below contains some properties of aluminium.

low density	**resists corrosion**
good electrical conductor	**good thermal conductor**

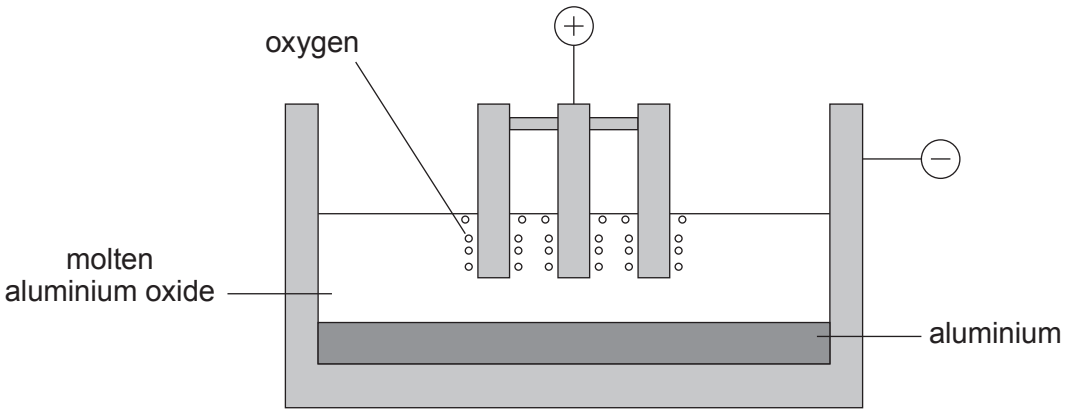
Window frames can be made from several materials including aluminium and iron. Choose **one** property from the box which makes aluminium a **better** material than iron for making window frames. Give a reason for your answer. [2]

Property .....

Reason .....

.....

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



(i) Which **negative ion** is attracted to the positive electrode? ..... [1]

(ii) Write a **word** equation for the total reaction which is happening. [1]

..... ⟶ ..... + ...

(iii) The temperature of the electrolysis cell is about 1000 °C. The melting point of aluminium is 660 °C.

Give the state (*solid*, *liquid* or *gas*) of the aluminium in the cell. [1]

.....

(iv) Give the **main** reason why this process is expensive. [1]

.....

6

Examiner only

4. Seawater is an important raw material from which many different substances can be obtained. The table below shows the concentration (measured in g / kg of seawater) of the most plentiful ions found in seawater.

Ion	Concentration (g / kg of seawater)
lithium	0.000174
fluoride	0.0013
sodium	10.77
magnesium	1.29
chloride	19.35
potassium	0.399
calcium	0.412
bromide	0.000067
iodide	0.0000005

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

(a) (i) Name the two **most** plentiful ions in seawater. [1]

..... and .....

(ii) Give the **chemical formula** of the compound formed from these ions. [1]

.....

(b) Both chlorine and iodine were once obtained from seawater. Suggest why it is too expensive to use seawater as a source of iodine. [1]

.....

3

Examiner only

5. *(a)* The table below shows information about some of the fractions obtained from crude oil.

Fraction	Boiling point range (°C)	Number of carbon atoms in the hydrocarbons
petrol	40-100	C_4-C_{12}
naphtha	100-150	C_7-C_{14}
paraffin (kerosene)	150-250	C_{11}-C_{15}
diesel oil (gas oil)	250-350	C_{15}-C_{19}

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

(i) Pentane is a hydrocarbon found in crude oil and has the formula C_5H_{12}. Suggest a value for the boiling point of pentane. [1]

..... °C

(ii) Give the number of carbon atoms in the hydrocarbons found in both the paraffin and diesel oil fractions. [1]

.....

(iii) Give **one** piece of information from the table which shows that each fraction is a mixture. [1]

.....

(b) Propane, C_3H_8, is a hydrocarbon that burns in air forming carbon dioxide and water.

One more step is needed to balance the symbol equation that represents this reaction.

$$C_3H_8 + \boxed{?}\ O_2 \longrightarrow 3CO_2 + 4H_2O$$

Begin the last step by calculating the total number of oxygen atoms shown on the **right hand side** of the equation. [1]

Number of oxygen atoms = ...

Examiner only

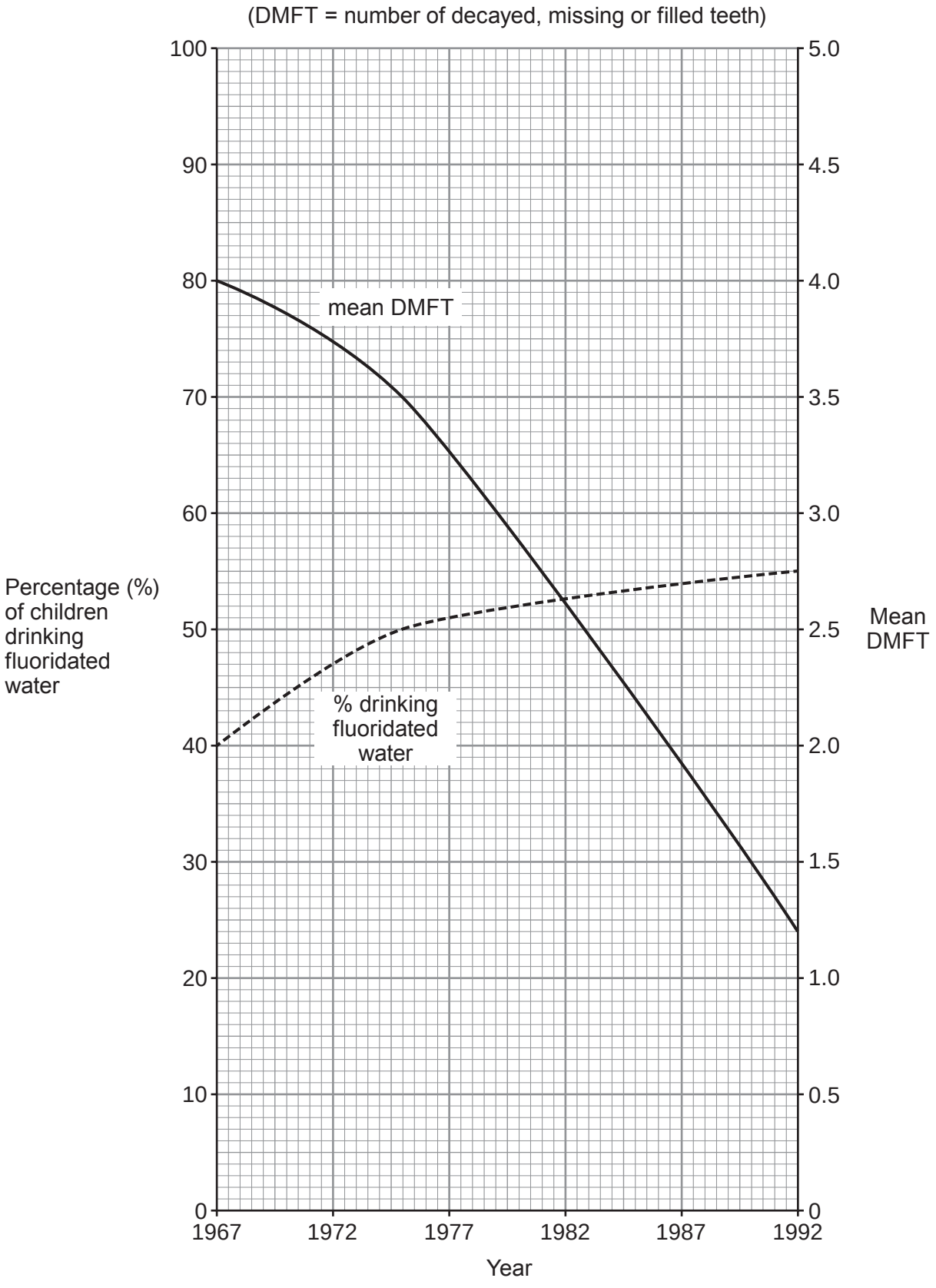
(c) Choose from the box below. What is the term used for the process of breaking down long-chain hydrocarbons into smaller more useful ones? [1]

cracking	**polymerisation**	**reduction**	**neutralisation**

.....

5

6. The graphs below show the results of research on the effect of water fluoridation on the teeth of children aged 12 years in the United States.



Examiner only

(a) Use the graph. Find the decrease in the mean DMFT between 1967 and 1992. [1]

Decrease in the mean DMFT = ...

(b) "Fluoridation of drinking water is responsible for the decrease in tooth decay among 12 year-olds."

Does the evidence from the graph support this statement? Give a reason for your answer. [1]

.....

.....

.....

(c) Give **two** reasons why some people do not agree with the fluoridation of drinking water. [2]

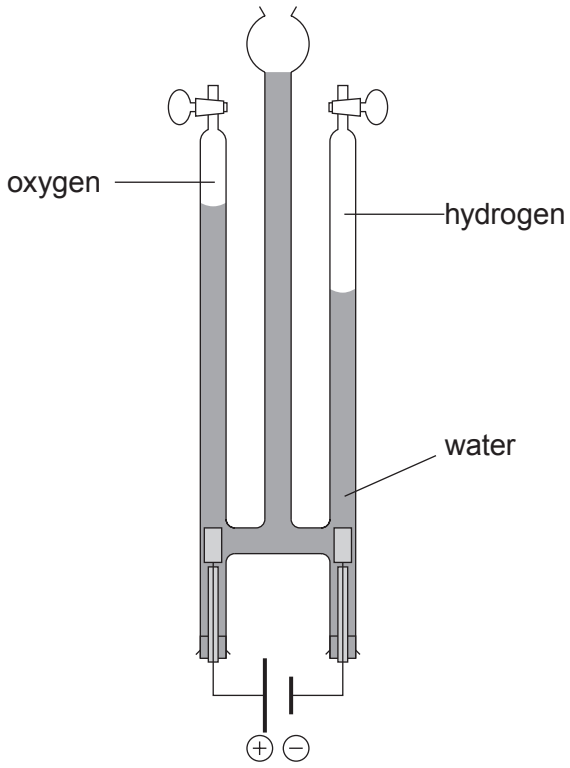
Reason 1 .....

Reason 2 .....

4

Examiner only

7. *(a)* The apparatus below is used to break down water into hydrogen and oxygen using an electric current.



(i) Name this process. ..... [1]

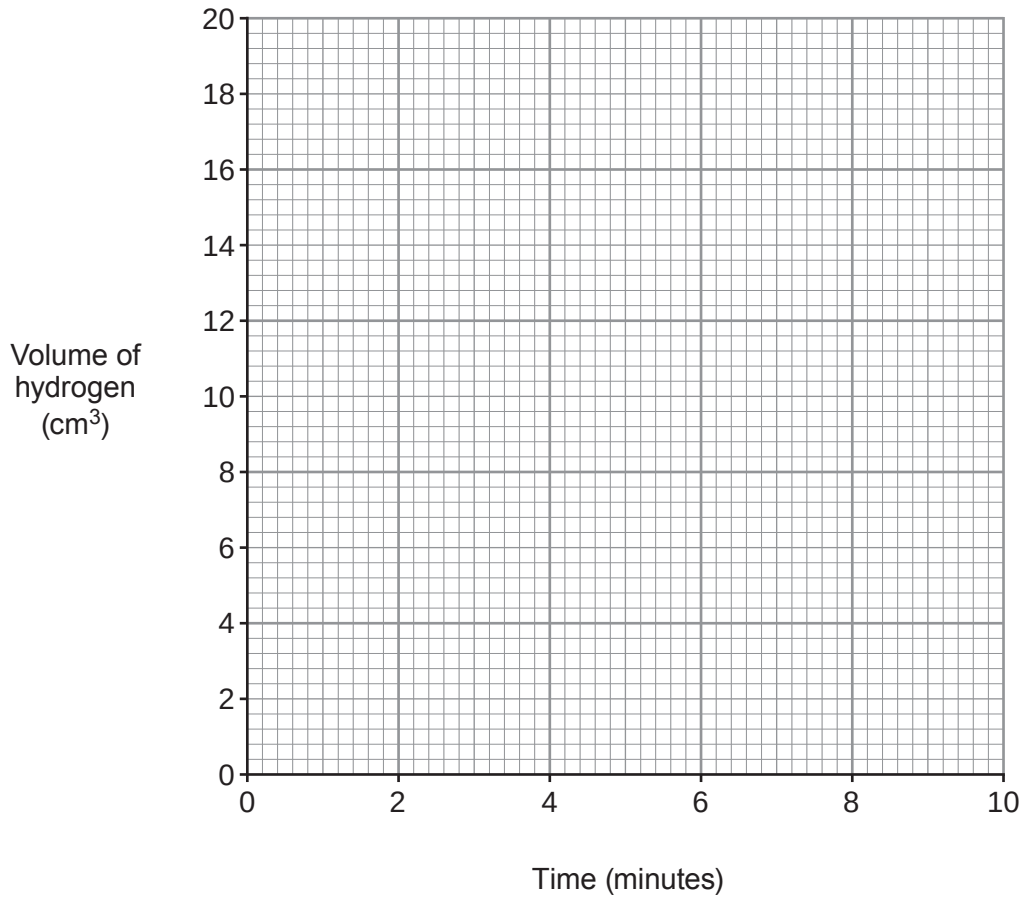
(ii) The table below shows the total volume of hydrogen formed over 10 minutes.

Time (minutes)	0	2	4	6	8	10
Volume of hydrogen (cm^3)	0	4	8	12	16	20

I Plot the results from the table on the grid opposite and draw a suitable line. **Label this line 'hydrogen'.** [2]

II Draw a second line on the grid to show the volume of oxygen that would be collected during the same 10 minutes. [2] **Label this line 'oxygen'.**

Examiner only

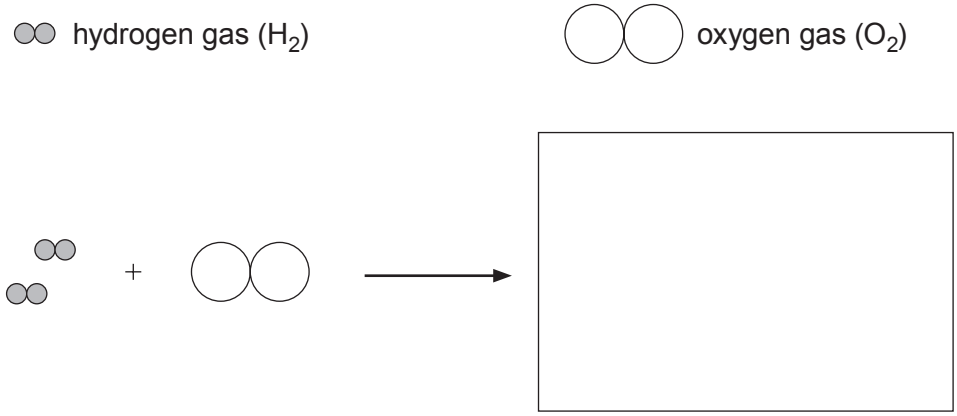


(b) Hydrogen burns in air forming water. This reaction is represented by the following symbol equation.

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

Use this and the key below to complete the equation in the form of a diagram.

[2]



7

Examiner only

8. *(a)* The table below shows some properties of three elements in the Periodic Table.

Element	Melting point (°C)	Boiling point (°C)	Appearance	Malleable or brittle?	Electrical conductivity
aluminium	660	2519	shiny solid	malleable	good
silicon	1414	3265	shiny solid	brittle	semiconductor
phosphorus	44	280	white solid	brittle	poor

How does the information in the table show that silicon is difficult to classify as a metal or a non-metal? [2]

.....

.....

.....

(b) Give the **symbol** of the element which is found in Group 2 and Period 3 of the Periodic Table. [1]

.....

(c) (i) The chemical formula of copper(II) nitrate is $Cu(NO_3)_2$. Give the number of nitrogen atoms in the formula $Cu(NO_3)_2$. [1]

.....

(ii) Give the chemical formula of silver oxide. [1]

.....

(d) Nano-scale silver particles are added to socks to reduce the effects of smelly feet. Recent research has found that these particles can easily leak into waste water during washing.

(i) State the property of nano-scale silver particles that makes them useful in socks.

..... [1]

(ii) Why are some scientists concerned about nano-scale silver particles entering waste water? [1]

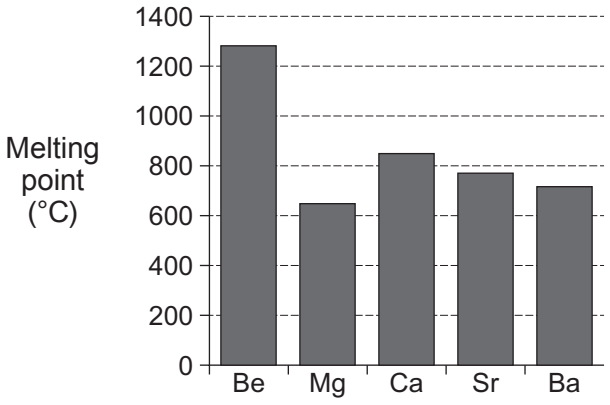
.....

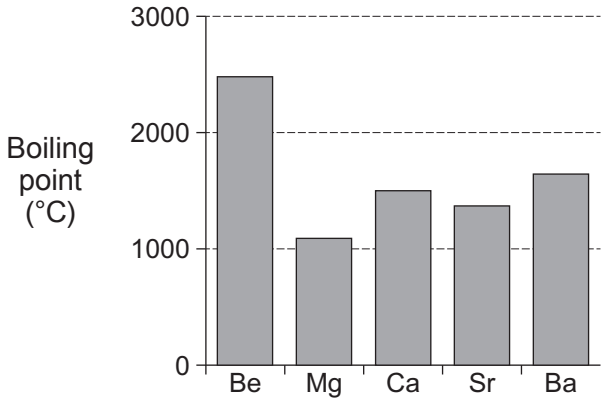
.....

7

Examiner only

9. *(a)* The graphs below show the melting points and boiling points of Group 2 elements.





Use the information in the graphs. Describe the trends, if any, in the melting point and boiling point of Group 2 elements. [2]

Melting point .....

.....

Boiling point .....

.....

(b) The table below describes the reactions of Group 2 elements when added to cold water.

Group 2 Element	Reaction when added to cold water
beryllium	no reaction
magnesium	very slow reaction
calcium	fairly vigorous reaction
strontium	very fast reaction

Barium lies below strontium in Group 2. How would you expect barium to react with cold water? Give a reason for your answer. [2]

.....

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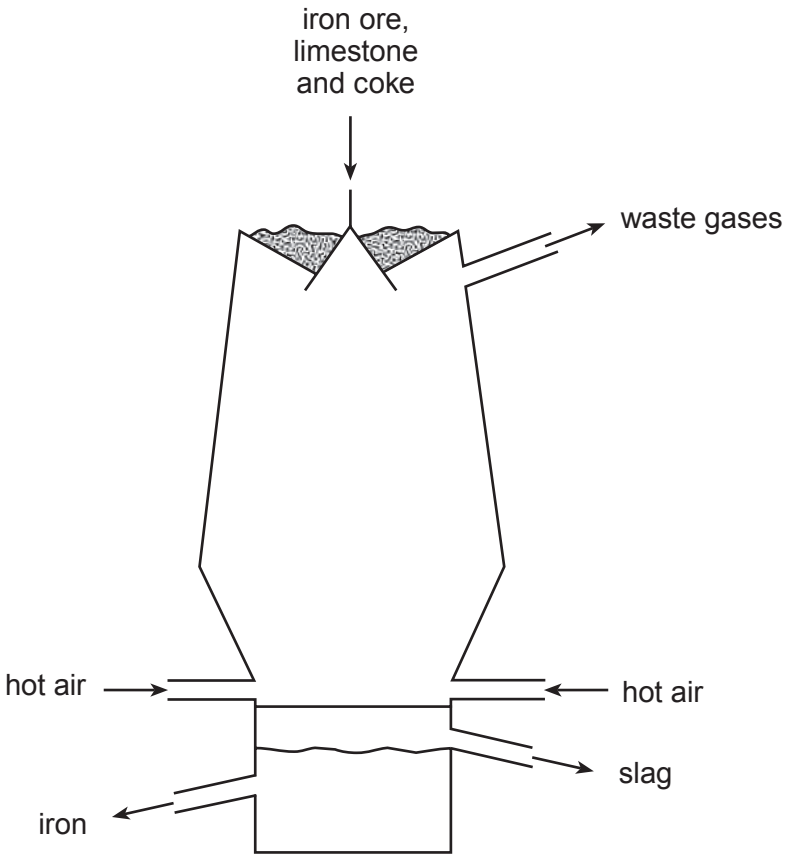
4

Examiner only

10. *(a)* Iron is extracted in the blast furnace. Iron ore, limestone, coke and hot air are the raw materials.



(i) Give the reason for adding each of the following to the furnace:

I coke; [1]

.....

II limestone. [1]

.....

(ii) I Balance the symbol equation that represents the main reaction occurring in the furnace. [1]

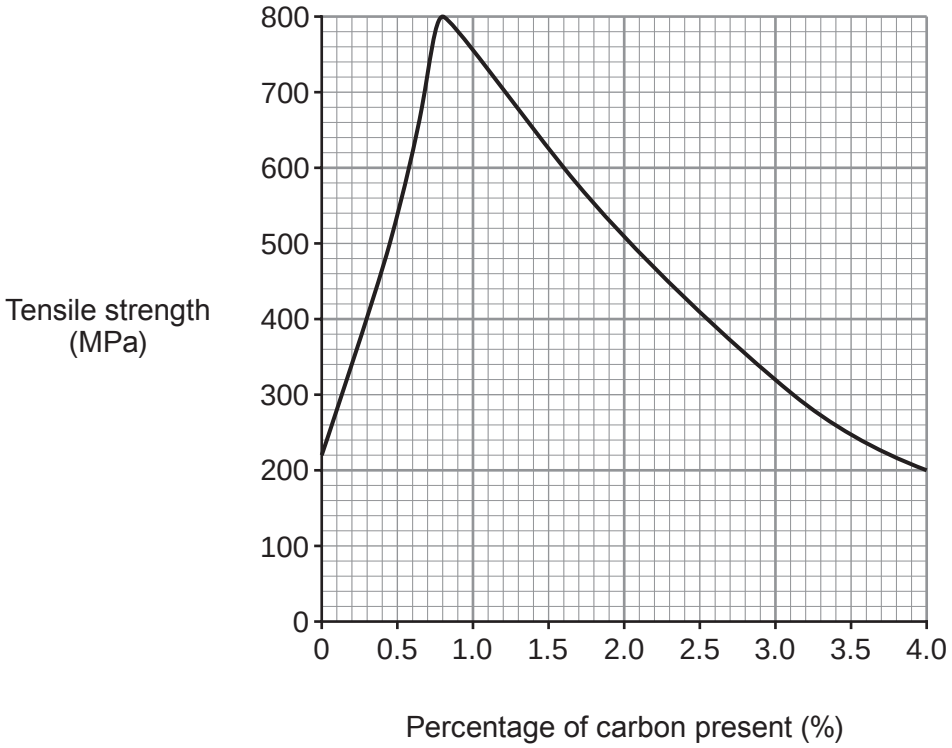
Fe_2O_3 + ☐ CO ⟶ ☐ Fe + ☐ CO_2

II Give the chemical name of the substance which is reduced in the furnace. [1]

.....

Examiner only

(b) The graph below shows how the tensile strength of iron alloys changes with the percentage of carbon present.



(i) How does the tensile strength change as the percentage of carbon present increases? [2]

.....

.....

(ii) The table below shows the percentage of carbon present in some iron alloys.

Alloy of iron	Percentage of carbon present in the alloy (%)
wrought iron	0.1
mild steel	0.3
high-carbon steel	0.9
cast iron	3.6

Use the information in the table and the graph. Name the alloy which has the **lowest** tensile strength. [1]

.....

7

Turn over.

Examiner only

11. Explain why plastics have replaced traditional materials such as iron, glass and wood for making many everyday things. Give examples in your answer. [6 QWC]

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6

END OF PAPER

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

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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
								$^{1}_{1}H$ 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: