THIS IS A NEW SPECIFICATION

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F

Thursday 24 May 2012 – Morning

GCSE GATEWAY SCIENCE
CHEMISTRY B

B741/01 Chemistry modules C1, C2, C3 (Foundation Tier)

B722310612

Candidates answer on the Question Paper.
A calculator may be used for this paper.

OCR supplied materials:
None

Other materials required:
- Pencil
- Ruler (cm/mm)

Duration: 1 hour 15 minutes

B741101

Candidate forename		Candidate surname	

Centre number						Candidate number				

INSTRUCTIONS TO CANDIDATES

- Write your name, centre number and candidate number in the boxes above. Please write clearly and in capital letters.
- Use black ink. HB pencil may be used for graphs and diagrams only.
- Answer **all** the questions.
- Read each question carefully. Make sure you know what you have to do before starting your answer.
- Write your answer to each question in the space provided. Additional paper may be used if necessary but you must clearly show your candidate number, centre number and question number(s).
- Do **not** write in the bar codes.

INFORMATION FOR CANDIDATES

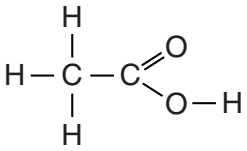
- Your quality of written communication is assessed in questions marked with a pencil (✎).
- The Periodic Table can be found on the back page.
- The number of marks is given in brackets **[ ]** at the end of each question or part question.
- The total number of marks for this paper is **75**.
- This document consists of **24** pages. Any blank pages are indicated.

Answer **all** the questions.

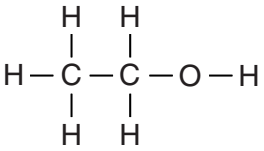
Section A – Module C1

1 This question is about carbon compounds.

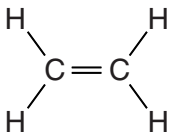
Look at the displayed formulas of some compounds.



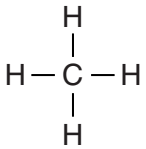
ethanoic acid



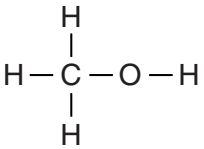
ethanol



ethene



methane



methanol

(a) Write down the name of a compound that is a **hydrocarbon**.

Choose from the compounds shown.

..... **[1]**

(b) Look at the displayed formula of **ethanol**.

How many atoms are shown in the displayed formula?

..... **[1]**

(c) Many ethene molecules react together to make a **polymer**.

Write down the name of the polymer.

..... **[1]**

[Total: 3]

2 John and Sue are building a new house.

They want to choose the best fuel for their house.

They find out some information about four possible fuels.

fuel	is it easy to use?	annual cost to heat the house in £	is it available to this house?
coal	no	750	yes
LPG	yes	972	yes
natural gas	yes	720	no
oil	yes	750	yes

(a) Which fuel should John and Sue choose?

Explain your choice.

.....

.....

..... **[2]**

(b) John and Sue need to consider other factors apart from ease of use, cost and availability.

Write down two **other** factors they need to consider when choosing a fuel for their house.

1.....

2..... **[2]**

(c) LPG contains propane gas.

Propane burns in oxygen. Carbon dioxide and water are made.

Write the **word equation** for this reaction.

..... **[1]**

[Total: 5]

3 This question is about paint.

Look at the information about two different paints.

ingredient	percentage of each ingredient	
	paint X	paint Y
binding medium	53	47
pigment	27	20
solvent	14	30
additives (to speed up the drying process)	6	3

(a) What is the job of the **pigment** in the paint?

Put a tick in the box (✓) next to the correct statement.

To stick the paint to the wall. ☐

To give the paint its colour. ☐

To stop the paint reacting with oxygen. ☐

To stop the paint separating. ☐

[1]

(b) Which paint, **X** or **Y**, would you expect to spread most easily on a wall?

Explain your choice.

.....

..... **[2]**

(c) Paint **Y** is cheaper than paint **X**.

Suggest **two** reasons why the cheaper paint may not be the best paint to buy.

.....

.....

..... **[2]**

[Total: 5]

4 This question is about polymers which are used to make plastics.

(a) Polymers are made in a reaction called **polymerisation**.

What happens in a polymerisation reaction?

.....

.....

..... **[2]**

(b) Look at the information about four polymers, **A**, **B**, **C** and **D**.

polymer	melting point in °C	easy to mould?	easily coloured?
A	250	no	yes
B	60	yes	no
C	240	no	no
D	160	yes	yes

Which polymer would be best for making a washing-up bowl?

answer ..... **[1]**

(c) Polymers have been described as "*one of the greatest inventions of the 20th century*".

However, polymers still cause problems.

- Write about some of the ways of disposing of polymers.
- Suggest why chemists are developing new types of polymers to help with disposal problems.

.....

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.....

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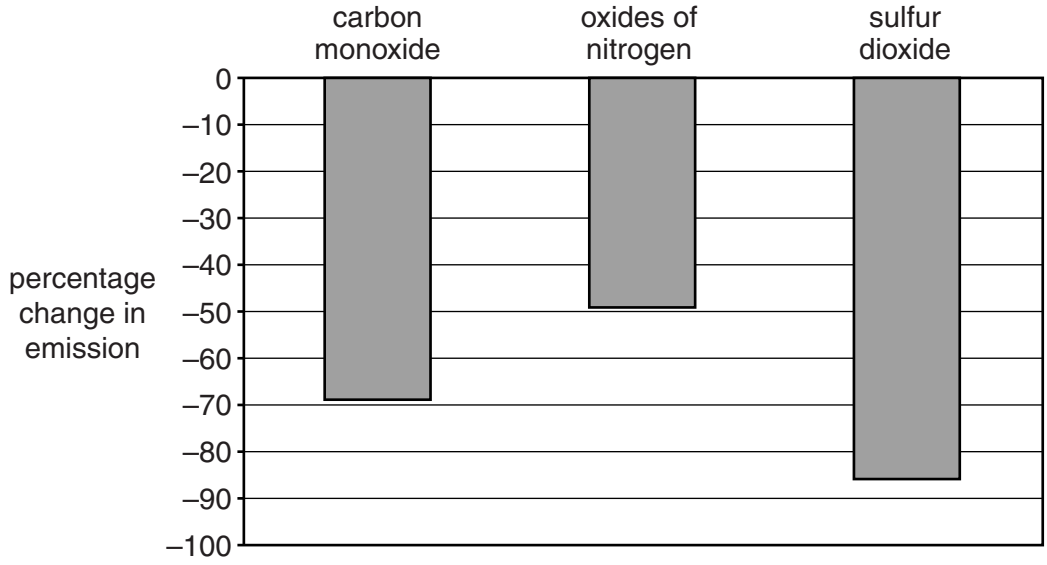
..... **[3]**

[Total: 6]

5 This question is about air pollutants.

Look at the graph.

It shows how the levels of some pollutants found in UK cities have changed from 1990 to 2008.



Describe how the levels of these pollutants have changed and suggest why.

Explain why it is important that air pollution is controlled.

The quality of written communication will be assessed in your answer to this question.

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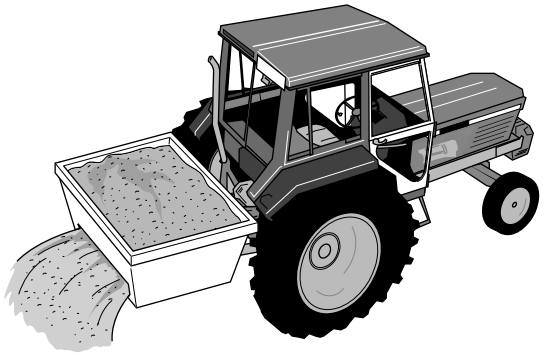
..... **[6]**

[Total: 6]

Section B – Module C2

6 This question is about fertilisers.

Farmers use fertilisers to increase crop yield.



Look at the table. It lists three fertilisers.

fertiliser	formula
ammonium nitrate	NH_4NO_3
ammonium phosphate	$(NH_4)_3PO_4$
potassium nitrate	KNO_3

(a) (i) Ammonium phosphate contains **two** of the **essential elements** needed for plant growth.

Which two?

..... and ..... **[1]**

(ii) Write down the total number of **atoms** in the formula $(NH_4)_3PO_4$.

answer ..... **[1]**

(b) Chloe finds the pH of a solution of a fertiliser using a pH meter.

Write about **another** way she can find the pH of this solution.

.....

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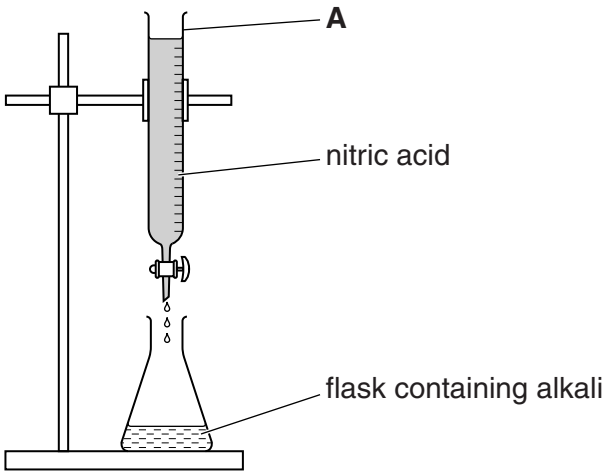
..... **[2]**

(c) Chloe makes some potassium nitrate by neutralising an alkali with nitric acid.

Look at the diagram. It shows the apparatus she uses.



(i) Write down the name of apparatus **A.**

..... **[1]**

(ii) Write down the **name** of the **alkali** Chloe uses to make potassium nitrate.

..... **[1]**

[Total: 6]

7 Copper wire is used in electrical circuits.

Solder is an alloy used to join electrical wires together.

A hot soldering iron is used to melt the solder.

Look at the table.

It gives some information about solder.

	melting point in °C	**density in g/cm^3**	**relative strength**	**electrical conductivity**	**hardness**
solder	183	10.3	strong	conducts well	soft

Write about the properties that make solder suitable for joining electrical wires.

Use the information in the table.

.....

.....

..... **[2]**

[Total: 2]

8 Look at the photograph of an erupting volcano.

(a) Lava erupts from the volcano.

Some of the lava is thrown up into the air and falls into the sea.

The lava cools to form solid rock made of crystals.

Suggest what size the crystals in the rock will be.

Explain your answer.

.....

..... **[1]**

(b) It can be dangerous to live near an active volcano.

Some people choose to live near volcanoes.

Suggest why.

.....

..... **[1]**

(c) Many theories have been put forward to explain the structure of the Earth's surface.

Put a tick (✓) in the box next to the name of a theory that explains the structure of the Earth's surface.

reacting particle model	☐
electrolysis	☐
neutralisation	☐
plate tectonics	☐

[1]

[Total: 3]

9 This question is about the Haber process and other industrial processes.

(a) Ammonia is made by the Haber process from nitrogen and hydrogen.

The reaction uses

- a temperature of 450 °C
- a high pressure of 200 atmospheres
- a catalyst.

Write about the costs of making ammonia.

Explain which costs would change if a pressure of 100 atmospheres were used.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

(b) Another industrial process makes sulfur trioxide.

Sulfur dioxide, SO_2, reacts with oxygen, O_2.

Sulfur trioxide, SO_3, is made.

Write the **balanced symbol** equation for this reaction.

..... **[2]**

[Total: 8]

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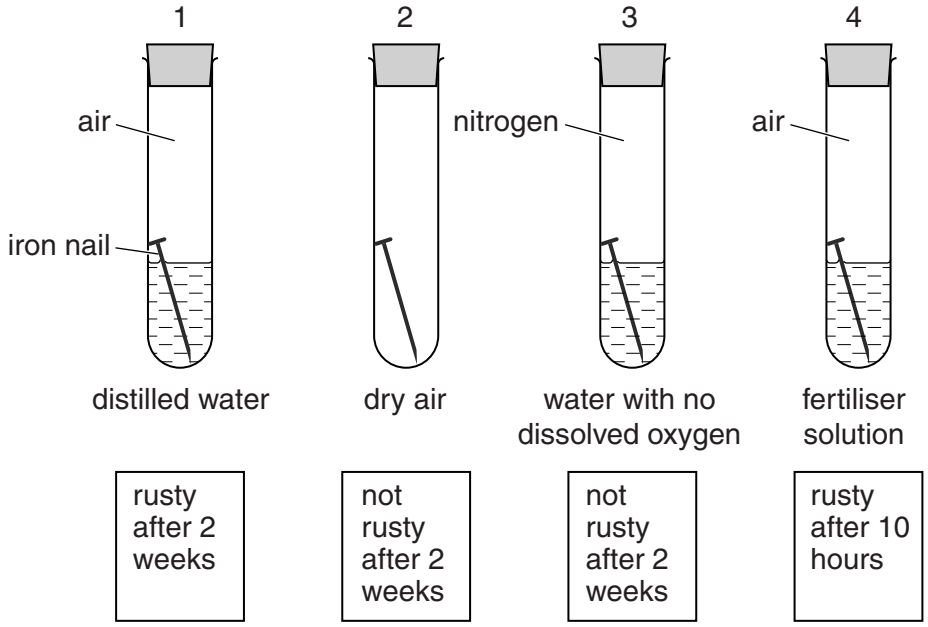
Question 10 begins on page 14.

PLEASE DO NOT WRITE ON THIS PAGE

10 Charlotte investigates the rusting of iron.

Look at the diagram.

It shows the apparatus she uses.



(a) (i) Which substance in Charlotte's investigation **speeds up** rusting the most?

..... **[1]**

(ii) Charlotte thinks that oxygen and water react with iron when it rusts.

How do you know she is right?

Use the diagram to help you.

.....

.....

..... **[2]**

(b) Charlotte repeats her investigation using aluminium nails instead of iron.

The aluminium does not corrode.

Explain why.

.....

..... **[1]**

(c) Drink cans are often made of aluminium.

People often put aluminium cans in recycling bins.

Write about the advantages of **recycling** aluminium.

.....

.....

..... **[2]**

[Total: 6]

Section C – Module C3

11 Antacid tablets are used to stop indigestion.

Jennie and Gary investigate two different antacid tablets, **X** and **Y**.

Both tablets, **X** and **Y**, contain only calcium carbonate and magnesium hydroxide.

Calcium carbonate reacts with hydrochloric acid.

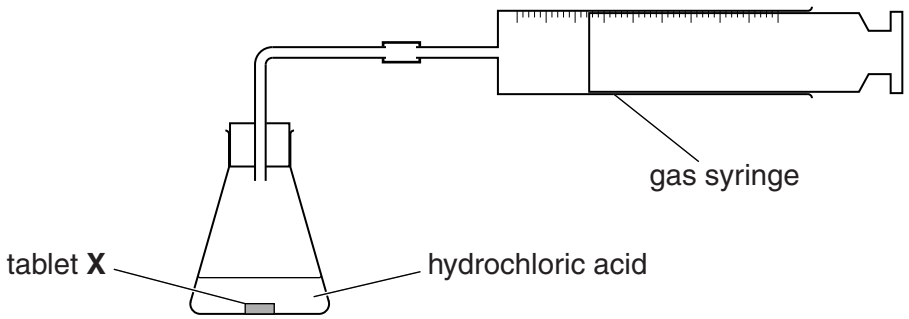
Calcium chloride, water and carbon dioxide are made.

(a) Write a **word equation** for this reaction.

.....

..... **[1]**

(b) Look at the diagram. It shows the apparatus they use.



Jennie and Gary react tablet **X** with 100 cm^3 of hydrochloric acid.

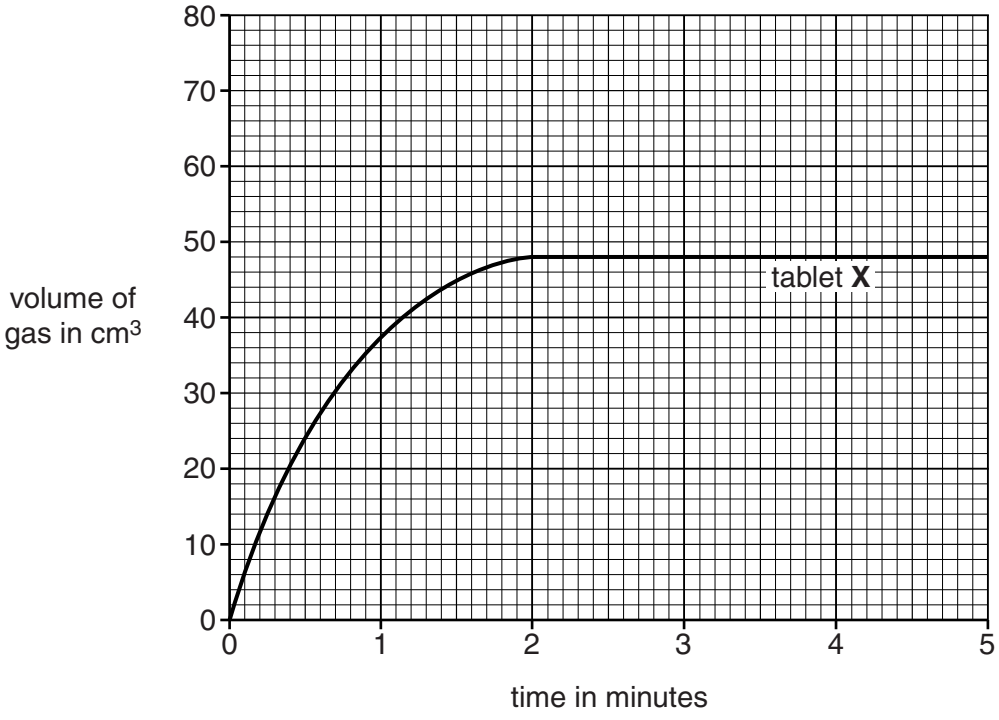
They measure the volume of gas made during the first five minutes.

They do a second experiment using tablet **Y** and 100 cm^3 of hydrochloric acid.

Look at the table. It shows their results.

time in minutes	total volume of gas in cm^3	
	tablet X	tablet Y
0	0	0
1	38	32
2	48	54
3	48	67
4	48	72
5	48	72

Look at the graph. It shows the results for tablet **X**.



(i) What is the volume of gas made by the end of the experiment?

answer ..... cm^3 **[1]**

(ii) Why does the reaction stop?

..... **[1]**

(iii) Plot the results for tablet **Y** on the graph.

Draw the best curve through the points. **[2]**

(c) Tablet **X** contains less calcium carbonate than tablet **Y**.

How do the results show this?

.....

..... **[1]**

(d) The rate of reaction between calcium carbonate and hydrochloric acid can be sped up.

One method is by using a more concentrated solution of hydrochloric acid.

Write down and explain, using the reacting particle model, two **other** ways that the reaction could be **sped up**.

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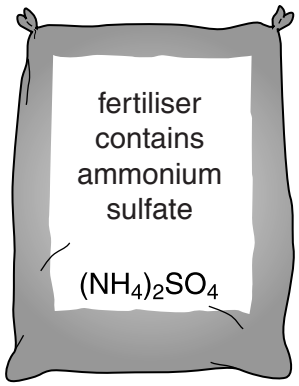
..... **[4]**

[Total: 10]

12 Fertilisers and medicines are useful chemicals.

Ammonium sulfate is used as a fertiliser.



Ammonium sulfate is made by reacting ammonia with dilute sulfuric acid.

The ammonia needed for this reaction is made in a **continuous** process.

This is different to the **batch** process used to make most medicines.

(a) (i) A continuous process is used to make ammonia but a batch process is used to make most medicines.

Explain why.

.....

.....

..... **[2]**

(ii) How do scientists check that medicines are pure?

Choose from this list.

chromatography

electrolysis

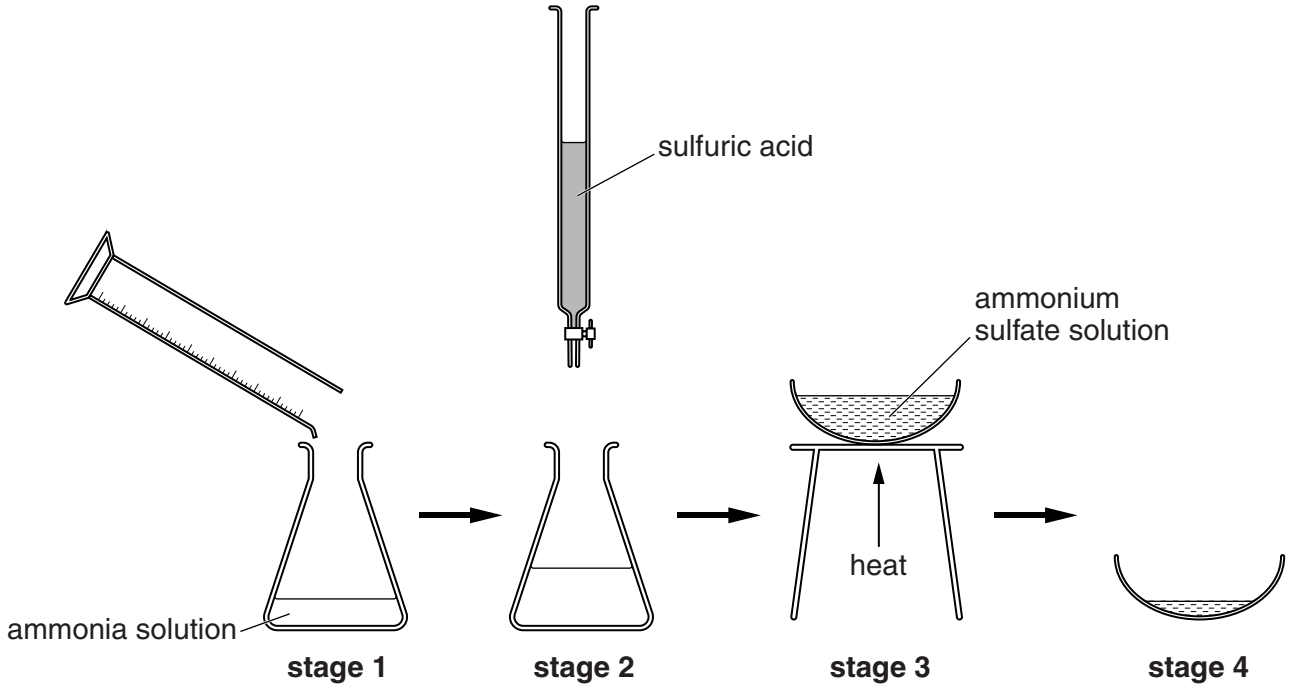
neutralisation

answer ..... **[1]**

Turn over for the remainder of question 12

(b) Alex makes some ammonium sulfate in a laboratory.

Look at the diagrams. They show the method he uses.



(i) Alex predicts he should make 8.0 g of ammonium sulfate.

He actually makes 6.0 g.

Show, by calculation, that his **percentage yield** of ammonium sulfate is 75%.

.....

.....

..... **[2]**

(ii) Suggest why he did not get a 100% yield.

.....

..... **[1]**

(c) Alex decides to make another fertiliser called sodium nitrate, $NaNO_3$.

He reacts sodium hydroxide, NaOH, with nitric acid, HNO_3.

Sodium nitrate and water are made.

(i) Write a **balanced symbol** equation for this reaction.

..... **[1]**

(ii) Alex reacts 4.0 g of sodium hydroxide with 6.3 g of nitric acid.

He makes sodium nitrate and 1.8 g of water.

Use the principle of conservation of mass to calculate the mass of sodium nitrate that Alex made.

.....

.....

mass of sodium nitrate ..... g **[2]**

[Total: 9]

13 Stephanie is investigating some liquid fuels.

Stephanie investigates the energy given out by four different fuels.

She burns 1.5 g of fuel each time.

Look at her table of results.

fuel	starting temperature of water in °C	final temperature of water in °C
paraffin	20	45
petrol	20	40
ethanol	18	45
propanol	15	45

Describe, using a diagram, the experiment Stephanie did to obtain these results.

Use her results to decide which fuel gives out the most energy. Explain your choice.

The quality of written communication will be assessed in your answer to this question.

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..... **[6]**

[Total: 6]

END OF QUESTION PAPER

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The Periodic Table of the Elements

1	2											3	4	5	6	7	0
							1 **H** hydrogen 1										4 **He** helium 2
7 **Li** lithium 3	9 **Be** beryllium 4											11 **B** boron 5	12 **C** carbon 6	14 **N** nitrogen 7	16 **O** oxygen 8	19 **F** fluorine 9	20 **Ne** neon 10
23 **Na** sodium 11	24 **Mg** magnesium 12											27 **Al** aluminium 13	28 **Si** silicon 14	31 **P** phosphorus 15	32 **S** sulfur 16	35.5 **Cl** chlorine 17	40 **Ar** argon 18
39 **K** potassium 19	40 **Ca** calcium 20	45 **Sc** scandium 21	48 **Ti** titanium 22	51 **V** vanadium 23	52 **Cr** chromium 24	55 **Mn** manganese 25	56 **Fe** iron 26	59 **Co** cobalt 27	59 **Ni** nickel 28	63.5 **Cu** copper 29	65 **Zn** zinc 30	70 **Ga** gallium 31	73 **Ge** germanium 32	75 **As** arsenic 33	79 **Se** selenium 34	80 **Br** bromine 35	84 **Kr** krypton 36
85 **Rb** rubidium 37	88 **Sr** strontium 38	89 **Y** yttrium 39	91 **Zr** zirconium 40	93 **Nb** niobium 41	96 **Mo** molybdenum 42	[98] **Tc** technetium 43	101 **Ru** ruthenium 44	103 **Rh** rhodium 45	106 **Pd** palladium 46	108 **Ag** silver 47	112 **Cd** cadmium 48	115 **In** indium 49	119 **Sn** tin 50	122 **Sb** antimony 51	128 **Te** tellurium 52	127 **I** iodine 53	131 **Xe** xenon 54
133 **Cs** caesium 55	137 **Ba** barium 56	139 **La*** lanthanum 57	178 **Hf** hafnium 72	181 **Ta** tantalum 73	184 **W** tungsten 74	186 **Re** rhenium 75	190 **Os** osmium 76	192 **Ir** iridium 77	195 **Pt** platinum 78	197 **Au** gold 79	201 **Hg** mercury 80	204 **Tl** thallium 81	207 **Pb** lead 82	209 **Bi** bismuth 83	[209] **Po** polonium 84	[210] **At** astatine 85	[222] **Rn** radon 86
[223] **Fr** francium 87	[226] **Ra** radium 88	[227] **Ac*** actinium 89	[261] **Rf** rutherfordium 104	[262] **Db** dubnium 105	[266] **Sg** seaborgium 106	[264] **Bh** bohrium 107	[277] **Hs** hassium 108	[268] **Mt** meitnerium 109	[271] **Ds** darmstadtium 110	[272] **Rg** roentgenium 111	Elements with atomic numbers 112-116 have been reported but not fully authenticated						

Key

relative atomic mass
atomic symbol
name
atomic (proton) number

**** The lanthanoids (atomic numbers 58-71) and the actinoids (atomic numbers 90-103) have been omitted.***

The relative atomic masses of copper and chlorine have not been rounded to the nearest whole number.