AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.2.6

Group 7

Past-paper questions

Tier	**Foundation**
Question groups	**20**
Available paper years	**2008–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.1.2.6 Group 7

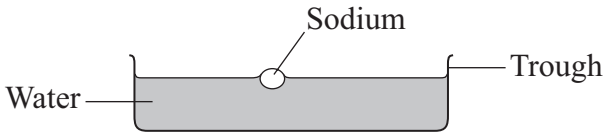
Question 01

June 2008 | CHY3F | Original Q2 | Legacy

2 (a) Read a student's report about the reaction between sodium and water.

The reaction between sodium and water

A small piece of sodium was added to some water in a trough.



The sodium floated and started to react.

The sodium moved along the surface of the water and melted to give a ball of molten metal.

The ball became smaller and smaller until it had all gone.

A gas was given off and a colourless solution was left.

The word equation for this reaction is:

sodium + water → sodium hydroxide + hydrogen

Use the information from the student's report to answer these questions.

2 (a) (i) Which information shows that sodium has a low density?

.....

(1 mark)

2 (a) (ii) Which information shows that the reaction is exothermic?

.....

(1 mark)

2 (a) (iii) Name the gas given off.

.....

(1 mark)

2 (b) The periodic table on the Data Sheet may help you to answer these questions.

2 (b) (i) Sodium is in Group 1.

Name a Group 1 element that is more reactive than sodium.

.....

(1 mark)

4.1.2.6 Group 7

Question 01 · continued

for mark

2 (b) (ii) Here are some statements about Group 1 elements.
Only **two** of these statements are correct.
Put a tick (✓) next to the **two** correct statements.

Statement	(✓)
They are halogens	
They are metals	
They form covalent compounds	
They form ions with a +1 charge	

(2 marks)

2 (c) Dimitri Mendeleev put forward his periodic table in 1869.

Complete these sentences by drawing a ring around the correct answer.

2 (c) (i) Mendeleev arranged the elements in order of their [atomic weight / density / reactivity] .

(1 mark)

2 (c) (ii) The table is called a periodic table because elements with [identical / the same / similar] properties occur at regular intervals.

(1 mark)

2 (c) (iii) The vertical columns are known as [groups / periods / rows] .

(1 mark)

2 (d) How did Mendeleev overcome the problem of undiscovered elements when he designed his table?

.....

(1 mark)

10

4.1.2.6 Group 7

Question 02

March 2010 | CHY1AP | Original Q5 | Legacy

QUESTION FIVE

Anaesthetics are used to put patients to sleep before an operation.

Many new anaesthetics are based on alkanes in which some of the hydrogen atoms are replaced by fluorine (F), chlorine (Cl) and bromine (Br).

The temperature in an operating theatre is usually above 30 °C.

	Formula of the anaesthetic	Boiling point in °C	Additional information
A	$CF_3CHClBr$	50	Unstable in light
B	$CHF_2OCHClCF_3$	49	Very few side-effects
C	$(CF_3)_2CHOCH_2F$	59	High cost
D	$CF_3CHFOCHF_2$	24	Large amount needed to put patients to sleep

Match anaesthetics, **A**, **B**, **C** and **D**, with the numbers **1–4** below.

1 It does **not** require warming in the operating theatre to turn it into a gas.

2 It has to be stored in a dark bottle.

3 It contains the most fluorine atoms in its formula.

4 It would cause least harm to patients.

4.1.2.6 Group 7

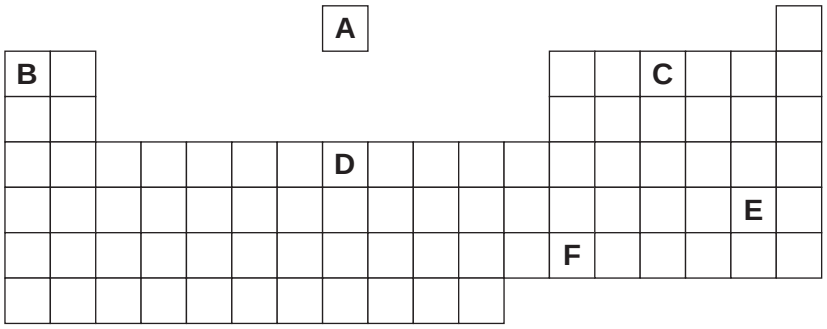
Question 03

June 2010 | CHY3F | Original Q3 | Legacy

3 (a) Use the periodic table on the Data Sheet to help you answer these questions.

Part of the periodic table is shown below.

The letters are **not** the symbols of the elements.



Choose your answers **only** from the letters shown in the periodic table above.

Which letter, **A**, **B**, **C**, **D**, **E** or **F**, represents

3 (a) (i) hydrogen Letter ☐

(1 mark)

3 (a) (ii) a Group 3 element Letter ☐

(1 mark)

3 (a) (iii) a halogen Letter ☐

(1 mark)

3 (a) (iv) the element with atomic (proton) number of 7 Letter ☐

(1 mark)

3 (a) (v) an element with one electron in its outer shell? Letter ☐

(1 mark)

4.1.2.6 Group 7

Question 03 · continued

3 (b) The table shows the melting points of the Group 1 metals arranged in alphabetical order.

Group 1 metal		
Name	**Symbol**	**Melting point in °C**
Caesium	Cs	29
Francium	Fr	27
Lithium	Li	180
Potassium	K	64
Rubidium	Rb	39
Sodium	Na	98

3 (b) (i) Arrange these metals in order of increasing melting point. Three have been done for you.

Fr Cs Li

Lowest ⟶ Highest

(1 mark)

3 (b) (ii) Use the periodic table on the Data Sheet **and** your answer in part (b)(i) above to complete this sentence about how the melting points change.

Going down Group 1, the melting points ..... .

(1 mark)

3 (c) The transition metals are a block of elements between Groups 2 and 3 of the periodic table. Transition metals have different properties to Group 1 metals.

Put ticks (✓) next to the **three** correct statements about transition metals in the table below.

Statement	(✓)
They are harder than Group 1 metals	
They have lower densities than Group 1 metals	
They have higher melting points than Group 1 metals	
They are more reactive with water than Group 1 metals	
They often form coloured compounds but Group 1 compounds are usually white	

(3 marks)

10

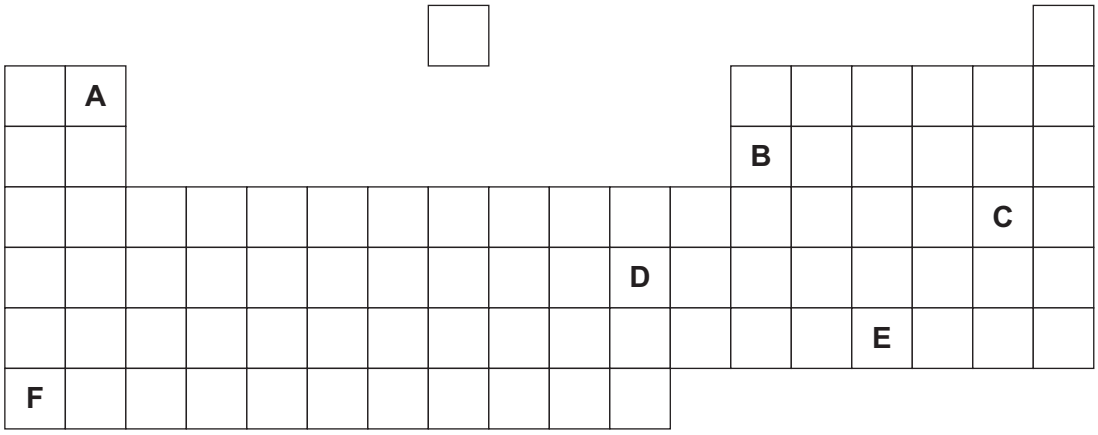
4.1.2.6 Group 7

Question 04

January 2011 | CHY3F | Original Q1 | Legacy

1 The periodic table on the Data Sheet may help you to answer these questions.

1 (a) Part of the periodic table is shown below.



The letters are **not** the symbols of the elements.

Choose your answers **only** from the letters shown in the periodic table above.

Which letter, **A**, **B**, **C**, **D**, **E** or **F**, represents

1 (a) (i) aluminium ☐ *(1 mark)*

1 (a) (ii) a Group 5 element ☐ *(1 mark)*

1 (a) (iii) an alkali metal ☐ *(1 mark)*

1 (a) (iv) the element with atomic (proton) number of 47 ☐ *(1 mark)*

1 (a) (v) an element with seven electrons in its outer shell? ☐ *(1 mark)*

4.1.2.6 Group 7

1 (b) The table shows the boiling points of the Group 7 elements.

The elements are arranged **in alphabetical order**.

Group 7 element		
Name	**Symbol**	**Boiling point in °C**
Astatine	At	337
Bromine		58
Chlorine	Cl	–34
Fluorine	F	–188
Iodine	I	184

1 (b) (i) The symbol for bromine is missing from the table.

What is the symbol for bromine? Symbol = ...

(1 mark)

1 (b) (ii) Arrange these elements in order of **decreasing** boiling point. The first one and the last one have been done for you.

At .... F

Highest boiling point ⟶ Lowest boiling point

(1 mark)

1 (c) The table shows some statements about Group 7 elements.

Tick (✓) the **two** correct statements.

	Tick (✓)
They are halogens.	
They are metals.	
They become less reactive down Group 7.	
They are compounds.	

(2 marks)

9

4.1.2.6 Group 7

Question 05

1 Use the periodic table on the Data Sheet to help you to answer these questions.

1 (a) The following is a list of symbols of some elements.

Sb	**Se**	**Si**	**Sn**	**Sr**

Choose your answers **only** from the symbols shown in the box above.

Which symbol represents

1 (a) (i) a Group 5 element ☐

(1 mark)

1 (a) (ii) the element in the same group as oxygen (O) ☐

(1 mark)

1 (a) (iii) the element with atomic (proton) number of 50 ☐

(1 mark)

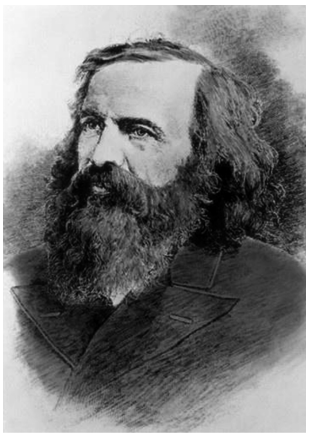
1 (a) (iv) silicon? ☐

(1 mark)

Question 1 continues on the next page

4.1.2.6 Group 7

1 (b)



Mendeleev suggested his version of the periodic table in 1869.

Part of Mendeleev's table is shown below.

Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
H						
Li	Be	B	C	N	O	F
Na	Mg	Al	Si	P	S	Cl
K Cu	Ca Zn	# #	Ti #	V As	Cr Se	Mn Br

4.1.2.6 Group 7

Question 05 · continued

There are differences between Mendeleev's table and the periodic table on the Data Sheet.

Draw a ring around the correct answer to complete the sentences.

1 (b) (i) Mendeleev left gaps (shown by #) in his table.

Mendeleev left gaps for [compounds / elements / mixtures] that had not been discovered.

(1 mark)

1 (b) (ii) Mendeleev put copper (Cu) in the same box as [bromine (Br). / chromium (Cr). / potassium (K).]

(1 mark)

1 (b) (iii) Mendeleev did **not** have a Group [0. / 3. / 5.]

(1 mark)

7

4.1.2.6 Group 7

Question 06

June 2013 | CH2FP | Original Q1 | Legacy

1 This question is about lithium and sodium.

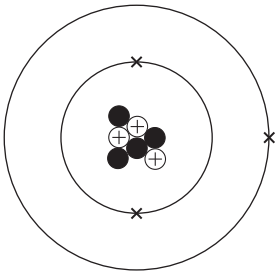
1 (a) Use the Chemistry Data Sheet to help you to answer this question.

In which group of the periodic table are lithium and sodium? Group ☐

(1 mark)

1 (b) A lithium atom can be represented as $^{7}_{3}Li$

The diagram represents the lithium atom.



1 (b) (i) Some particles in the nucleus have a positive charge.

What is the name of these particles? .....

(1 mark)

1 (b) (ii) Some particles in the nucleus have no charge.

What is the name of these particles? .....

(1 mark)

1 (b) (iii) Use the correct answer from the box to complete the sentence.

3	4	7

The mass number of this atom of lithium is ☐

(1 mark)

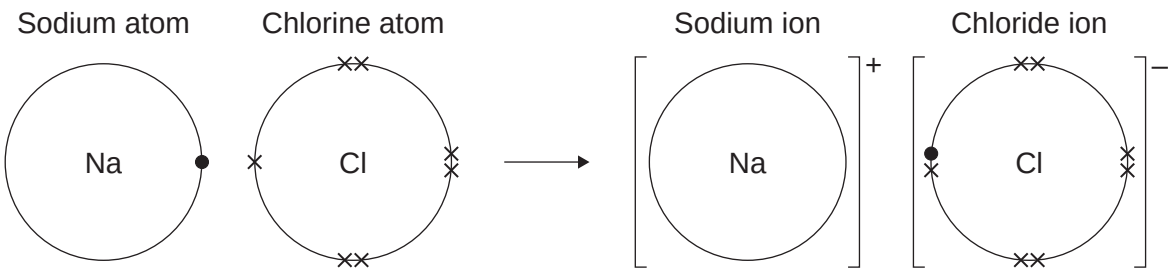
Question 1 continues on the next page

1 (c) Sodium reacts with chlorine to produce sodium chloride.

sodium + chlorine ⟶ sodium chloride

The diagram shows how the reaction happens.

Only the outer electrons are shown.



Draw a ring around the correct answer to complete each sentence.

1 (c) (i) A sodium atom changes into a sodium ion by [gaining / losing / sharing] an electron.

(1 mark)

1 (c) (ii) A sodium ion has [a negative / no / a positive] charge.

(1 mark)

1 (c) (iii) The ions in sodium chloride are held together by strong [covalent / electrostatic / magnetic] forces.

(1 mark)

4.1.2.6 Group 7

Question 06 · continued

1 (d) Sodium chloride is an ionic compound.

Tick (✓) **two** properties of ionic compounds.

Property	Tick (✓)
Do **not** dissolve in water	
High melting points	
Low boiling points	
Strong bonds	

(2 marks)

1 (e) (i) The formula of sodium chloride is NaCl

Calculate the relative formula mass of sodium chloride.

Relative atomic masses: Na = 23; Cl = 35.5

.....

.....

Relative formula mass = ...

(1 mark)

1 (e) (ii) Draw a ring around the correct answer to complete the sentence.

The relative formula mass of a substance, in grams, is one ion / isotope / mole of the substance.

(1 mark)

1 (f) Nanoparticles of sodium chloride (salt) are used to flavour crisps.

What are nanoparticles?

.....

.....

(1 mark)

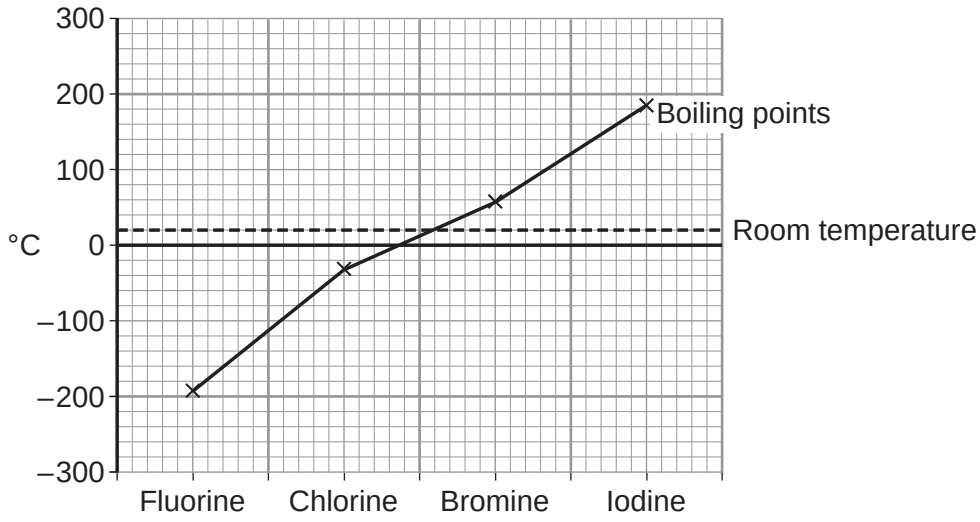
12

4.1.2.6 Group 7

Question 07

June 2013 | CH3FP | Original Q5 | Legacy

5 The graph shows the boiling points of the halogens.



5 (a) Use the graph to help you answer these questions.

5 (a) (i) Use the correct answer from the box to complete the sentence.

gas	liquid	solid

At room temperature chlorine is a ..... .

(1 mark)

5 (a) (ii) Describe the trend in boiling point from fluorine to iodine.

.....

.....

(1 mark)

5 (b) Chlorine reacts with metals to produce metal chlorides.

5 (b) (i) When a chlorine atom forms a chloride ion it gains one electron.

What is the charge on a chloride ion?

.....

(1 mark)

5 (b) (ii) Write a word equation for the reaction between sodium and chlorine.

.....

(1 mark)

4.1.2.6 Group 7

Question 07 · continued

5 (c) In the UK water companies add chlorine to tap water.

Why is chlorine added to tap water?

.....

(1 mark)

5 (d) Water companies add fluoride to tap water in some parts of the UK.
Fluoride is added to improve dental health.

Suggest **one** reason why some people are against adding fluoride to tap water.

.....

.....

.....

(1 mark)

6

Turn over for the next question

4.1.2.6 Group 7

Question 08

June 2014 | CH1FP | Original Q2 | Legacy

2 Some theories suggest that the Earth's early atmosphere was the same as Mars' atmosphere today.

Table 1 shows the percentage of four gases in the atmosphere of Mars today and the atmosphere of Earth today.

Table 1

Gases	The atmosphere of	
	Mars today	Earth today
Carbon dioxide	95.00%	0.04%
Nitrogen	3.50%	78.00%
Argon	1.00%	0.96%
Oxygen	0.50%	21.00%

2 (a) Which **one** of the gases in **Table 1** is a noble gas?

[1 mark]

.....

2 (b) Draw a ring around the correct answer to complete each sentence.

2 (b) (i) Noble gases are in Group

0

1

7

[1 mark]

2 (b) (ii) Noble gases are

slightly reactive.

unreactive.

very reactive.

[1 mark]

4.1.2.6 Group 7

Question 08 · continued

2 (c) The percentage of carbon dioxide in the Earth's early atmosphere was 95.00%.
It is 0.04% in the Earth's atmosphere today.

2 (c) (i) Calculate the decrease in the percentage of carbon dioxide in the Earth's atmosphere.
[1 mark]

.....

.....

Decrease in percentage = ...%

2 (c) (ii) Give **two** reasons for this decrease.
[2 marks]

.....

.....

.....

.....

6

4.1.2.6 Group 7

Question 09

June 2014 | CH3FP | Original Q1 | Legacy

1 This question is about the periodic table of elements.

Use the Chemistry Data Sheet to help you to answer these questions.

In 1869 Dmitri Mendeleev produced an early version of the periodic table.

1 (a) Draw a ring around the correct answer to complete each sentence.

1 (a) (i) Mendeleev first arranged the elements in order of their

atomic weight.

date of discovery.

electron number.

[1 mark]

1 (a) (ii) Mendeleev then placed elements with similar properties in columns called

groups.

periods.

shells.

[1 mark]

1 (a) (iii) When the next element did not fit the pattern,

Mendeleev

ignored the element.

left a gap.

put the element at the end of the row.

[1 mark]

1 (a) (iv) Mendeleev was not able to include the noble gases (Group 0) in his periodic table

because the noble gases

are not elements.

are not reactive.

had not been discovered by 1869.

[1 mark]

4.1.2.6 Group 7

Question 09 · continued

1 (b) Use the correct word from the box to complete each sentence.

[2 marks]

electrons	molecules	neutrons	protons

In the modern periodic table elements are arranged in order of the number of ..... in their nucleus. Elements in the same group have the same number of ..... in their highest energy level (outer shell).

1 (c) Sodium (Na) is in Group 1 of the periodic table.

Nickel (Ni) is a transition element.

Tick (✓) **two** correct statements about sodium and nickel.

[2 marks]

Statement	Tick (✓)
Sodium and nickel are both metals.	
Sodium has a higher melting point than nickel.	
Sodium is more reactive than nickel.	
Sodium is harder than nickel.	

1 (d) Chlorine, bromine and iodine are in Group 7 of the periodic table.

Chlorine is more reactive than bromine.

1 (d) (i) Complete the word equation for the reaction between chlorine and sodium bromide.

[1 mark]

chlorine + sodium bromide ⟶ ..... + sodium chloride

1 (d) (ii) Why does iodine **not** react with sodium bromide solution?

[1 mark]

.....

.....

10

4.1.2.6 Group 7

Question 10

June 2015 | CH3FP | Original Q9 | Legacy

9 This question is about the halogens (Group 7).

9 (a) How do the boiling points of the halogens change down the group from fluorine to iodine?

[1 mark]

.....

.....

9 (b) Sodium bromide is produced by reacting sodium with bromine.

Sodium bromide is an ionic compound.

9 (b) (i) Write down the symbols of the **two** ions in sodium bromide.

[1 mark]

.....

9 (b) (ii) Chlorine reacts with sodium bromide solution to produce bromine and one other product.

Complete the word equation for the reaction.

[1 mark]

chlorine + sodium bromide ⟶ bromine + ...

9 (b) (iii) Why does chlorine displace bromine from sodium bromide?

[1 mark]

.....

.....

9 (b) (iv) Use the Chemistry Data Sheet to help you to answer this question.

Suggest which halogen could react with sodium chloride solution to produce chlorine.

[1 mark]

.....

5

4.1.2.6 Group 7

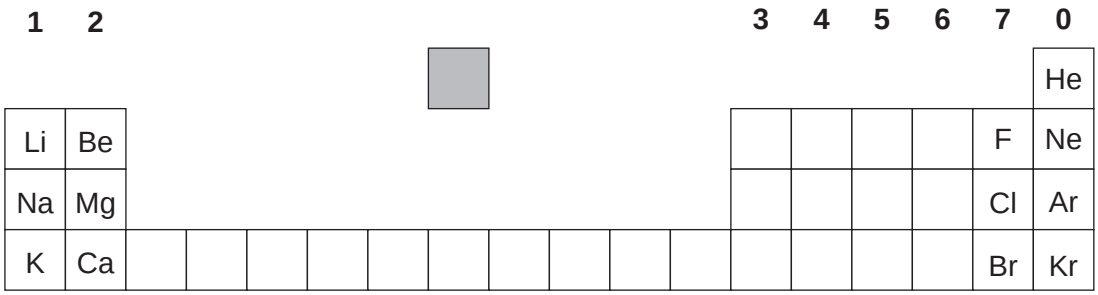
Question 11

June 2017 | CH1FP | Original Q2 | Legacy

2 Use the Chemistry Data Sheet to help you answer this question.

Figure 2 shows part of the periodic table.

Figure 2



2 (a) Give the name of the element that should be in the shaded box.

[1 mark]

2 (b) How many different elements are there in the complete periodic table?

[1 mark]

Tick (✓) **one** box.

About 36 ☐

About 100 ☐

About 500 ☐

4.1.2.6 Group 7

Question 11 · continued

2 (c) What are **two** reasons why lithium, sodium and potassium are in the same group of the periodic table?

[2 marks]

Tick (✓) **two** boxes.

- Low melting points ☐
- Same number of electrons in the outer shell ☐
- Similar atomic (proton) numbers ☐
- Similar chemical reactions ☐
- Two electrons in the innermost shell ☐

2 (d) Complete each sentence.

[2 marks]

The elements in Group 0 are called _____ gases.

The elements in the central block are known as _____ metals.

2 (e) Use the correct word from the box to complete each sentence.

[2 marks]

alloys	ions	molecules	polymers	protons

Atoms of fluorine gain electrons to form fluoride _____ .

Atoms of fluorine share electrons to form fluorine _____ .

8

4.1.2.6 Group 7

Question 12

June 2017 | CH3FP | Original Q1 | Legacy

1 This question is about elements and compounds.

1 (a) (i) Use the correct answer from the box to complete the sentence.

[1 mark]

densities	numbers	weights

The elements in the modern periodic table are arranged in order of their atomic _____ .

1 (a) (ii) Use the correct answer from the box to complete the sentence.

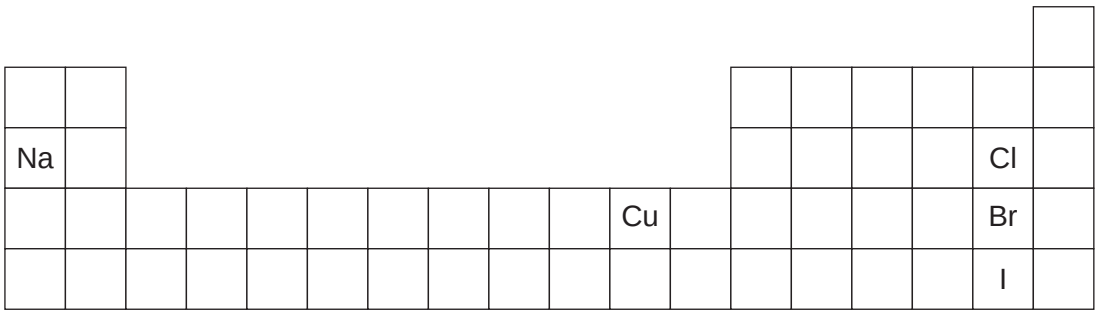
[1 mark]

electrons	neutrons	protons

The outer shells of atoms of elements in the same group have the same number of _____ .

1 (b) **Figure 1** shows the position of five elements in the modern periodic table.

Figure 1



1 (b) (i) Which **one** of the elements in **Figure 1** is a gas at room temperature?

[1 mark]

_____

4.1.2.6 Group 7

Question 12 · continued

1 (b) (ii) Which **one** of the elements in **Figure 1** is a transition metal?

[1 mark]

_____

1 (b) (iii) Complete the sentence.

[1 mark]

In the modern periodic table, bromine (Br) is in Group _____ .

1 (c) Bromine reacts with sodium iodide to produce iodine.

The word equation for the reaction is:

bromine + sodium iodide ⟶ iodine + sodium bromide

1 (c) (i) What type of reaction is this?

[1 mark]

Tick (✓) **one** box.

Combustion ☐

Displacement ☐

Neutralisation ☐

1 (c) (ii) Use the Chemistry Data Sheet to help you answer this question.

Which halogen would react with sodium chloride solution to produce chlorine?

[1 mark]

Tick (✓) **one** box.

Bromine ☐

Fluorine ☐

Iodine ☐

Question 1 continues on the next page

4.1.2.6 Group 7

Question 12 · continued

1 (d) Silver nitrate in the presence of dilute nitric acid is used to test for iodide ions.

What colour precipitate is produced?

[1 mark]

Tick (✓) **one** box.

Cream ☐

White ☐

Yellow ☐

4.1.2.6 Group 7

Question 12 · continued

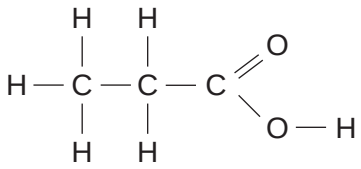
1 (e) Propanoic acid is a compound containing carbon atoms.

1 (e) (i) **Figure 2** shows the displayed structure of propanoic acid.

Draw a ring around the functional group of propanoic acid in **Figure 2**.

[1 mark]

Figure 2



1 (e) (ii) Use the correct answer from the box to complete the sentence.

[1 mark]

carbon dioxide	hydrogen	oxygen

Propanoic acid reacts with carbonates to produce _____ .

1 (e) (iii) Use the correct answer from the box to complete the sentence.

[1 mark]

alkalis	esters	fuels

Propanoic acid reacts with alcohols to produce pleasant smelling compounds called _____ .

11

4.1.2.6 Group 7

Question 13

June 2018 | 8462/1F | Original Q2

0 2 The halogens are elements in Group 7.

0 2 . 1 Bromine is in Group 7.

Give the number of electrons in the outer shell of a bromine atom.

[1 mark]

0 2 . 2 Bromine reacts with hydrogen. The gas hydrogen bromide is produced.

What is the structure of hydrogen bromide?

[1 mark]

Tick **one** box.

- Giant covalent ☐
- Ionic lattice ☐
- Metallic structure ☐
- Small molecule ☐

0 2 . 3 What is the formula for fluorine gas?

[1 mark]

Tick **one** box.

- F ☐
- F_2 ☐
- F^2 ☐
- 2F ☐

4.1.2.6 Group 7

Question 13 · continued

A student mixes solutions of halogens with solutions of their salts.

Table 1 shows the student's observations.

Table 1

	Potassium chloride (colourless)	Potassium bromide (colourless)	Potassium iodide (colourless)
Chlorine (colourless)		Solution turns orange	Solution turns brown
Bromine (orange)	No change		Solution turns brown
Iodine (brown)	No change	No change	

0 2 . 4 Explain how the reactivity of the halogens changes going down Group 7.

Use the results in **Table 1**.

[3 marks]

Question 2 continues on the next page

4.1.2.6 Group 7

Question 13 · continued

A company uses chlorine to produce titanium chloride from titanium dioxide.

0 2 . 5 What is the relative formula mass (M_r) of titanium dioxide, TiO_2?

Relative atomic masses (A_r): O = 16 Ti = 48

[1 mark]

Tick **one** box.

64 ☐

80 ☐

128 ☐

768 ☐

0 2 . 6 The company calculates that 500 g of titanium dioxide should produce 1.2 kg of titanium chloride.

However, the company finds that 500 g of titanium dioxide only produces 900 g of titanium chloride.

Calculate the percentage yield.

[2 marks]

Percentage yield = _____ %

9

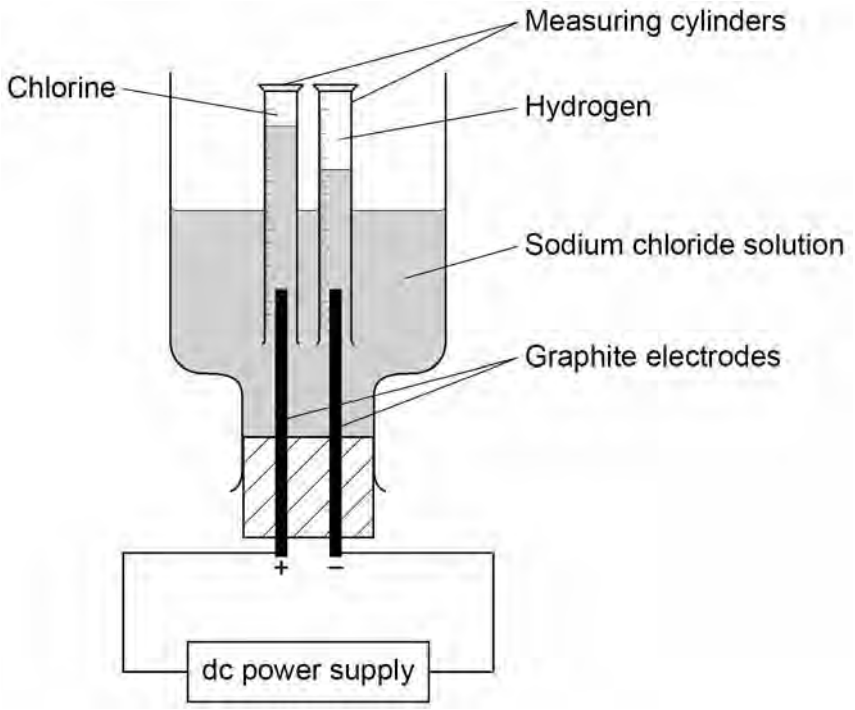
4.1.2.6 Group 7

Question 14

0 4 A student investigated the electrolysis of sodium chloride solution.

Figure 4 shows the apparatus.

Figure 4



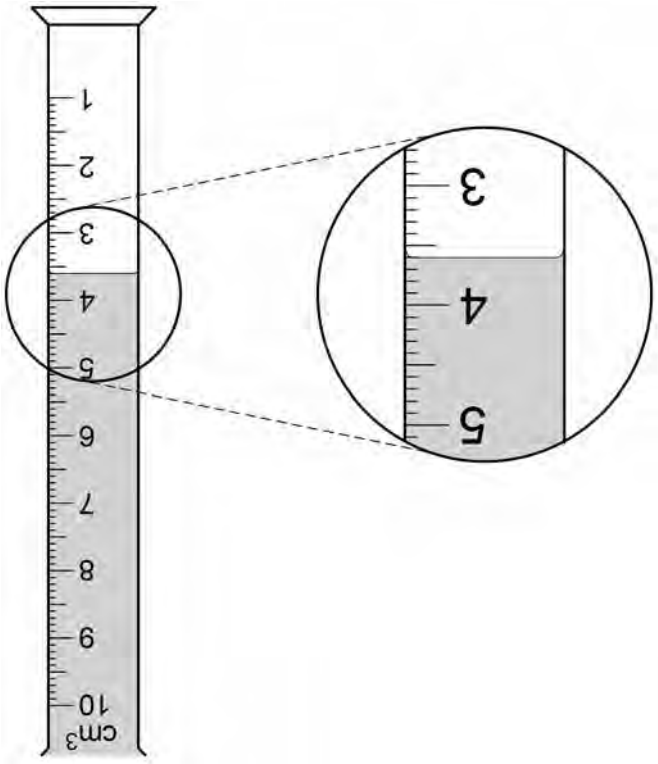
The student measured the volume of gas collected in each measuring cylinder every minute for 20 minutes.

4.1.2.6 Group 7

Question 14 · continued

0 4 . 1 **Figure 5** shows the volume of hydrogen gas collected in the measuring cylinder after 8 minutes.

Figure 5



What is the volume of hydrogen gas collected?

[1 mark]

Volume = _____ cm^3

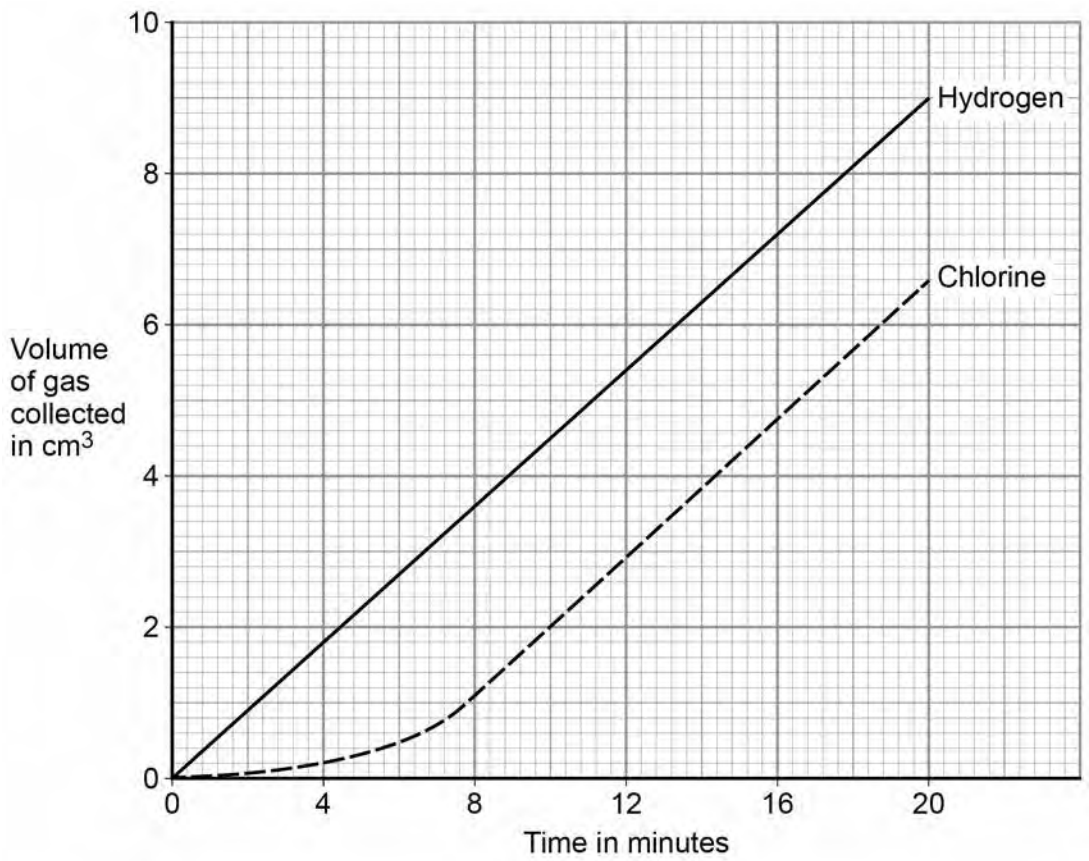
Question 4 continues on the next page

4.1.2.6 Group 7

Question 14 · continued

Figure 6 shows the results of the investigation.

Figure 6



0 4 . 2 Which of the lines on **Figure 6** show that the volume of gas collected is directly proportional to the time?

[1 mark]

Tick **one** box.

- Both lines ☐
- Chlorine line only ☐
- Hydrogen line only ☐
- Neither line ☐

4.1.2.6 Group 7

Question 14 · continued

0 4 . 3 Which of the lines on **Figure 6** show a positive correlation between the volume of gas collected and time?

[1 mark]

Tick **one** box.

- Both lines ☐
- Chlorine line only ☐
- Hydrogen line only ☐
- Neither line ☐

Question 4 continues on the next page

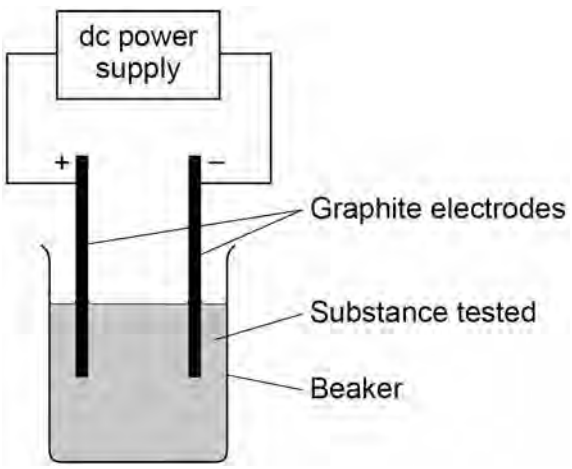
4.1.2.6 Group 7

Question 14 · continued

A teacher demonstrates the electrolysis of different substances using graphite electrodes.

Figure 7 shows the apparatus used.

Figure 7



0 4 . 4 Why can graphite conduct electricity?

[1 mark]

Tick **one** box.

Graphite exists in layers of atoms. ☐

Graphite has a giant structure. ☐

Graphite has a high melting point. ☐

Graphite has delocalised electrons. ☐

4.1.2.6 Group 7

Question 14 · continued

0 4 . 5 The teacher demonstrates the electrolysis of:

- molten zinc chloride
- potassium bromide solution.

Complete **Table 3** to predict the products.

Choose answers from the box.

[4 marks]

chlorine	**bromine**	**hydrogen**	**oxygen**	**potassium**	**zinc**

Table 3

Substance electrolysed	Product at cathode (negative electrode)	Product at anode (positive electrode)
Molten zinc chloride		
Potassium bromide solution		

4.1.2.6 Group 7

Question 15

0 8 This question is about the periodic table.

In the 19th century, some scientists tried to classify the elements by arranging them in order of their atomic weights.

Figure 11 shows the periodic table Mendeleev produced in 1869.

His periodic table was more widely accepted than previous versions.

Figure 11

	Group 1	Group 2	Group 3	Group 4	Group 5	Group 6	Group 7
Period 1	H						
Period 2	Li	Be	B	C	N	O	F
Period 3	Na	Mg	Al	Si	P	S	Cl
Period 4	K Cu	Ca Zn	* *	Ti *	V As	Cr Se	Mn Br
Period 5	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	* I

0 8 . 1 The atomic weight of tellurium (Te) is 128 and that of iodine (I) is 127

Why did Mendeleev reverse the order of these two elements?

[1 mark]

4.1.2.6 Group 7

Question 15 · continued

0 8 . 2 Mendeleev left spaces marked with an asterisk *

He left these spaces because he thought missing elements belonged there.

Why did Mendeleev's periodic table become more widely accepted than previous versions?

[3 marks]

0 8 . 3 Mendeleev arranged the elements in order of their atomic weight.

What is the modern name for atomic weight?

[1 mark]

Tick (✓) **one** box.

- Atomic number ☐
- Mass number ☐
- Relative atomic mass ☐
- Relative formula mass ☐

0 8 . 4 Complete the sentence.

[1 mark]

In the modern periodic table, the elements are arranged in order of

_____.

4.1.2.6 Group 7

Question 15 · continued

Chlorine, iodine and astatine are in Group 7 of the modern periodic table.

0 8 . 5 Astatine (At) is below iodine in Group 7.

Predict:

- the formula of an astatine molecule
- the state of astatine at room temperature.

[2 marks]

Formula of astatine molecule _____

State at room temperature _____

0 8 . 6 Sodium is in Group 1 of the modern periodic table.

Describe what you would see when sodium reacts with chlorine.

[2 marks]

_____

_____

_____

_____

10

4.1.2.6 Group 7

Question 16

November 2020 | 8462/1F | Original Q1

0 1 This question is about the elements in Group 7 of the periodic table.

Table 1 shows the melting points and boiling points of some of the elements.

Table 1

Element	Melting point in °C	Boiling point in °C
Fluorine	–220	–188
Chlorine	–101	–35
Bromine	–7	59

0 1 . 1 What is the state of bromine at 100 °C?

Use **Table 1**.

[1 mark]

Tick (✓) **one** box.

Gas ☐

Liquid ☐

Solid ☐

4.1.2.6 Group 7

Question 16 · continued

0 1 . 2 What temperature does chlorine gas condense at to form a liquid?

Use **Table 1**.

[1 mark]

Temperature = _____ °C

0 1 . 3 Complete the sentences.

[2 marks]

Going down Group 7 the melting points _____.

This is because the size of the molecules increases so the

intermolecular forces _____.

Question 1 continues on the next page

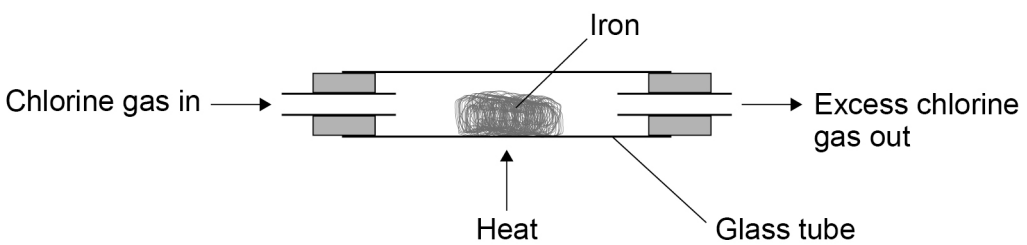
4.1.2.6 Group 7

Question 16 · continued

A teacher investigated the reaction of iron with chlorine.

Figure 1 shows the apparatus used.

Figure 1



0 1 . 4 Why did the teacher do the investigation in a fume cupboard?

[1 mark]

Tick (✓) **one** box.

Chlorine gas is coloured. ☐

Chlorine gas is flammable. ☐

Chlorine gas is toxic. ☐

4.1.2.6 Group 7

Question 16 · continued

0 1 . 5 The word equation for the reaction is:

iron + chlorine → iron chloride

Iron chloride is a solid.

The teacher weighed the glass tube and contents:

- before the reaction
- after the reaction.

What happened to the mass of the glass tube and contents during the reaction?

Give **one** reason for your answer.

[2 marks]

The mass of the glass tube and contents _____.

Reason _____

_____

Question 1 continues on the next page

Question 16 · continued

The teacher repeated the investigation with bromine gas and with iodine gas.

Table 2 shows the results.

Table 2

Element	Observation
Chlorine	Iron burns vigorously with an orange glow
Bromine	Iron burns with an orange glow
Iodine	Iron slowly turns darker

0 1 . 6 Fluorine is above chlorine in Group 7.

Predict what you would observe when fluorine gas reacts with iron.

Use **Table 2**.

[1 mark]

0 1 . 7 Balance the equation for the reaction between iron and bromine.

[1 mark]

$$2Fe + _____ Br_2 \rightarrow 2FeBr_3$$

0 1 . 8 Calculate the relative formula mass (M_r) of $FeBr_3$

Relative atomic masses (A_r): Fe = 56 Br = 80

[2 marks]

Relative formula mass (M_r) = _____

11

4.1.2.6 Group 7

Question 17

0 4 This question is about the periodic table.

Figure 6 shows an early version of the periodic table published by a scientist.

Figure 6

H							
Li	Be	B	C	N	O	F	
Na	Mg	Al	Si	P	S	Cl	
K Cu	Ca Zn	? ?	Ti ?	V As	Cr Se	Mn Br	Fe Co Ni
Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	? I	Ru Rh Pd

0 4 . 1 The scientist left gaps in the periodic table in **Figure 6**.

Each gap is represented by a question mark (**?**).

Give **one** reason why the scientist left gaps in this periodic table.

[1 mark]

0 4 . 2 Which scientist published the periodic table in **Figure 6**?

[1 mark]

Tick (✓) **one** box.

Bohr ☐

Chadwick ☐

Mendeleev ☐

4.1.2.6 Group 7

Question 17 · continued

0 4 . 3 The modern periodic table is different from the periodic table in **Figure 6**.

One extra group of elements has been added.

What is the name of the extra group of elements in the modern periodic table?

[1 mark]

Tick (✓) **one** box.

- Alkali metals ☐
- Halogens ☐
- Noble gases ☐

0 4 . 4 Why do the elements in Group 1 of the modern periodic table have similar chemical properties?

[1 mark]

Tick (✓) **one** box.

- The elements all form negative ions. ☐
- The elements all have one electron in the outer shell. ☐
- The elements all have the same number of shells. ☐

Question 4 continues on the next page

Question 17 · continued

0 4 . 5 **Table 3** shows the melting points of the first five elements going down Group 1.

Table 3

Element	Melting point in °C
Lithium	181
Sodium	98
Potassium	**X**
Rubidium	39
Caesium	29

Predict value **X**.

[1 mark]

X = _____ °C

0 4 . 6 Give **one** observation you would see when a small piece of potassium is added to water.

[1 mark]

_____

_____

4.1.2.6 Group 7

Question 17 · continued

0 4 . 7 **Table 4** shows information about the first five elements going down Group 7.

Table 4

Element	State at 150 °C	Symbol	Formula of the compound with hydrogen
Fluorine	gas	F	HF
Chlorine	_____	Cl	HCl
Bromine	gas	Br	HBr
Iodine	liquid	I	HI
Astatine	solid	At	_____

Complete **Table 4**.

[2 marks]

0 4 . 8 The elements in Group 7 consist of molecules.

What is the formula of a molecule of bromine?

[1 mark]

Tick (✓) **one** box.

Br ☐

Br_2 ☐

Br^2 ☐

2Br ☐

9

4.1.2.6 Group 7

Question 18

June 2024 | 8462/1F | Original Q6

0 6 This question is about electrolysis and the extraction of metals.

0 6 . 1 Why can some molten substances be electrolysed?

[1 mark]

Tick (✓) **one** box.

Electrons can move through the molten substance to the electrodes. ☐

Ions can move through the molten substance to the electrodes. ☐

Protons can move through the molten substance to the electrodes. ☐

0 6 . 2 **Table 3** shows the products of the electrolysis of some molten compounds.

Complete **Table 3**.

[3 marks]

Table 3

Molten compound	Product at negative electrode	Product at positive electrode
Lead chloride	_____	Chlorine
Potassium iodide	Potassium	_____
_____	Zinc	Bromine

Question 18 · continued

Aluminium is extracted by electrolysing molten aluminium oxide.

0 6 . 3 Balance the equation for the reaction.

Choose numbers from the box.

[2 marks]

2	**3**	**4**	**5**

$$2Al_2O_3 \rightarrow __ Al + __ O_2$$

0 6 . 4 Calculate the relative formula mass (M_r) of aluminium oxide (Al_2O_3).

Relative atomic masses (A_r): O = 16 Al = 27

[2 marks]

Relative formula mass (M_r) = _____

Question 6 continues on the next page

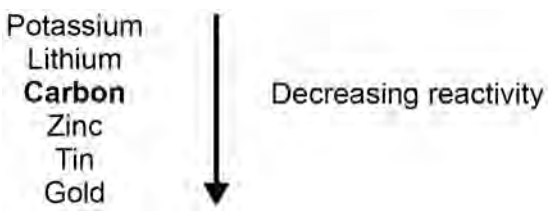
4.1.2.6 Group 7

Question 18 · continued

0 6 . 5 **Figure 13** shows part of the reactivity series of metals.

The non-metal carbon has been included.

Figure 13



Metals can be extracted from their compounds by:

- electrolysis
- reduction with carbon.

Electrolysis is more expensive than reduction with carbon.

Predict one metal that would be extracted by each method.

Use Figure 13.

[2 marks]

Extracted by electrolysis _____

Extracted by carbon reduction _____

10

4.1.2.6 Group 7

Question 19

June 2024 | 8462/1F | Original Q9

0 9 This question is about the periodic table.

Sodium and potassium are in Group 1 of the periodic table.

0 9 . 1 Give **one** similarity and **one** difference between the electronic structures of sodium and potassium.

[2 marks]

Similarity _____

_____

Difference _____

_____

Group 1 elements react with water.

0 9 . 2 Give **two** observations made when potassium reacts with water.

[2 marks]

1 _____

_____

2 _____

_____

0 9 . 3 Potassium hydroxide solution is produced when potassium reacts with water.

What is the colour of universal indicator when added to potassium hydroxide solution?

Give **one** reason for your answer.

[2 marks]

Colour of universal indicator _____

Reason _____

_____

4.1.2.6 Group 7

Question 19 · continued

Table 4 shows the densities of some of the elements in Group 0 of the periodic table.

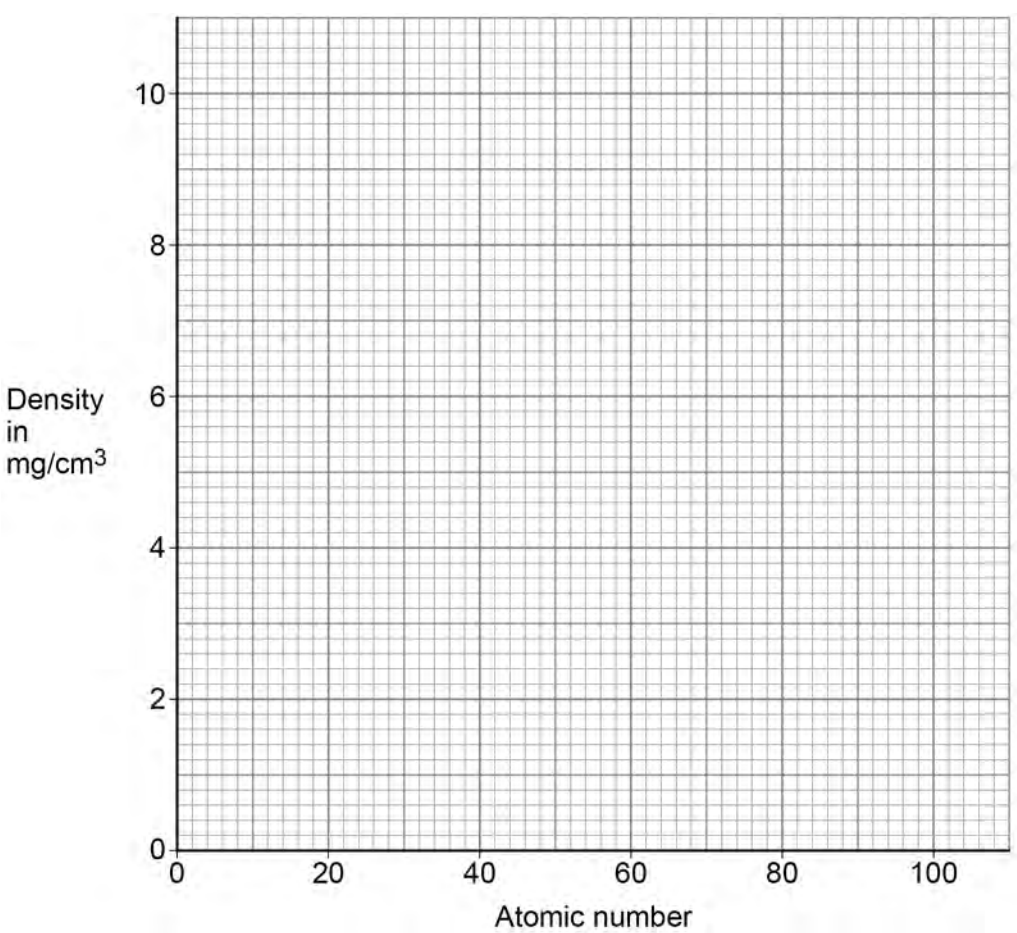
Table 4

Element	Atomic number	Density in mg/cm^3
Helium	2	0.2
Neon	10	0.8
Argon	18	1.6
Krypton	36	**X**
Xenon	54	5.4
Radon	86	9.1

0 9 . 4 Plot the data from **Table 4** on **Figure 15**.

[2 marks]

Figure 15



4.1.2.6 Group 7

Question 19 · continued

0 9 . 5 Estimate the density (**X**) of krypton.

Use **Figure 15** and **Table 4**.

[1 mark]

Density = _____ mg/cm^3

0 9 . 6 The elements in Group 7 are called the halogens.

A more reactive halogen can displace a less reactive halogen from a solution of its salt.

Which combination of solutions will produce a reaction when mixed?

[1 mark]

Tick (✓) **one** box.

- Chlorine and potassium fluoride ☐
- Chlorine and potassium bromide ☐
- Bromine and potassium fluoride ☐
- Bromine and potassium chloride ☐

0 9 . 7 Which of the following describes the trends going down Group 7?

[1 mark]

Tick (✓) **one** box.

- Relative molecular mass decreases and boiling point decreases. ☐
- Relative molecular mass decreases and boiling point increases. ☐
- Relative molecular mass increases and boiling point decreases. ☐
- Relative molecular mass increases and boiling point increases. ☐

11

Question 20

0 5 This question is about electrolysis.

0 5 . 1 **Table 4** shows some of the products of electrolysis of two molten compounds.

Complete **Table 4**.

[2 marks]

Table 4

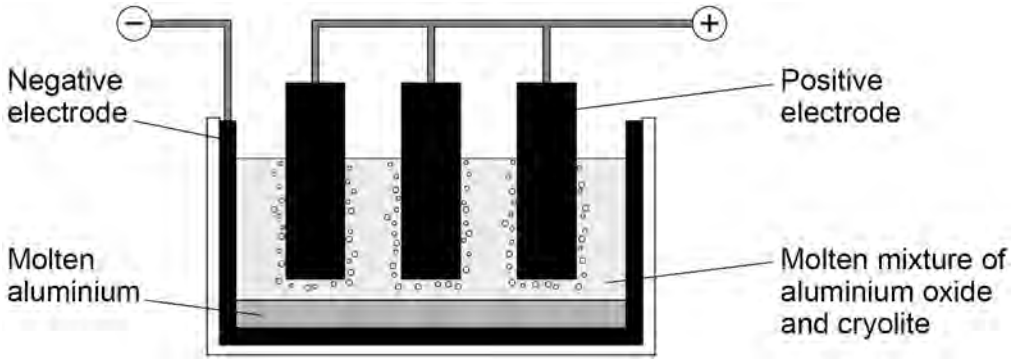
Molten compound	Product at the negative electrode	Product at the positive electrode
Copper chloride		Chlorine
Potassium bromide	Potassium	

Aluminium is extracted by electrolysis of a molten mixture of aluminium oxide and cryolite.

The products are molten aluminium and oxygen gas.

Figure 4 shows the electrolysis cell.

Figure 4



0 5 . 2 What is the formula of oxygen gas?

[1 mark]

Tick (✓) **one** box.

O ☐ O_2 ☐ O^2 ☐ 2O ☐

4.1.2.6 Group 7

Question 20 · continued

0 5 . 3 Aluminium oxide contains the ions Al^{3+} and O^{2-}

Explain why aluminium is produced at the **negative** electrode.

[2 marks]

0 5 . 4 The melting point of aluminium oxide is 2045 °C.

The melting point of the mixture of aluminium oxide and cryolite is 950 °C.

Explain why the electrolysis uses the mixture instead of pure aluminium oxide.

[2 marks]

0 5 . 5 The positive electrodes in the electrolysis cell are made of carbon.

Why do the positive electrodes need to be continually replaced?

[1 mark]

Tick (✓) **one** box.

Carbon reacts with the aluminium oxide. ☐

Carbon reacts with the aluminium produced. ☐

Carbon reacts with the oxygen produced. ☐

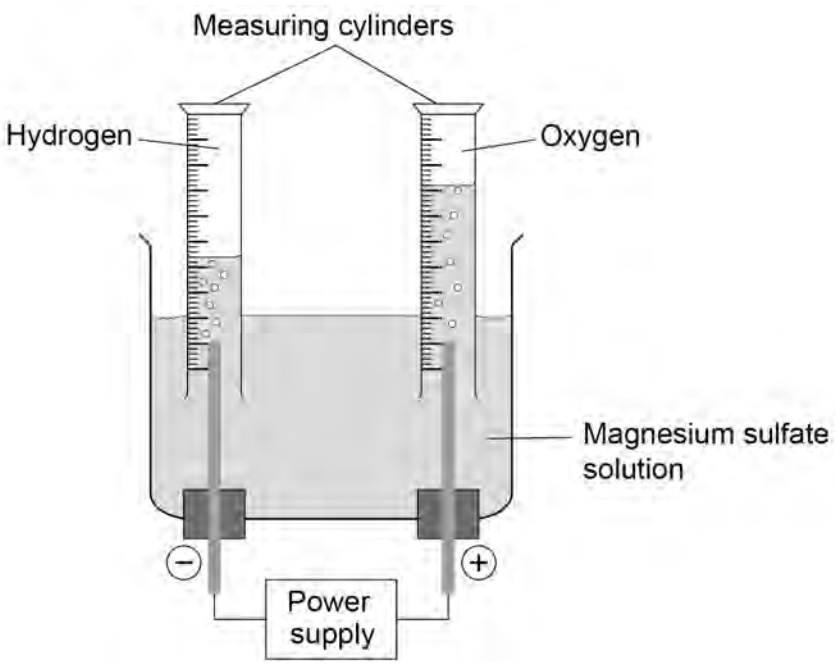
4.1.2.6 Group 7

Question 20 · continued

A student investigated the electrolysis of magnesium sulfate solution.

Figure 5 shows the apparatus.

Figure 5



This is the method used.

1. Set the power supply to give a current of 0.05 A.

2. Measure the volume of each gas every minute for 5 minutes.

3. Repeat steps 1 and 2 using a current of 0.10 A in step 1.

4.1.2.6 Group 7

Question 20 · continued

0 5 . 6 **Figure 6** shows a measuring cylinder during the electrolysis.

Figure 6



What is the volume of gas in the measuring cylinder?

[1 mark]

Tick (✓) **one** box.

2.7 cm^3 ☐ 3.4 cm^3 ☐ 4.6 cm^3 ☐

0 5 . 7 Hydrogen is produced instead of magnesium at the negative electrode.

Why is hydrogen produced at the negative electrode?

[1 mark]

Tick (✓) **one** box.

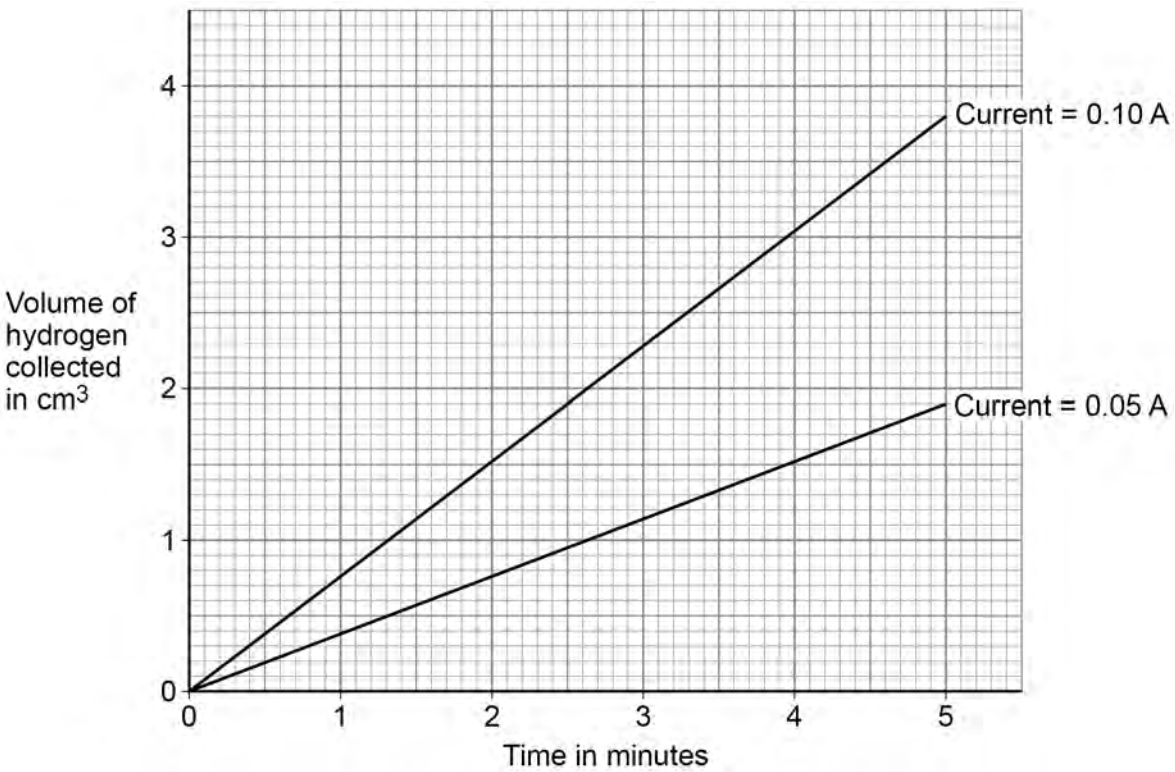
Hydrogen is less reactive than magnesium. ☐

Hydrogen has the same reactivity as magnesium. ☐

Hydrogen is more reactive than magnesium. ☐

0 5 . 8 **Figure 7** shows the results for the volume of hydrogen collected.

Figure 7



Which hypothesis explains the results in **Figure 7**?

[1 mark]

Tick (✓) **one** box.

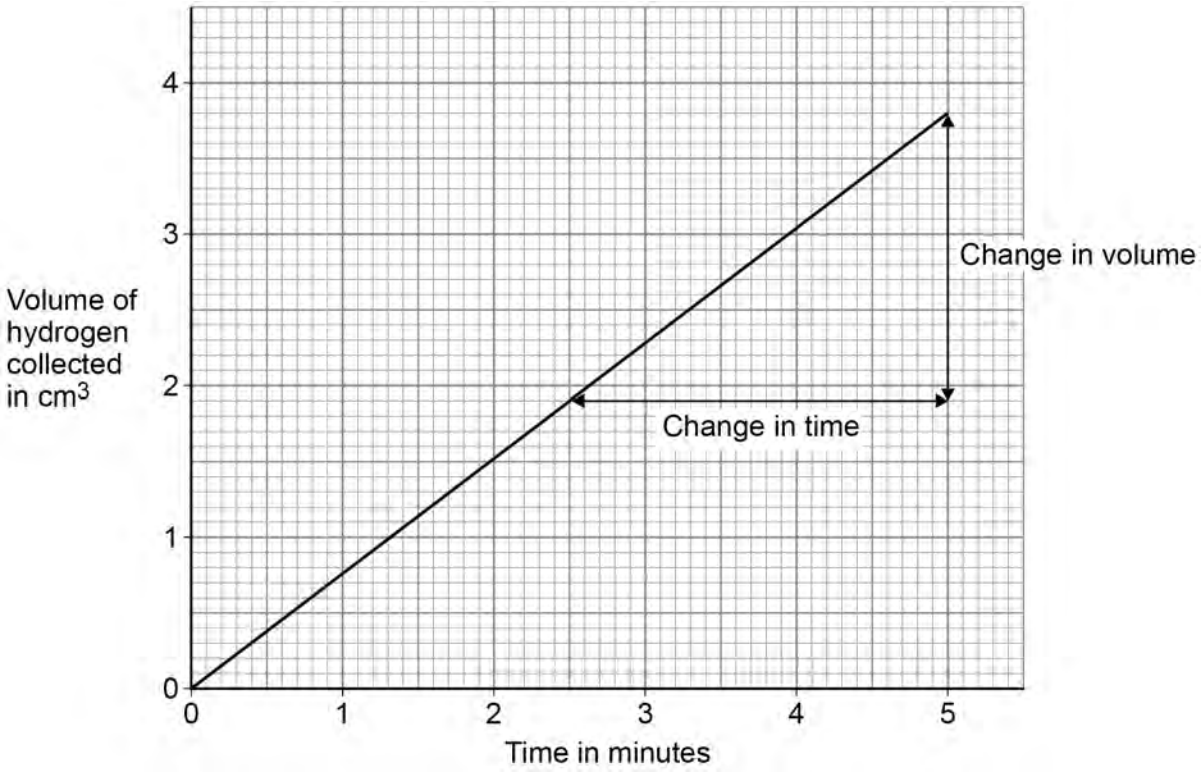
The volume of hydrogen collected depends on **both** the current and the time. ☐

The volume of hydrogen collected depends on the current but **not** the time. ☐

The volume of hydrogen collected depends on the time but **not** the current. ☐

0 5 . 9 **Figure 8** is a repeat of part of the graph for current = 0.10 A in **Figure 7**.

Figure 8



Determine the gradient of the graph in **Figure 8**.

Use the equation

$$\text{gradient} = \frac{\text{change in volume}}{\text{change in time}}$$

[4 marks]

Change in volume = _____ cm^3

Change in time = _____ min

Gradient = _____ cm^3/min

15