

Please check the examination details below before entering your candidate information	
Candidate surname	Other names
Centre Number	Candidate Number
Pearson Edexcel Level 1/Level 2 GCSE (9–1)	
Tuesday 13 June 2023	
Morning (Time: 1 hour 10 minutes)	Paper reference 1SC0/2CF
Combined Science	
PAPER 5	
Foundation Tier	
You must have: Calculator, ruler	Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided – *there may be more space than you need.*
- Calculators may be used.
- Any diagrams may NOT be accurately drawn, unless otherwise indicated.
- You must **show all your working out** with **your answer clearly identified** at the **end of your solution**.

Information

- The total mark for this paper is 60.
- The marks for **each** question are shown in brackets – *use this as a guide as to how much time to spend on each question.*
- In questions marked with an **asterisk** (*), marks will be awarded for your ability to structure your answer logically, showing how the points that you make are related or follow on from each other where appropriate.
- There is a periodic table on the back cover of the paper.

Advice

- Read each question carefully before you start to answer it.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions. Write your answers in the spaces provided.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1** Figure 1 shows the structure of a molecule of each of four compounds, **A**, **B**, **C** and **D**.

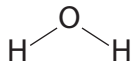
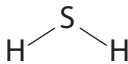
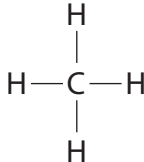
compound A	compound B	compound C	compound D
	$O=C=O$		

Figure 1

- (a) The formula of a molecule of compound **A** is H_2O .

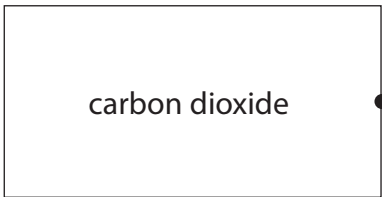
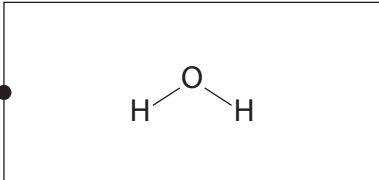
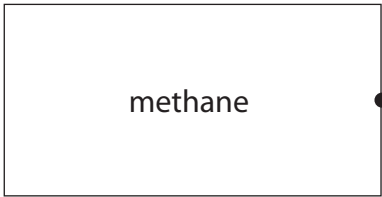
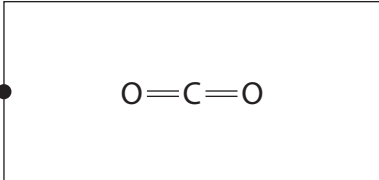
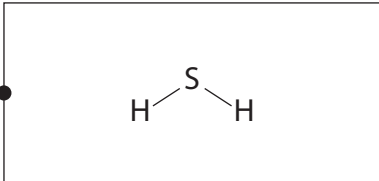
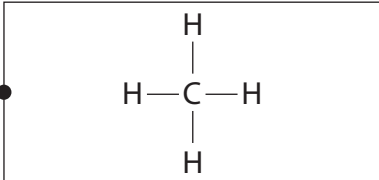
Give the formula of a molecule of compound **D**.

(1)

- (b) The names of two of the compounds in Figure 1 are shown below.

Draw one straight line from each name to the structure of a molecule of that compound.

(2)

name of compound	structure of molecule
	
	
	
	



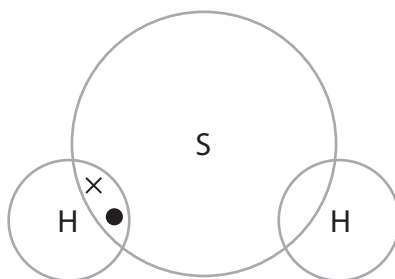
- (c) Figure 2 shows information about the number of electrons in the outer shell of each of the different atoms in a molecule of compound **C**.

symbol of element	number of electrons in outer shell of the atom
H	1
S	6

Figure 2

Use the information in Figure 2 to complete the dot and cross diagram for a molecule of compound **C**.

(2)



- (d) The atomic number of phosphorus, P, is 15.

One atom of phosphorus has a relative atomic mass of 31.

Give the number of protons, neutrons and electrons in this atom of phosphorus.

(3)

number of protons =

number of neutrons =

number of electrons =

(Total for Question 1 = 8 marks)



- 2 A student investigated the temperature change that took place when different salts were dissolved in water.

The student used the following method.

step 1 pour 50 cm^3 of water into a polystyrene cup and record the temperature of the water

step 2 find the mass of an empty boiling tube

step 3 add 2 spatula measures of a salt to the boiling tube and find its new mass

step 4 add the salt to the water

step 5 stir the mixture and record the temperature after 2 minutes.

Figure 3 shows the apparatus used.

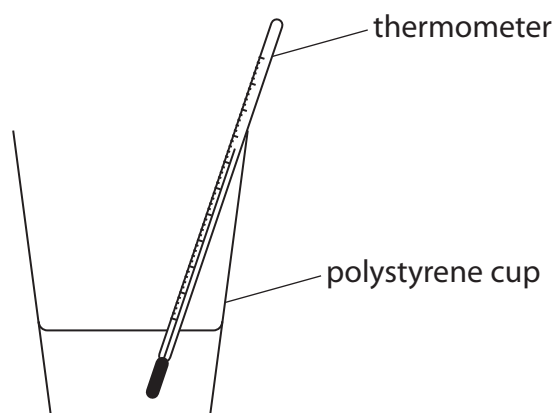


Figure 3

- (a) For steps 2 and 3, the student obtained the mass measurements shown in Figure 4 for the first salt.

mass of empty boiling tube in g	22.52
mass of boiling tube + 2 spatula measures of a salt in g	24.16

Figure 4

Use the mass measurements in Figure 4 to calculate the mass of salt, in grams, added to the water.

(1)

mass of salt = g



- (b) The student repeated the method for three different salts, **A**, **B** and **C**.

The same mass of each salt was used.

Figure 5 shows the temperature readings obtained for the three different salts.

salt	starting temperature of the water in °C	temperature of the mixture after 2 minutes in °C	temperature change in °C
A	20.5	25.6	+5.1
B	20.5	19.8	-0.7
C	20.5	29.2	

Figure 5

- (i) Calculate the temperature change for salt **C**.

Include a sign to show if the temperature change is an increase or a decrease.

(2)

temperature change = °C

- (ii) Explain which salt produces the biggest exothermic change.

(2)

- (c) Explain why a polystyrene cup is a better container to use for this investigation than a glass beaker.

(2)

(Total for Question 2 = 7 marks)



P 7 2 5 6 2 A 0 5 2 0

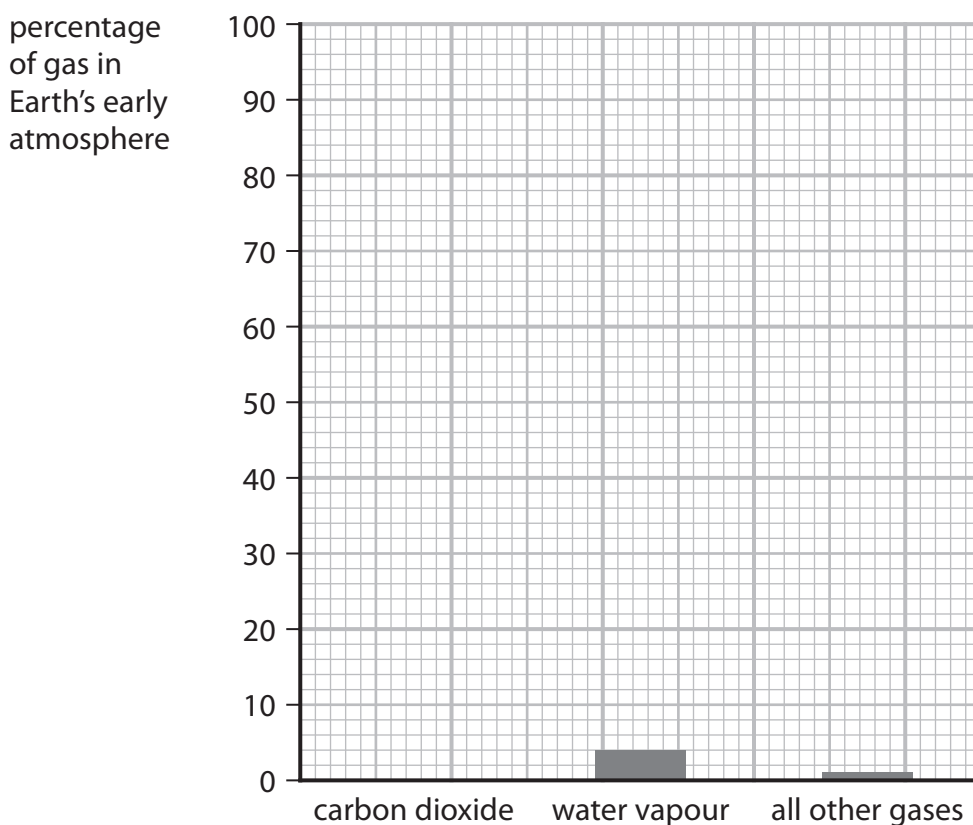
- 3 A scientist produced the information in Figure 6 about the Earth's atmosphere and the Earth's average surface temperature.

Earth's atmosphere 3 billion years ago		Earth's atmosphere today	
gas	%	gas	%
carbon dioxide	95	nitrogen	78.00
water vapour	4	oxygen	21.00
all other gases	1	carbon dioxide	0.04
		all other gases including water vapour	0.96
average surface temperature 3 billion years ago		average surface temperature today	
above 400 °C		20 °C	

Figure 6

- (a) Complete the bar chart showing the composition of the Earth's atmosphere 3 billion years ago by adding a bar to show the percentage of carbon dioxide.

(1)



- (b) (i) Use words from the box to complete the following sentence.

(1)

has decreased

has increased

has stayed the same

Over the past 3 billion years the average surface temperature of the Earth

.....

- (ii) The Earth's atmosphere 3 billion years ago contained much more water vapour than today's atmosphere.

Explain what happened to the water vapour.

(2)

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.....

- (c) Scientists think that the decrease in percentage of carbon dioxide was partly due to this gas being used in the growth of primitive plants.

- (i) Carbon dioxide was used in the growth of primitive plants and produced oxygen.

Give the name of the process in plants that takes in carbon dioxide and produces oxygen.

(1)

.....

- (ii) Which of the following tests would show that a gas is oxygen?

(1)

- ☐ **A** put a lighted splint into the gas and it burns with a pop
- ☐ **B** put a glowing splint into the gas and it relights
- ☐ **C** put a lighted splint into the gas and it relights
- ☐ **D** put a glowing splint into the gas and it burns with a pop

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(d) Many people are concerned by the increasing amount of carbon dioxide in the atmosphere.

- (i) The amount of carbon dioxide in the atmosphere is measured in parts per million (ppm).

Figure 7 shows the amount of carbon dioxide in the atmosphere in June 2001 and in June 2021.

	amount of carbon dioxide in ppm
June 2001	371.17
June 2021	416.56

Figure 7

Calculate the increase in the amount of carbon dioxide, in ppm, from June 2001 to June 2021.

Give your answer to the nearest whole number.

(2)

increase in amount of carbon dioxide = ppm

- (ii) State **one** possible effect that could be caused by the increasing amount of carbon dioxide in the atmosphere.

(1)

(Total for Question 3 = 9 marks)



4 Chlorine is an element in group 7 of the periodic table.

(a) What name is given to group 7 of the periodic table?

(1)

- ☐ A alkali metals
- ☐ B halogens
- ☐ C noble gases
- ☐ D transition metals

(b) Chlorine reacts with sodium to form sodium chloride.

(i) Write the word equation for this reaction.

(2)

..... →

(ii) Chlorine, Cl_2 , is made of simple molecules.

Describe what is meant by the term **molecule**.

(2)

.....

.....

.....

.....

(iii) Sodium, like all metals, conducts electricity.

Explain how sodium conducts electricity.

(2)

.....

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.....

.....

(iv) Sodium chloride contains sodium ions, Na^+ , and chloride ions, Cl^- .

Use this information to state the formula of sodium chloride.

(1)

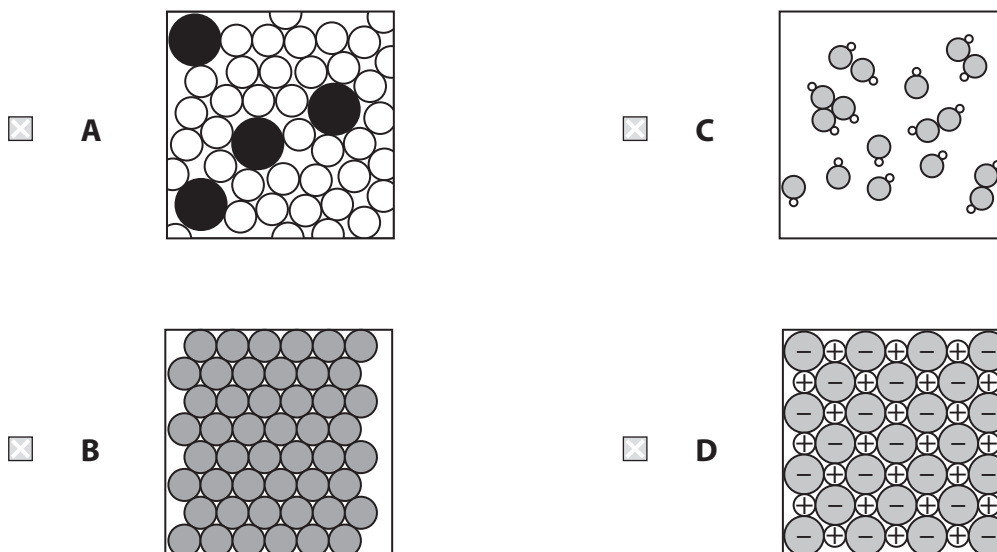
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(v) Sodium chloride is made of a giant structure of ions.

Which diagram shows the arrangement of particles in sodium chloride?

(1)



(vi) Sodium chloride solution conducts electricity.

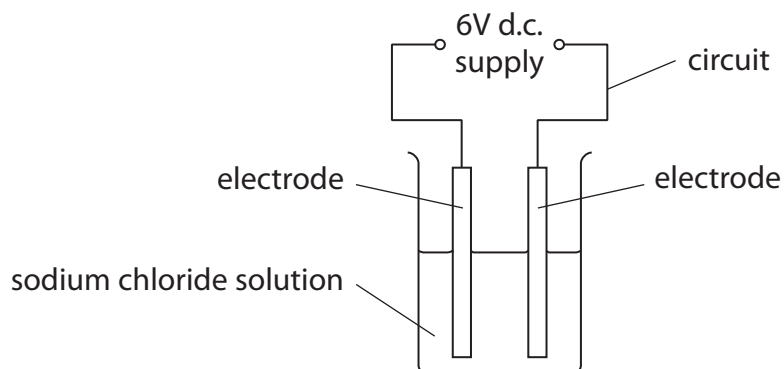


Figure 8

State what can be put into the circuit in Figure 8 to show that a current is flowing.

(1)

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(c) Figure 9 shows a flow diagram of how hydrochloric acid can be made.

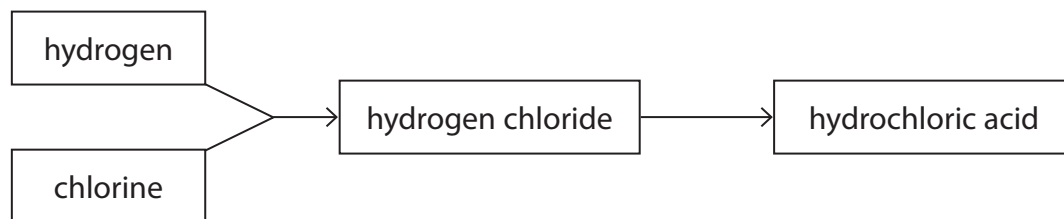


Figure 9

- (i) Balance the equation for the reaction between hydrogen and chlorine to form hydrogen chloride.

(1)



- (ii) State how hydrogen chloride can be converted into hydrochloric acid.

(1)

(Total for Question 4 = 12 marks)

- 5 A student used the apparatus shown in Figure 10 to investigate the reaction between marble chips and dilute hydrochloric acid.

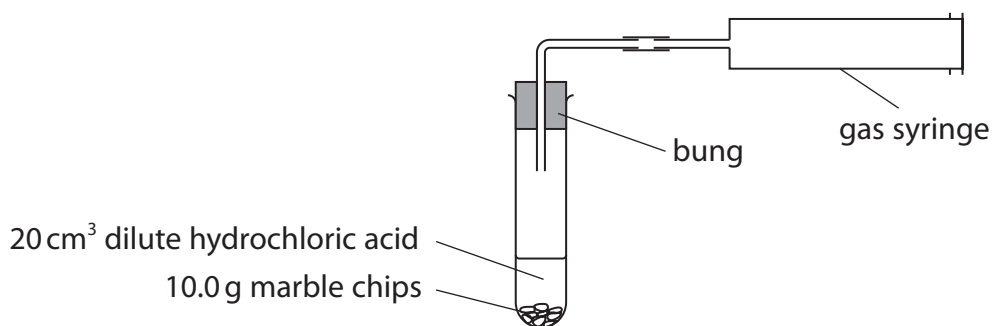


Figure 10

The student recorded the volume of gas every minute as shown in Figure 11.

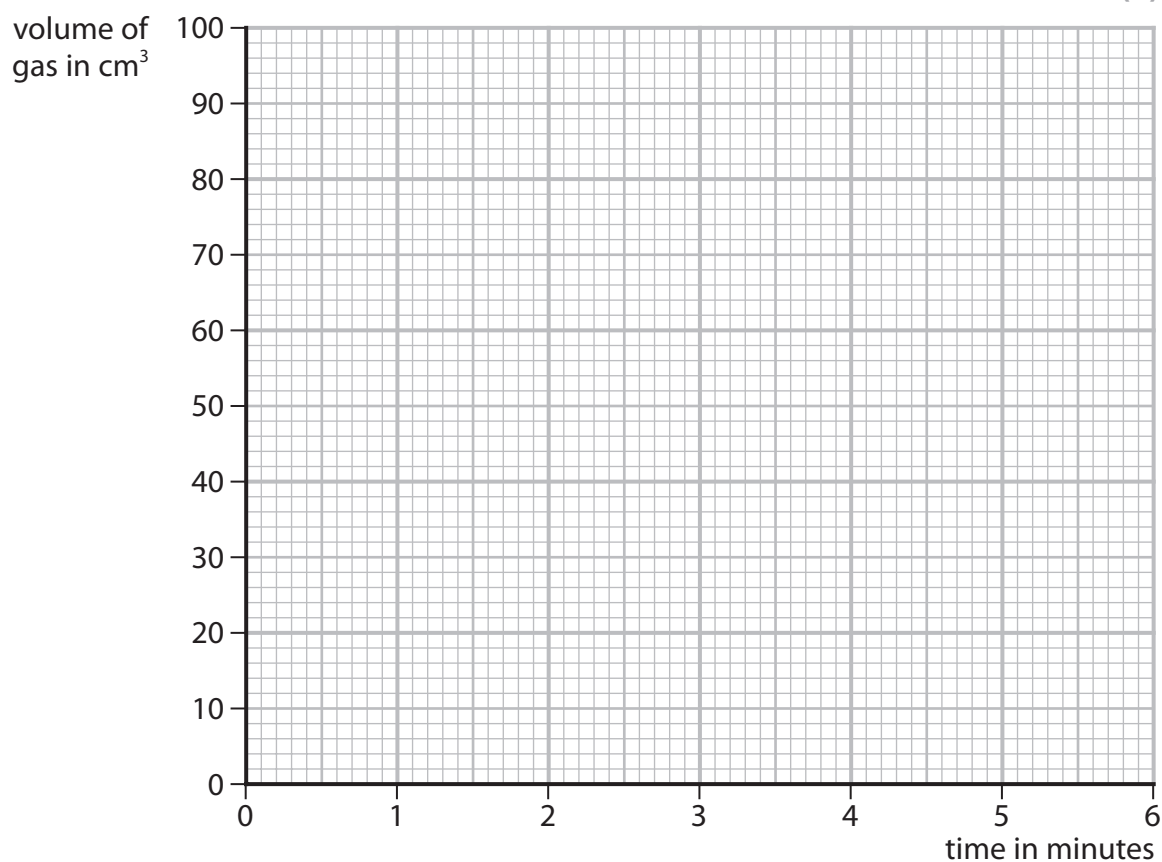
time in minutes	0	1	2	3	4	5	6
volume of gas in cm ³	0	52	78	91	97	100	100

Figure 11

- (a) On the grid, plot the results shown in Figure 11.

Draw a curve of best fit.

(3)



(b) Rate of reaction can be calculated using

$$\text{rate of reaction} = \frac{\text{volume of gas produced in 1 minute}}{1 \text{ minute}}$$

Figure 12 shows the rates of reaction calculated from the results of this experiment.

The rate of reaction for the time interval 2 to 3 minutes is missing.

time interval	0 to 1 minute	1 to 2 minutes	2 to 3 minutes	3 to 4 minutes	4 to 5 minutes
rate of reaction in $\text{cm}^3 \text{ min}^{-1}$	52	26		6	3

Figure 12

(i) Calculate the rate of reaction for the time interval 2 to 3 minutes.

(1)

rate of reaction = $\text{cm}^3 \text{ min}^{-1}$

(ii) State and explain what happens to the rate of reaction as the acid reacts with the marble chips in this experiment.

(3)

(c) The student repeated the experiment using the same volume of acid and the same mass of marble chips but used smaller marble chips.

All other conditions remained the same.

The student found that the reaction with the smaller marble chips was faster to start with but produced the same volume of gas.

Using this information, draw a line on the grid to show the results for the reaction with the smaller marble chips.

Label this line 'C'.

(2)



(d) Which of the following changes would make the reaction faster?

(1)

- ☐ **A** use a larger boiling tube
- ☐ **B** use a larger volume of the dilute acid
- ☐ **C** use a more concentrated acid
- ☐ **D** use a smaller boiling tube

(e) State what could be used to measure time in the investigation.

(1)

(Total for Question 5 = 11 marks)



6 Figure 13 shows some information about some group 1 metals.

group 1 metal	atomic number	relative atomic mass
lithium	3	7
sodium	11	23
potassium	19	39
rubidium	37	85
caesium	55	133

Figure 13

- (a) Explain, in terms of their electronic configurations, why these metals are placed in group 1 of the periodic table.

(2)

.....

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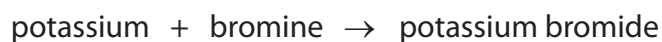
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- (b) Which row shows two correct properties of group 1 metals?

(1)

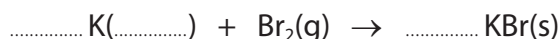
properties of group 1 metals		
☐ A	compounds are white in colour	high density
☐ B	low melting points	compounds are blue in colour
☐ C	soft enough to be cut by a knife	low melting points
☐ D	high density	conduct electricity

- (c) The word equation for the reaction of potassium with bromine is



Add the missing state symbol and balance the equation for this reaction.

(2)



- (d) A sample of potassium contains three isotopes, potassium-39, potassium-40 and potassium-41.

Explain the meaning of the term **isotopes**.

(2)

.....

.....

.....

.....

- *(e) The reactivity of the group 1 metals increases from lithium to caesium.

Often, teachers demonstrate the reactions of lithium, sodium and potassium with water.

These reactions can be used to predict the behaviour and reactions of rubidium and caesium with water.

Describe the reactions of each of the group 1 metals with water including the predicted behaviour and reactions of rubidium and caesium.

You may use word equations in your answer.

(6)

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(Total for Question 6 = 13 marks)

TOTAL FOR PAPER = 60 MARKS



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1	2	Key					3	4	5	6	7	0																							
		relative atomic mass atomic symbol name atomic (proton) number																																	
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	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

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