AQA GCSE Chemistry | 8462

SPECIFICATION POINT 4.1.2.5

Group 1

Past-paper questions

Tier	**Foundation**
Question groups	**51**
Available paper years	**2007–2025**

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.

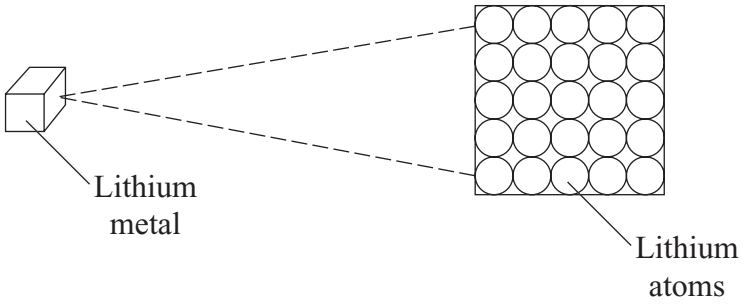
4.1.2.5 Group 1

Question 01

January 2007 | CHY1F | Original Q1 | Legacy

1 Lithium metal is used in alkaline batteries.

(a) The diagram shows the atoms in lithium metal.



Why is lithium metal described as an element?

.....

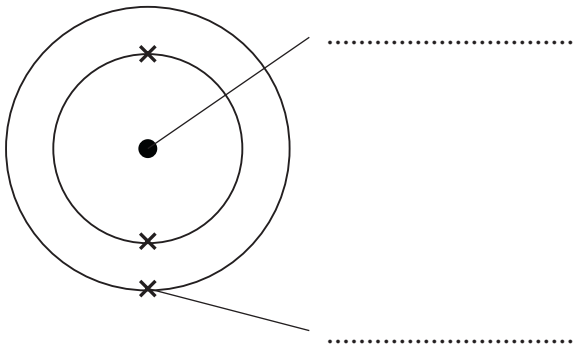
.....

(1 mark)

(b) The diagram below represents a lithium atom.

Choose words from the box to label parts of the atom.

bond	**electron**	**molecule**	**nucleus**



(2 marks)

3

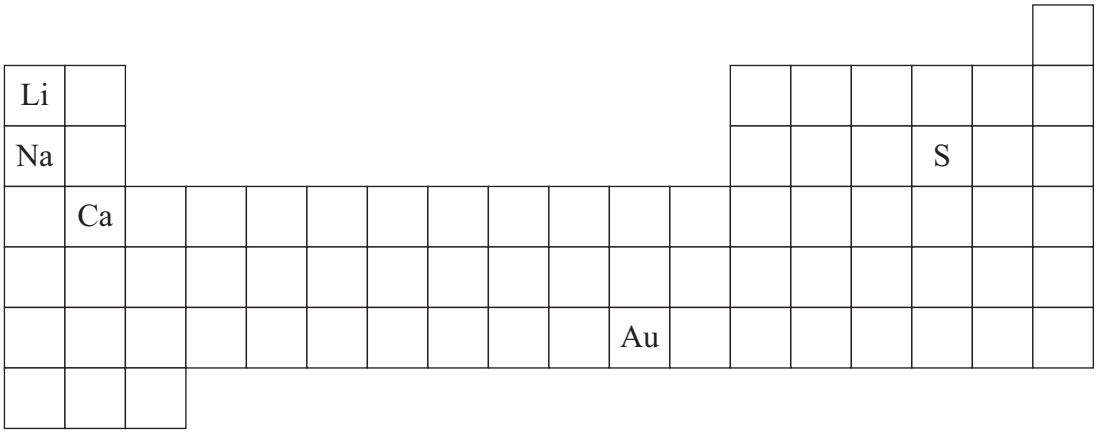
4.1.2.5 Group 1

Question 02

June 2007 | CHY1A | Original Q2 | Legacy

QUESTION TWO

The diagram shows the position of some elements in the periodic table.



Match elements, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.

A gold (Au)

B lithium (Li)

C calcium (Ca)

D sulfur (S)

	What we can say about the element
1	It is combined with the element oxygen in quicklime.
2	It is in a compound that produces acid rain.
3	It is an unreactive transition metal.
4	It has similar chemical properties to sodium.

4.1.2.5 Group 1

Question 03

November 2007 | CHY1A | Original Q1 | Legacy

QUESTION ONE

The equation shows how sodium reacts with water.

2Na	+	$2H_2O$	→	2NaOH	+	H_2
sodium		water		sodium hydroxide		hydrogen

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A atoms

B compounds

C elements

D molecules

In the equation:

2Na represents two . . . **1** . . . of sodium.

$2H_2O$ represents two . . . **2** . . . of water.

Water and sodium hydroxide are . . . **3** . . . .

Sodium and hydrogen are . . . **4** . . . .

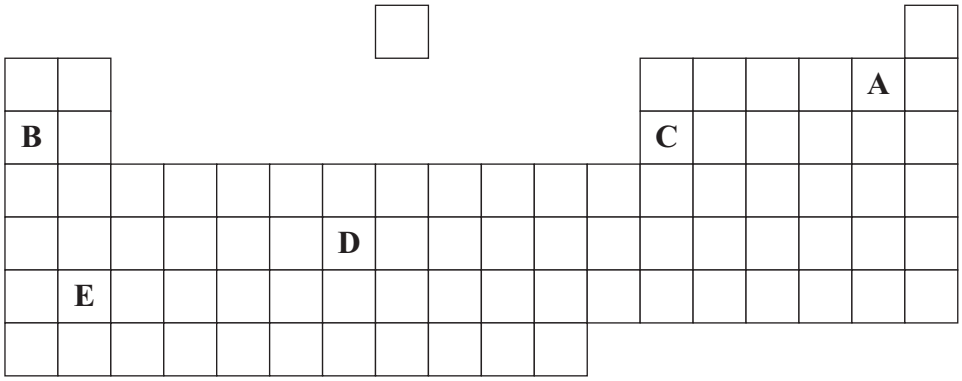
4.1.2.5 Group 1

Question 04

January 2008 | CHY3F | Original Q1 | Legacy

1 (a) The periodic table on the Data Sheet may help you to answer this question.

Part of the periodic table is shown below.



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

Which letter, **A** to **E**, represents:

(i) sodium Letter .....

(1 mark)

(ii) a non-metal Letter .....

(1 mark)

(iii) a Group 2 element Letter .....

(1 mark)

(iv) a transition element? Letter .....

(1 mark)

4.1.2.5 Group 1

Question 04 · continued

BLANK

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

(i) Attempts to classify the elements into a periodic table were made

by [Arrhenius and Dalton / Brønsted and Lowry / Mendeleev and Newlands] .

(1 mark)

(ii) They arranged the elements in order of their [atomic weight / melting point / reactivity] .

(1 mark)

(iii) They put elements in the same Group if they had similar [boiling points / chemical reactions / electrical conductivities] .

(1 mark)

(iv) We now know that elements in the same Group have the same number of

[electrons / neutrons / protons] in their outer shell (energy level).

(1 mark)

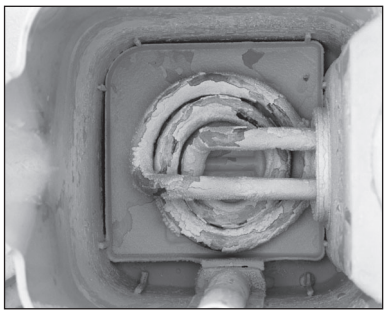
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4.1.2.5 Group 1

Question 05

January 2008 | CHY3F | Original Q4 | Legacy

4 Two problems of hard water are scale and scum, as shown in the pictures of a heating element and a wash basin.





(a) Name **one** ion that causes water to be hard.

.....

(1 mark)

(b) Hard water can be softened using an ion-exchange column.

Complete this sentence by choosing the correct word from the box.

aluminium	**copper**	**sodium**

When hard water passes through the column, the ions that cause hardness are

exchanged for ..... ions, and soft water is produced.

(1 mark)

(c) Describe how soap solution can be used to show that the water going into the column is hard **and** the water coming out is soft.

.....

.....

.....

.....

.....

.....

(3 marks)

5

4.1.2.5 Group 1

Question 06

June 2008 | CHY2F | Original Q1 | Legacy

1 This label was taken from a cola drink.



The pH of this drink is 2.5.

1 (a) (i) Which **one** of the ingredients in the cola drink causes the low pH?

.....

(1 mark)

1 (a) (ii) Draw a ring around the name of the ion that gives the cola drink its low pH.

chloride **hydrogen** **hydroxide** **sodium**

(1 mark)

for mark

1 (b) The preservative used in the cola drink is sodium benzoate.
Sodium benzoate is made using two chemical reactions.

Reaction 1
Methylbenzene is reacted with oxygen, with the help of a catalyst, to form benzoic acid.

Reaction 2
Benzoic acid is neutralised by sodium hydroxide solution to form sodium benzoate and water.

1 (b) (i) How does the catalyst help **reaction 1**?

.....

.....

(1 mark)

1 (b) (ii) **Reaction 1** has a high atom economy.

The table lists several statements. Put a tick (✓) next to the **one** statement which best describes a high atom economy.

Statement	(✓)
All the atoms used are cheap.	
Most of the starting materials end up as useful products.	
Only a small number of atoms are used in the reaction.	

(1 mark)

1 (b) (iii) **Reaction 2** is a neutralisation reaction.

Complete the equation by writing the formula of the product.

$H^+ + OH^- \rightarrow$ .....

(1 mark)

5

4.1.2.5 Group 1

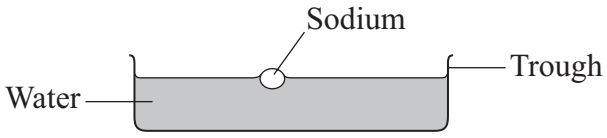
Question 07

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)

4.1.2.5 Group 1

Question 07 · 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)

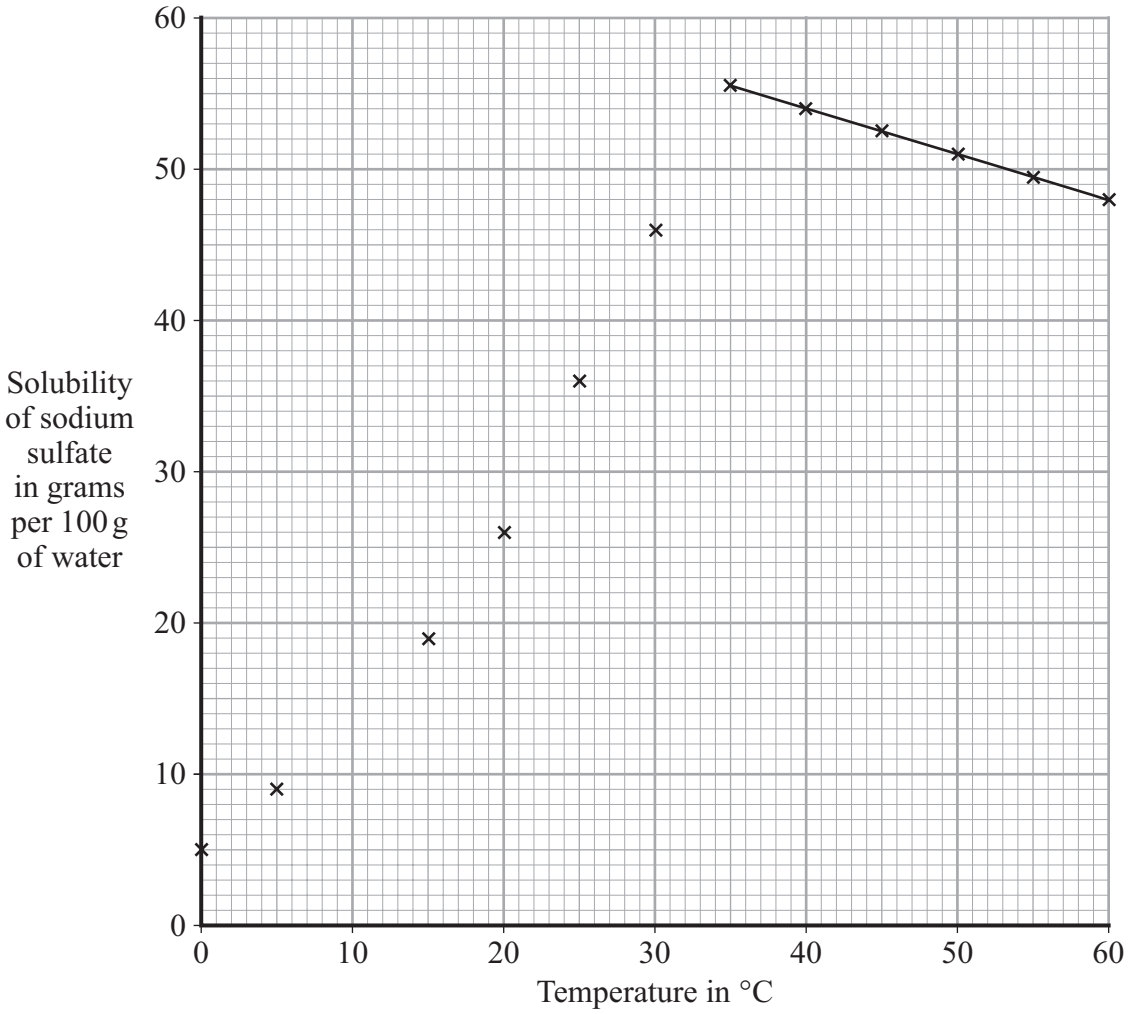
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4.1.2.5 Group 1

Question 08

June 2008 | CHY3F | Original Q7 | Legacy

7 A student did experiments to find the maximum amount of sodium sulfate that dissolves in 100 g of water at different temperatures. Each experiment was repeated several times. The points on the graph show the student's average results.



Use the graph to answer the following questions.

7 (a) Complete the graph by drawing a smooth curve through the points. *(1 mark)*

7 (b) The student was surprised by the shape of this solubility graph.

Suggest why.

.....

(1 mark)

7 (c) Suggest why the student was sure that the results were reliable.

.....

(1 mark)

4.1.2.5 Group 1

Question 08 · continued

for mark

7 (d) At what temperature is the solubility of sodium sulfate greatest? ..... °C
(1 mark)

7 (e) Use your graph to find the maximum mass of sodium sulfate that dissolves in 100 g of water at 10 °C.

Mass = ... g
(1 mark)

7 (f) A *saturated solution* of sodium sulfate in 100 g of water is made at 30 °C. It is then cooled to 15 °C.

What mass of sodium sulfate crystallises from the solution?

.....

.....

Mass = ... g
(2 marks)

7 (g) At a given temperature what is meant by a *saturated solution*?

.....

.....
(1 mark)

8

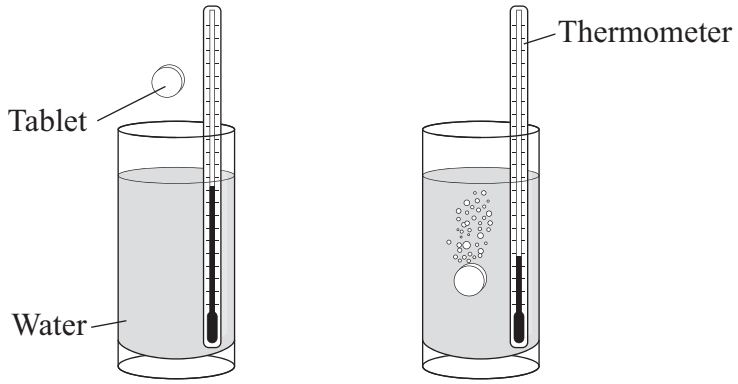
4.1.2.5 Group 1

Question 09

June 2009 | CHY2F | Original Q2 | Legacy

2 An indigestion tablet contains sodium hydrogencarbonate and citric acid.

When the tablet is added to cold water a chemical reaction takes place and there is a lot of fizzing.



2 (a) The formula of the gas that causes the fizzing is CO_2

Name this gas ..... . *(1 mark)*

2 (b) This chemical reaction is endothermic.

2 (b) (i) Tick (✓) the statement which describes what happens to the temperature of the solution.

Statement	Tick (✓)
The temperature of the solution will increase.	
The temperature of the solution will decrease.	
The temperature of the solution will stay the same.	

(1 mark)

2 (b) (ii) Tick (✓) the statement which describes what happens to the energy during the reaction.

Statement	Tick (✓)
Energy is given out to the surroundings.	
Energy is taken in from the surroundings.	
No energy is given out to or taken from the surroundings.	

(1 mark)

3

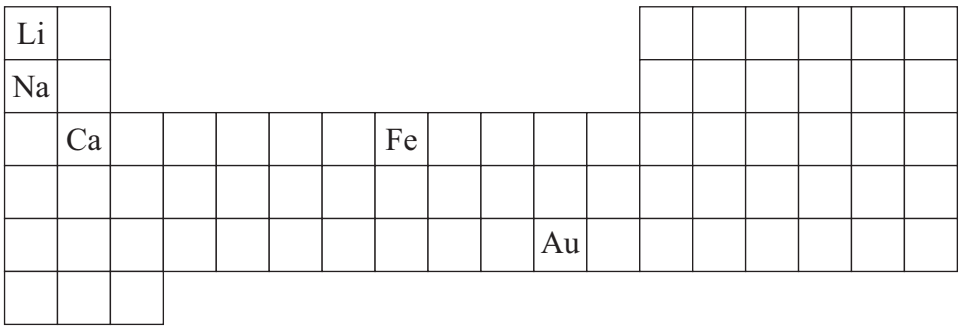
4.1.2.5 Group 1

Question 10

November 2009 | CHY1AP | Original Q5 | Legacy

QUESTION FIVE

The diagram shows part of the periodic table.



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

A Calcium (Ca)

B Lithium (Li)

C Gold (Au)

D Iron (Fe)

1	It will not react with oxygen or water even at high temperatures.
2	It forms the oxide known as quicklime.
3	It has properties most similar to those of sodium (Na).
4	It is a transition element found in the Earth as an oxide.

4.1.2.5 Group 1

Question 11

8 Read the article.

In the late eighteenth century the French scientist Nicolas Leblanc invented a process to change sodium chloride into sodium carbonate.

The main steps in the original process were:

Step 1. Sodium chloride was reacted with sulfuric acid to make sodium sulfate. Hydrogen chloride was formed and escaped into the atmosphere.
The hydrogen chloride damaged plants over a wide area around the factory.

Step 2. The sodium sulfate was heated with limestone and coal. A solid mixture was formed which contained sodium carbonate, calcium sulfide and unreacted coal.
The calcium sulfide gave off a very unpleasant smell.

Step 3. The sodium carbonate was dissolved in water and separated from the insoluble calcium sulfide and unreacted coal.

Step 4. Crystals of sodium carbonate were obtained from the solution of sodium carbonate.

The process was later improved.

- The hydrogen chloride produced in **Step 1** was changed into chlorine which was used to make bleach.
- The calcium sulfide produced in **Step 2** was converted into sulfur. This sulfur was used to make sulfuric acid.

8 (a) The symbol equation for the reaction in **Step 1** is shown below.

$$2NaCl(s) + H_2SO_4(l) \rightarrow Na_2SO_4(s) + 2HCl(g)$$

What property of hydrogen chloride allowed it to escape into the atmosphere?

.....

(1 mark)

4.1.2.5 Group 1

Question 11 · continued

for mark

8 (b) The insoluble solids, calcium sulfide and unreacted coal were separated from the sodium carbonate solution in **Step 3**.

Suggest how this was done.

.....

.....

(1 mark)

8 (c) Sodium carbonate crystals were obtained from sodium carbonate solution in **Step 4**.

Suggest how this was done.

.....

.....

(1 mark)

8 (d) It has been stated that: 'the Chemical Industry can turn problems into profit'.

State **two** problems with the original process and explain how they were turned into profit.

1 .....

.....

.....

.....

2 .....

.....

.....

.....

(4 marks)

7

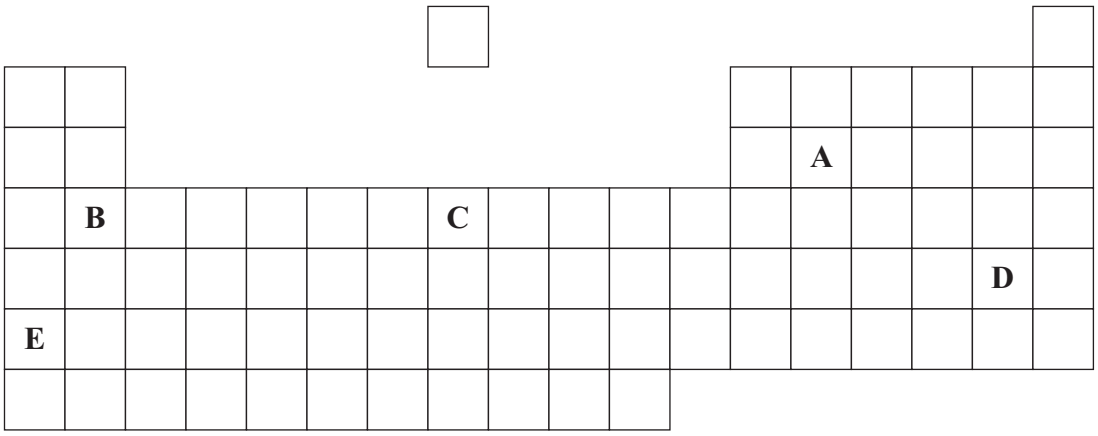
4.1.2.5 Group 1

Question 12

January 2010 | CHY3F | Original Q1 | Legacy

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

Part of the periodic table is shown below.



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

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

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

1 (a) (i) an alkali metal Letter ☐

(1 mark)

1 (a) (ii) the element calcium Letter ☐

(1 mark)

1 (a) (iii) a transition element Letter ☐

(1 mark)

1 (a) (iv) a Group 4 element? Letter ☐

(1 mark)

4.1.2.5 Group 1

Question 12 · continued

for mark

1 (b) A chemistry teacher demonstrated the reaction between sodium and water to some students. One of the students wrote the following notes.

The reaction between sodium and water

A piece of sodium was cut easily into smaller pieces with a knife.

The sodium was added to water in a trough.

The sodium:
- floated
- melted quickly to give a silvery ball
- moved on the surface of the water
- fizzed.

Use the information in the box to help you to answer these questions.

What evidence is there that:

1 (b) (i) sodium has a low melting point

.....

.....

(1 mark)

1 (b) (ii) sodium is soft

.....

.....

(1 mark)

1 (b) (iii) a gas was produced?

.....

.....

(1 mark)

7

4.1.2.5 Group 1

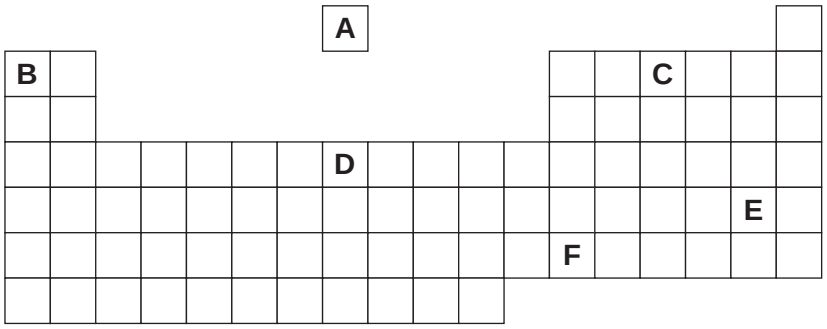
Question 13

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)

4.1.2.5 Group 1

Question 13 · 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

4.1.2.5 Group 1

Question 14

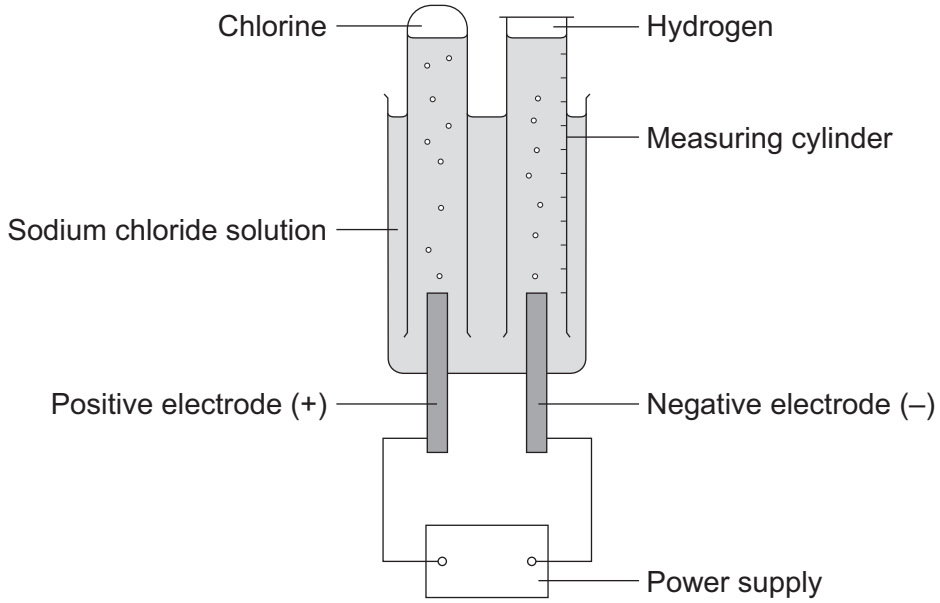
6 A student investigated the electrolysis of sodium chloride solution.

Five sodium chloride solutions were made. Each solution had a different concentration.

To make each solution the student:

- weighed the amount of sodium chloride needed
- dissolved it in water
- added more water until the total volume was one cubic decimetre (1 dm^3).

The solutions were placed one at a time in the apparatus shown below.



The student measured the volume of hydrogen gas produced in ten minutes.

The results are shown on the graph on the next page.

6 (a) Sodium chloride does not conduct electricity when it is solid.

Explain, in terms of ions, why sodium chloride solution conducts electricity.

.....

.....

(1 mark)

6 (b) Chlorine is produced at the positive electrode.

Why are chloride ions attracted to the positive electrode?

.....

(1 mark)

Question 6 continues on the next page

4.1.2.5 Group 1

Question 14 · continued

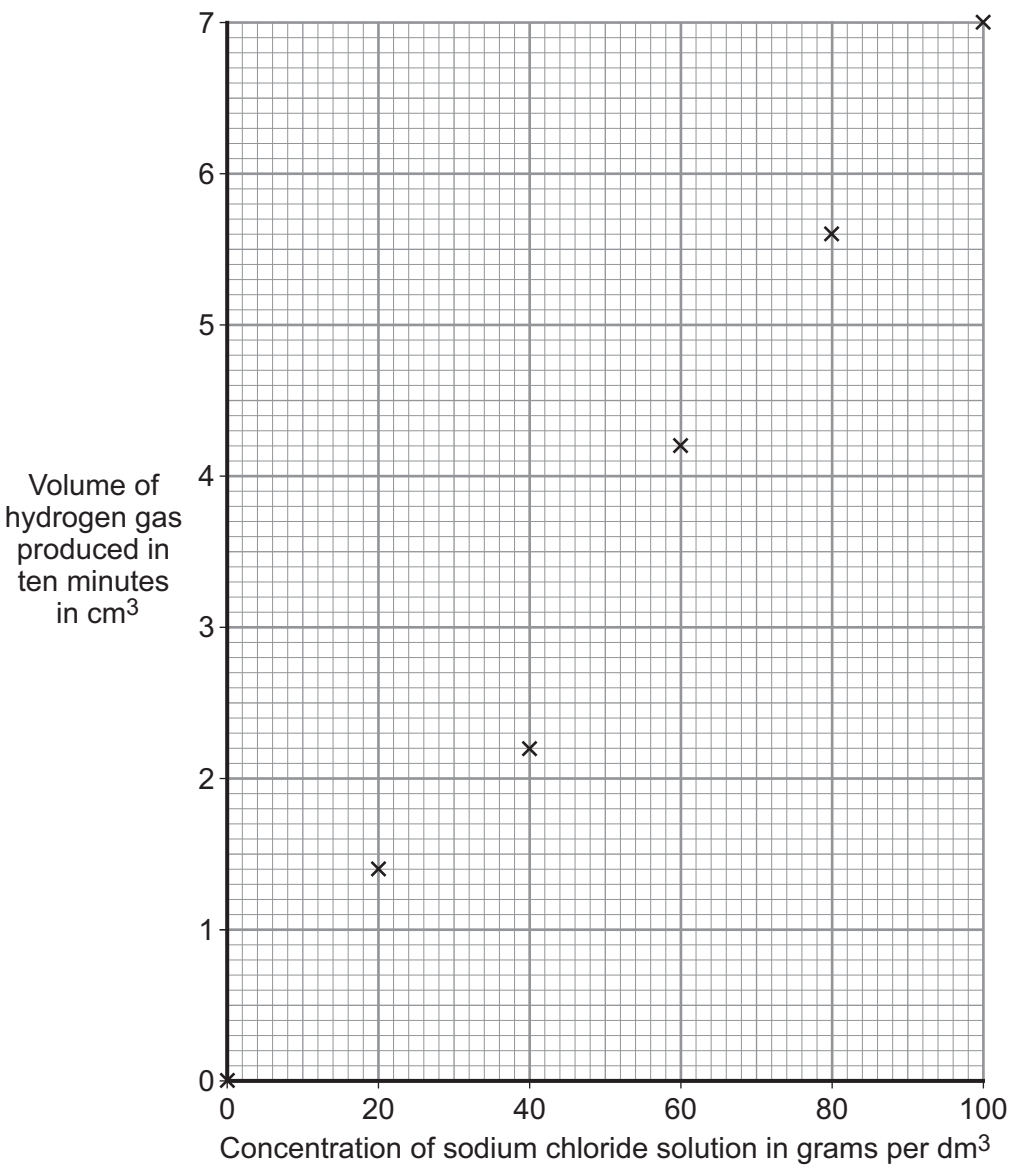
6 (c) The solution left at the end of each experiment contains sodium hydroxide.

Draw a ring around **one** number which could be the pH of this solution.

2 **5** **7** **13**

(1 mark)

6 (d) The results for the experiment on the previous page are shown on the graph.



4.1.2.5 Group 1

Question 14 · continued

6 (d) (i) Draw a line of best fit on the graph.

(1 mark)

6 (d) (ii) The result for one concentration is anomalous.
Which result is anomalous?

The result at concentration ..... grams per dm^3

(1 mark)

6 (d) (iii) Suggest **two** possible causes of this anomalous result.

1 .....

.....

2 .....

.....

(2 marks)

6 (d) (iv) Suggest how the student could check the reliability of the results.

.....

.....

(1 mark)

6 (d) (v) How did an increase in the concentration of the sodium chloride solution affect the volume of hydrogen gas produced in ten minutes?

.....

.....

(1 mark)

9

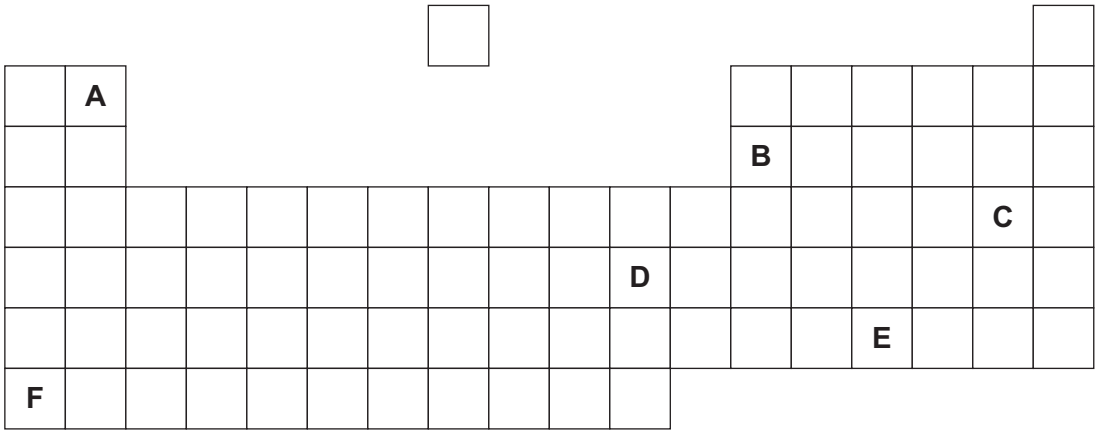
4.1.2.5 Group 1

Question 15

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)*

4.1.2.5 Group 1

Question 15 · continued

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

4.1.2.5 Group 1

Question 16

2 Read the information in the box and then answer the questions.

> Seidlitz Powder is a medicine.
>
> Seidlitz Powder comes as two powders. One powder is wrapped in white paper and contains tartaric acid. The other powder is wrapped in blue paper and contains sodium hydrogencarbonate.
>
> The contents of the blue paper are dissolved in water and the contents of the white paper are added. This causes a reaction that produces carbon dioxide gas. The mixture is safe to drink when the reaction stops.

2 (a) Suggest why Seidlitz Powder comes as two separate powders.

.....

(1 mark)

2 (b) The reaction produces carbon dioxide gas.

2 (b) (i) What would you see during the reaction?

.....

(1 mark)

2 (b) (ii) Which state symbol in a chemical equation shows that carbon dioxide is a gas?

Draw a ring around **one** answer.

(s) **(l)** **(aq)** **(g)**

(1 mark)

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

Carbon dioxide can be identified because it turns [limescale / limestone / limewater] milky.

(1 mark)

4.1.2.5 Group 1

Question 16 · continued

2 (c) Sodium hydrogencarbonate contains sodium ions. Sodium ions can be identified by flame tests.

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

Sodium ions give a [blue / red / yellow] flame.

(1 mark)

2 (d) Some Seidlitz Powder was bought on the Internet for £5. However, when tested, it was found to be only magnesium sulfate, worth a few pence.

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

2 (d) (i) The test for sulfate ions uses [barium chloride / silver nitrate / sodium hydroxide] solution.

(1 mark)

2 (d) (ii) A positive test for sulfate ions produces a [blue / red / white] precipitate.

(1 mark)

2 (d) (iii) Suggest **one** disadvantage of buying medicines on the Internet.

.....

.....

(1 mark)

8

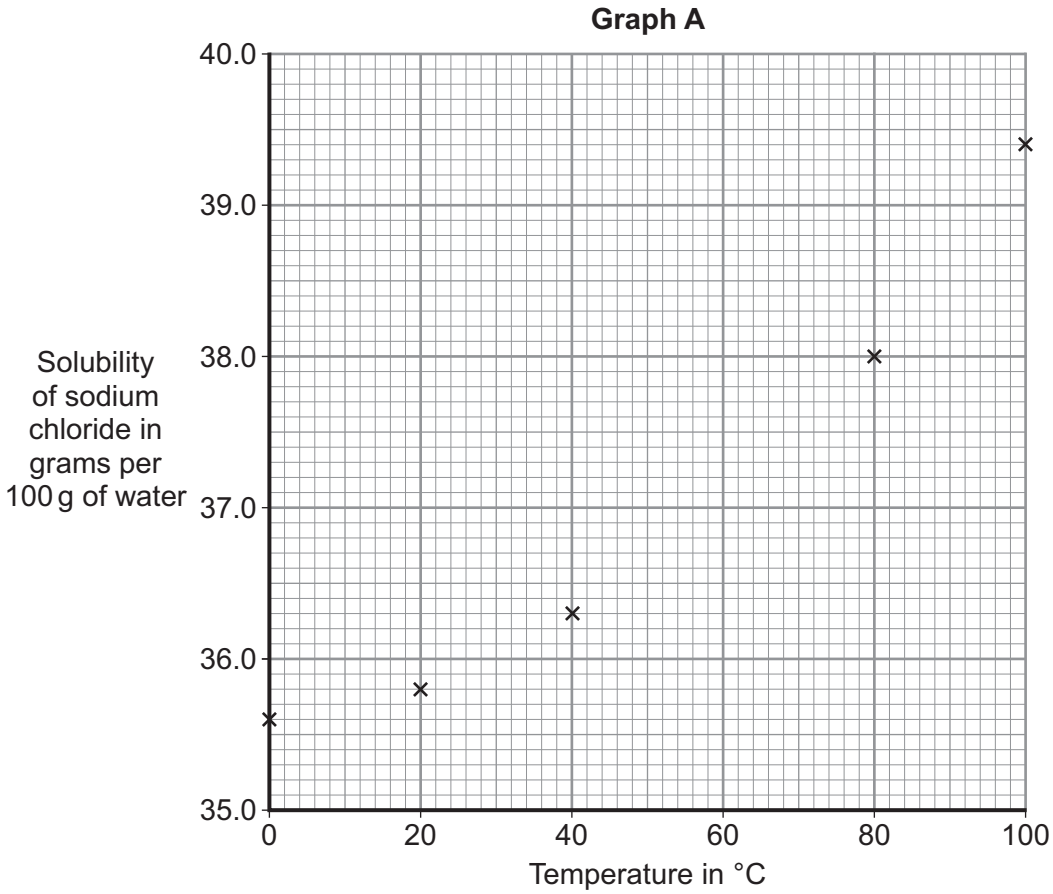
4.1.2.5 Group 1

Question 17

5 The table gives the solubility of sodium chloride in water at different temperatures.

Temperature in °C	0	20	40	80	100
Solubility in g per 100 g of water	35.6	35.8	36.3	38.0	39.4

5 (a) A student plotted Graph **A** using the data in the table.



5 (a) (i) Draw a smooth curve through all the points on Graph **A**. *(1 mark)*

5 (a) (ii) Use this graph to find the mass of sodium chloride that dissolves in 100 g of water at 60 °C.

Mass = ... g

(1 mark)

5 (a) (iii) A saturated solution of sodium chloride in 100 g of water is made at 60 °C. It is then cooled to 20 °C.

What mass of sodium chloride crystallises from the solution?

.....

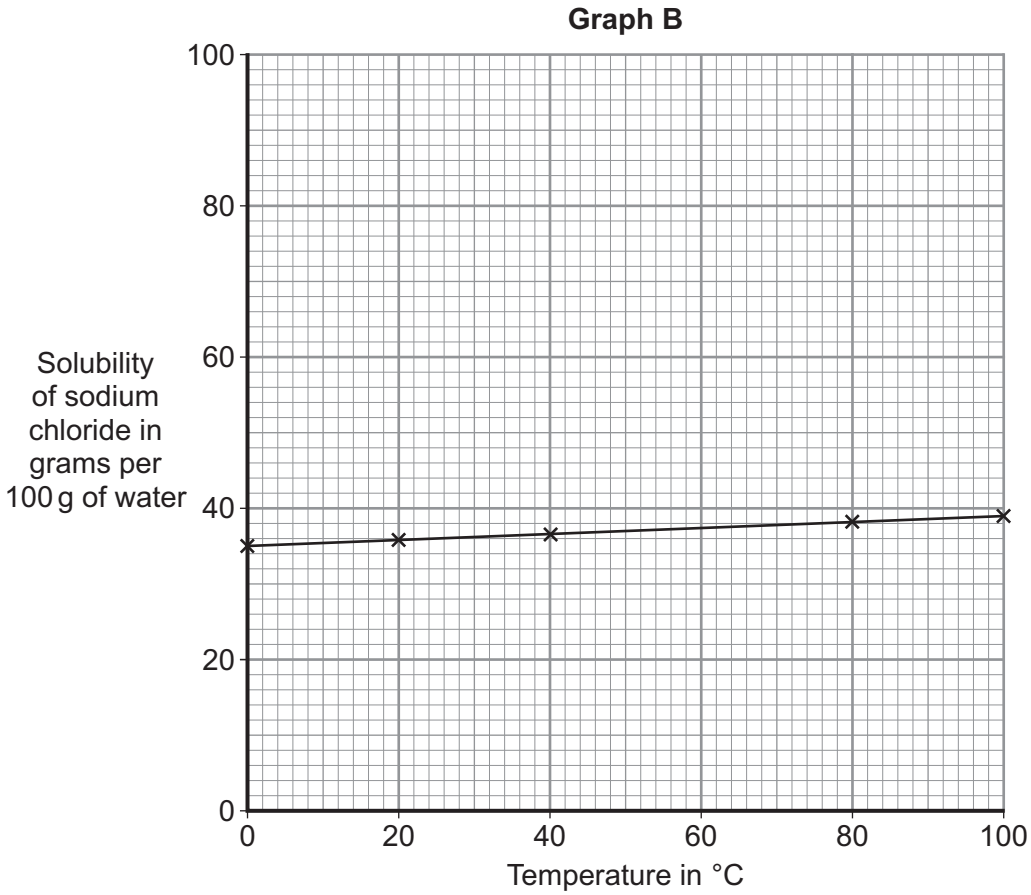
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(2 marks)

4.1.2.5 Group 1

Question 17 · continued

5 (b) Another student plotted Graph **B** using the same data.



The table shows the conclusion that each student made.

	How solubility changes as temperature increases
1st student (Graph A)	Very large increase
2nd student (Graph B)	Very small increase

Suggest why the students came to such different conclusions even though they had used the same data to plot their graphs.

.....

.....

.....

(1 mark)

5

4.1.2.5 Group 1

Question 18

June 2011 | CHY3F | Original Q1 | Legacy

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? ☐

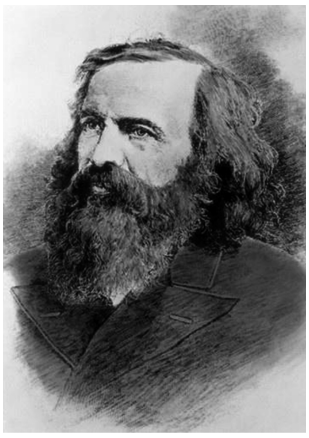
(1 mark)

Question 1 continues on the next page

4.1.2.5 Group 1

Question 18 · continued

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	Ca	#	Ti	V	Cr	Mn
Cu	Zn	#	#	As	Se	Br

4.1.2.5 Group 1

Question 18 · 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

4.1.2.5 Group 1

Question 19

June 2012 | CH2FP | Original Q7 | Legacy

7 (a) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The salt called potassium chloride is made when potassium hydroxide solution reacts with hydrochloric acid.

potassium hydroxide solution + hydrochloric acid → potassium chloride solution + water

Describe a method for making **crystals** of potassium chloride from potassium hydroxide solution and hydrochloric acid.

In this method you should:

- describe how you will add the correct amount of the hydrochloric acid to neutralise the potassium hydroxide solution
- describe how you will get crystals of potassium chloride.

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(6 marks)

Question 7 continues on the next page

4.1.2.5 Group 1

Question 19 · continued

7 (b) Ammonium nitrate is another salt.
Ammonium nitrate is made when ammonia solution is neutralised with an acid.

Name the acid to complete the word equation.

ammonia + ... acid → ammonium nitrate

(1 mark)

7 (c) Read the information.

Ammonium nitrate – good or bad?

Some farmers put a lot of ammonium nitrate on their farmland.

Many people are worried about this use of ammonium nitrate.

Rain water can wash the ammonium nitrate off the farmland and into rivers and lakes. The ammonium nitrate may get into drinking water supplies and could be harmful to health.

7 (c) (i) Why do some farmers put ammonium nitrate on their farmland?

.....

.....

(1 mark)

4.1.2.5 Group 1

Question 19 · continued

7 (c) (ii) Which **one** of the questions in the table cannot be answered by science alone?

Tick (✓) **one** question.

Question	Tick (✓)
How much ammonium nitrate is in drinking water?	
Should farmers stop using ammonium nitrate on their farmland?	
Is ammonium nitrate soluble in rain water?	

Give **two** reasons why this question **cannot** be answered by science alone.

.....

.....

.....

.....

(3 marks)

11

4.1.2.5 Group 1

Question 20

January 2013 | CH2FP | Original Q7 | Legacy

7 A student investigated the rate of reaction between sodium thiosulfate and dilute hydrochloric acid.

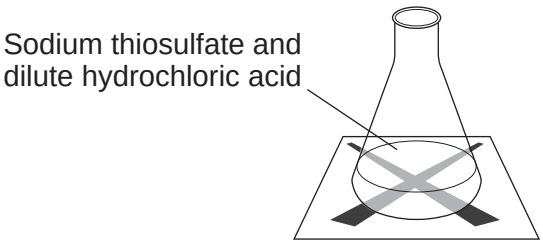
The student placed a conical flask over a cross on a piece of paper.

The student mixed the solutions in the flask.

The solution slowly went cloudy.

The student timed how long it took until the cross could not be seen.





The equation for the reaction is:

$$Na_2S_2O_3(aq) + 2\,HCl(aq) \rightarrow 2\,NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

sodium thiosulfate + hydrochloric acid → sodium chloride + water + sulfur dioxide + sulfur

7 (a) Explain why the solution goes cloudy.

.....

.....

.....

.....

(2 marks)

4.1.2.5 Group 1

Question 20 · continued

7 (b) The student repeated the experiment with different concentrations of sodium thiosulfate.

Concentration of sodium thiosulfate in moles per dm^3	Time taken until the cross could not be seen in seconds			
	Trial 1	Trial 2	Trial 3	Mean
0.040	71	67	69	69
0.060	42	45	45	44
0.080	31	41	33	

7 (b) (i) Calculate the mean time for 0.080 moles per dm^3 of sodium thiosulfate.

.....

.....

.....

Mean = ... seconds
(2 marks)

7 (b) (ii) Describe and explain, in terms of particles and collisions, the effect that increasing the concentration of sodium thiosulfate has on the rate of the reaction.

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(3 marks)

7

4.1.2.5 Group 1

Question 21

June 2013 | CH2FP | Original Q1 | Legacy

1 This question is about lithium and sodium.

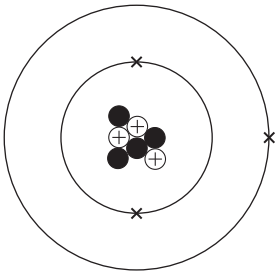
1 (a) Use the Chemistry Data Sheet to help you to answer this question.

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

4.1.2.5 Group 1

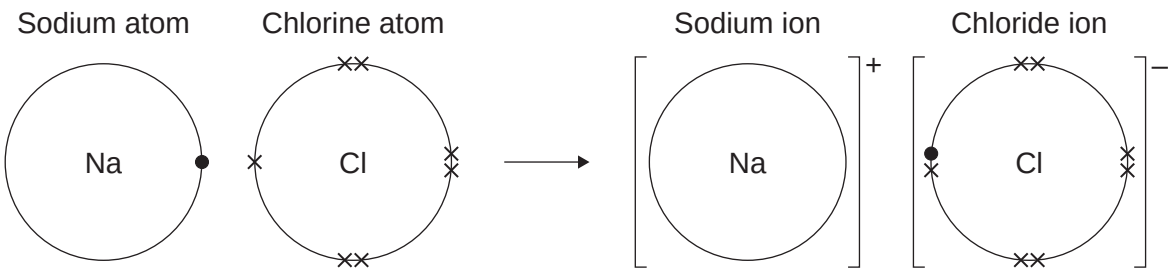
Question 21 · continued

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)

4.1.2.5 Group 1

Question 21 · 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

4.1.2.5 Group 1

Question 22

June 2013 | CH3FP | Original Q3 | Legacy

3 This question is about the periodic table.

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

3 (a) Complete the sentences.

Elements in the periodic table are arranged in order of atomic ..... .

The elements in Group ..... are called the noble gases.

(2 marks)

3 (b) Calcium (Ca) is in Group 2.

Name **one** other element in Group 2.

.....

(1 mark)

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

3 (c) (i) Sodium (Na) is

an alkali metal.

a non-metal.

a transition metal.

(1 mark)

3 (c) (ii) Nickel (Ni) is

an alkali metal.

a non-metal.

a transition metal.

(1 mark)

3 (d) In 1869 Mendeleev produced his periodic table.

Why did Mendeleev leave gaps in his periodic table?

.....

.....

(1 mark)

6

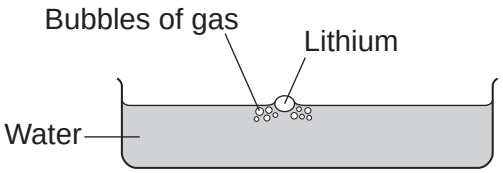
4.1.2.5 Group 1

Question 23

June 2013 | CH3FP | Original Q7 | Legacy

7 Lithium is in Group 1 of the periodic table.

Lithium reacts with water to produce a gas and an alkaline solution.



7 (a) (i) Name the gas produced.

.....

(1 mark)

7 (a) (ii) Which ion causes the solution to be alkaline?

.....

(1 mark)

7 (b) Potassium is also in Group 1 of the periodic table.
Potassium reacts with water in a similar way to lithium.

Write down **two** differences you would see between the reactions of potassium and lithium with water.

1 .....

.....

2 .....

.....

(2 marks)

4

4.1.2.5 Group 1

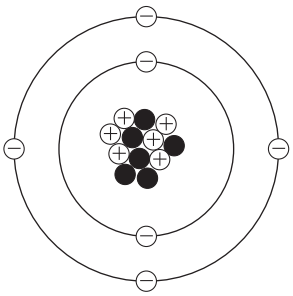
Question 24

June 2014 | CH1FP | Original Q1 | Legacy

1 Fossil fuels contain carbon.

1 (a) **Figure 1** represents a carbon atom.

Figure 1



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

1 (a) (i) The name of the particle with a positive charge is

an electron.
a neutron.
a proton.

[1 mark]

1 (a) (ii) The centre of the atom is called the

energy level.
molecule.
nucleus.

[1 mark]

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

Use the correct number from the box to complete each sentence.

[2 marks]

4	6	8	10	12

The mass number of this carbon atom is ☐

In the periodic table, carbon is in Group ☐

4.1.2.5 Group 1

Question 24 · continued

1 (b) Coal is a fossil fuel.

A piece of coal contains:

- 80% carbon
- 9% oxygen
- 1% sulfur
- 5% hydrogen.

The rest of the coal is other elements.

1 (b) (i) What is the percentage of other elements in this piece of coal?

[1 mark]

..... %

1 (b) (ii) Coal burns in air to produce carbon dioxide, sulfur dioxide and water.

Draw **one** line from each product to the type of pollution caused by each product.

[3 marks]

Product	Type of pollution
Carbon dioxide	Acid rain
Sulfur dioxide	Global dimming
Water	Global warming
	No pollution

8

4.1.2.5 Group 1

Question 25

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]

4.1.2.5 Group 1

Question 25 · 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

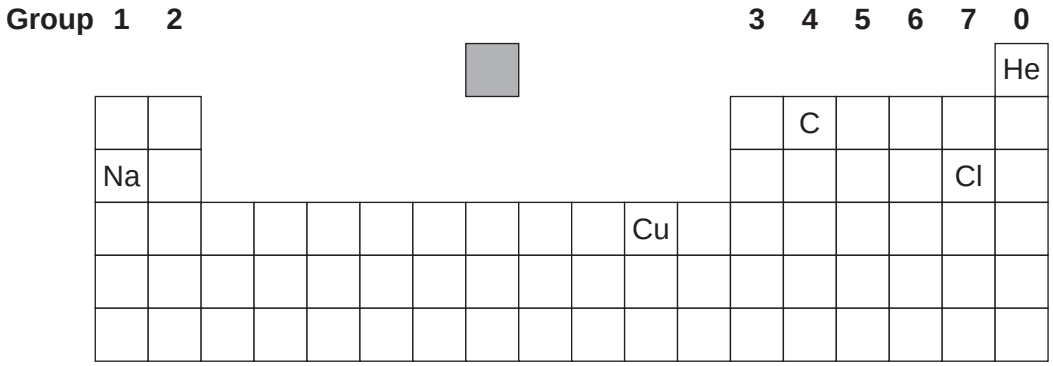
4.1.2.5 Group 1

Question 26

June 2015 | CH3FP | Original Q2 | Legacy

2 **Figure 2** shows the chemical symbols of five elements in the periodic table.

Figure 2



2 (a) Choose the correct chemical symbol from **Figure 2** to complete each sentence.

2 (a) (i) The element that is an alkali metal is ..... .

[1 mark]

2 (a) (ii) The element that is a transition metal is ..... .

[1 mark]

2 (a) (iii) The element in Group 4 is ..... .

[1 mark]

2 (a) (iv) The element with a full outer energy level (shell) of electrons is ..... .

[1 mark]

2 (b) Which other element goes in the shaded box in **Figure 2**? .....

[1 mark]

5

4.1.2.5 Group 1

Question 27

June 2015 | CH3FP | Original Q7 | Legacy

7 Some pollutants cause acid rain.

A student tested 25.0 cm^3 samples of three types of rainwater, **P**, **Q** and **R**.
The student titrated the samples with sodium hydroxide solution (an alkali).

The student recorded the volume of sodium hydroxide solution needed to neutralise the rainwater. The student's results are shown in **Table 1**.

Table 1

	Volume of sodium hydroxide needed to neutralise the rainwater in cm^3				
Type of rainwater	**Titration 1**	**Titration 2**	**Titration 3**	**Titration 4**	**Mean value**
P	18.0	15.5	14.5	15.0	15.0
Q	13.0	10.0	11.0	10.5	10.5
R	23.0	19.5	18.5	19.0	19.0

7 (a) (i) The student calculated the mean value for rainwater **R** as 19.0 cm^3.

Show how the student calculated the mean value for rainwater **R**.

[2 marks]

.....

.....

.....

.....

7 (a) (ii) Write down **P**, **Q** and **R** in order of their acidity.

[2 marks]

Most acidic .....

.....

Least acidic .....

4.1.2.5 Group 1

Question 27 · continued

7 (b) A second student repeated the experiment and recorded the results in **Table 2**.

Table 2

	Volume of sodium hydroxide needed to neutralise the rainwater in cm^3	
Type of rainwater	**Titration 1**	**Titration 2**
P	17	15
Q	11	9
R	20	18

Use **Table 1** and **Table 2** to suggest **two** improvements the second student could make to obtain more accurate results.

[2 marks]

.....

.....

.....

.....

7 (c) The results of the two students show that the experiment is reproducible.

Give the reason why.

[1 mark]

.....

.....

7

4.1.2.5 Group 1

Question 28

June 2015 | CH3FP | Original Q8 | Legacy

8 In 1866 John Newlands produced an early version of the periodic table.

Part of Newlands' periodic table is shown in **Figure 6**.

Figure 6

Column	1	2	3	4	5	6	7
	H	Li	Be	B	C	N	O
	F	Na	Mg	Al	Si	P	S
	Cl	K	Ca	Cr	Ti	Mn	Fe

Newlands' periodic table arranged all the known elements into columns in order of their atomic weight.

Newlands was trying to show a pattern by putting the elements into columns.

8 (a) Iron (Fe) does **not** fit the pattern in column 7.

Give a reason why.

[1 mark]

.....

.....

8 (b) In 1869 Dmitri Mendeleev produced his version of the periodic table.

Why did Mendeleev leave gaps for undiscovered elements in his periodic table?

[1 mark]

.....

.....

4.1.2.5 Group 1

Question 28 · continued

June 2015 | CH3FP | Original Q8 | Legacy

8 (c) Newlands and Mendeleev placed the elements in order of atomic weight.

Complete the sentence.

[1 mark]

The modern periodic table places the elements in order of ..... .

8 (d) Lithium, sodium and potassium are all in Group 1 of the modern periodic table.

Explain why.

[2 marks]

.....

.....

.....

.....

5

4.1.2.5 Group 1

Question 29

June 2015 | CH3FP | Original Q10 | Legacy

10 This question is about water.

10 (a) Rainwater is soft.

How is hard water produced from rainwater?

[2 marks]

.....

.....

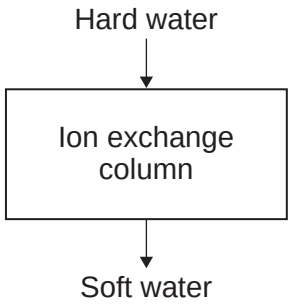
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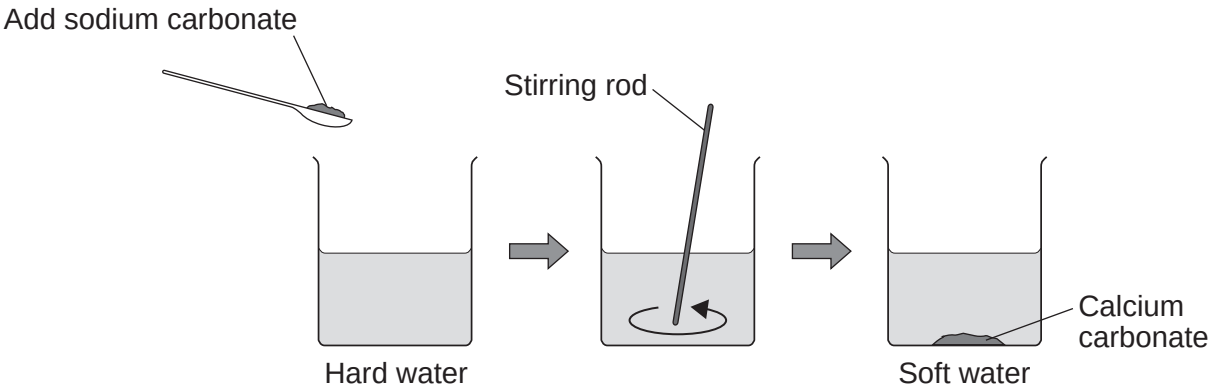
10 (b) **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Hard water can be softened by two different methods.

Method 1: Ion exchange



Method 2: Adding sodium carbonate (washing soda)



4.1.2.5 Group 1

Question 29 · continued

Describe how each method softens water **and** compare the advantages of these two methods.

[6 marks]

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Extra space .....

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4.1.2.5 Group 1

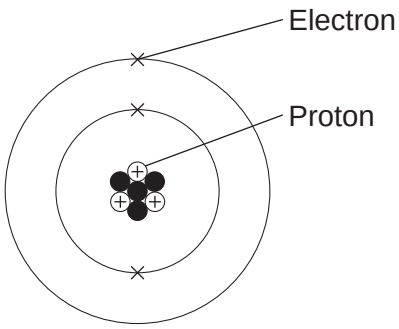
Question 30

June 2016 | CH1FP | Original Q1 | Legacy

1 There are eight elements in the second row (lithium to neon) of the periodic table.

1 (a) **Figure 1** shows a lithium atom.

Figure 1



1 (a) (i) What is the mass number of the lithium atom in **Figure 1**?

[1 mark]

Tick (✓) **one** box.

3 ☐

4 ☐

7 ☐

1 (a) (ii) What is the charge of an electron?

[1 mark]

Tick (✓) **one** box.

–1 ☐

0 ☐

+1 ☐

4.1.2.5 Group 1

Question 30 · continued

1 (a) (iii) Protons are in the nucleus.

Which other sub-atomic particles are in the nucleus?

[1 mark]

Tick (✓) **one** box.

ions ☐

molecules ☐

neutrons ☐

1 (b) What is **always** different for atoms of different elements?

[1 mark]

Tick (✓) **one** box.

number of neutrons ☐

number of protons ☐

number of shells ☐

Question 1 continues on the next page

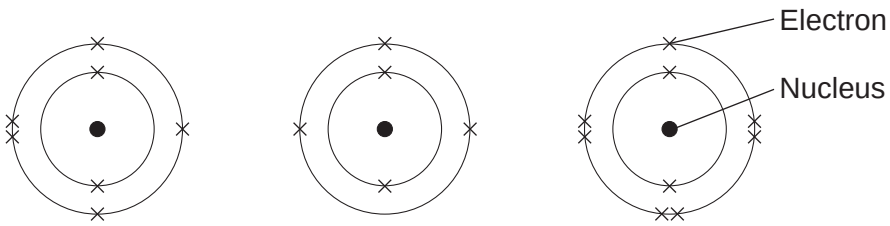
4.1.2.5 Group 1

Question 30 · continued

1 (c) **Figure 2** shows the electron arrangements of three different atoms, **X**, **Y** and **Z**.

These atoms are from elements in the second row (lithium to neon) of the periodic table.

Figure 2



Atom X **Atom Y** **Atom Z**

Which atom is from an element in Group 3 of the periodic table?

[1 mark]

Tick (✓) **one** box.

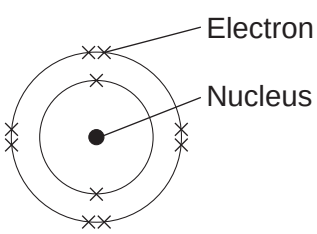
Atom X ☐

Atom Y ☐

Atom Z ☐

1 (d) **Figure 3** shows the electron arrangement of a different atom from an element in the second row of the periodic table.

Figure 3



1 (d) (i) Give the chemical symbol of this element.

[1 mark]

_____

1 (d) (ii) Why is this element unreactive?

[1 mark]

_____

_____

7

4.1.2.5 Group 1

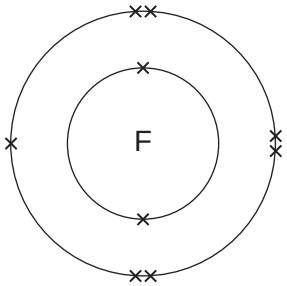
Question 31

June 2016 | CH2FP | Original Q1 | Legacy

1 This question is about fluorine.

1 (a) **Figure 1** shows the arrangement of electrons in a fluorine atom.

Figure 1



1 (a) (i) In which group of the periodic table is fluorine?

[1 mark]

Group _____

1 (a) (ii) Complete **Table 1** to show the particles in an atom and their relative masses.

[2 marks]

Table 1

Name of particle	Relative mass
Proton	
Neutron	1
	Very small

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

[1 mark]

alkalis	**alloys**	**isotopes**

Atoms of fluorine with different numbers of neutrons are called _____ .

4.1.2.5 Group 1

Question 31 · continued

1 (b) Sodium reacts with fluorine to produce sodium fluoride.

1 (b) (i) Complete the word equation for this reaction.

[1 mark]

sodium + _____ ⟶ _____

1 (b) (ii) Complete the sentence.

[1 mark]

Substances in which atoms of two or more different elements are chemically combined are called _____ .

1 (b) (iii) The relative formula mass (M_r) of sodium fluoride is 42.

Use the correct answer from the box to complete the sentence.

[1 mark]

ion	mole	molecule

The relative formula mass (M_r), in grams, of sodium fluoride is one _____ of the substance.

Question 1 continues on the next page

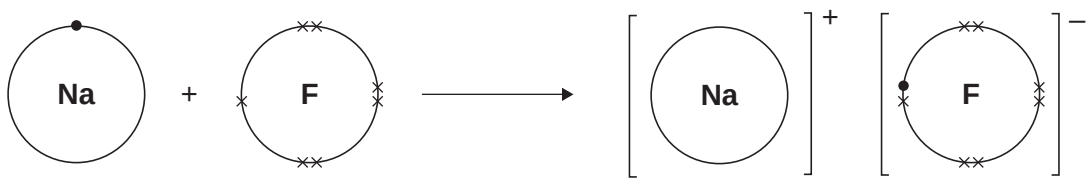
4.1.2.5 Group 1

Question 31 · continued

1 (b) (iv) **Figure 2** shows what happens to the electrons in the outer shells when a sodium atom reacts with a fluorine atom.

The dots (•) and crosses (×) represent electrons.

Figure 2



Use **Figure 2** to help you answer this question.

Describe, as fully as you can, what happens when sodium reacts with fluorine to produce sodium fluoride.

[4 marks]

4.1.2.5 Group 1

Question 31 · continued

1 (b) (v) Sodium fluoride is an ionic substance.

What are **two** properties of ionic substances?

[2 marks]

Tick (✓) **two** boxes.

- Dissolve in water ☐
- Gas at room temperature ☐
- High melting point ☐
- Low boiling point ☐

13

Turn over for the next question

4.1.2.5 Group 1

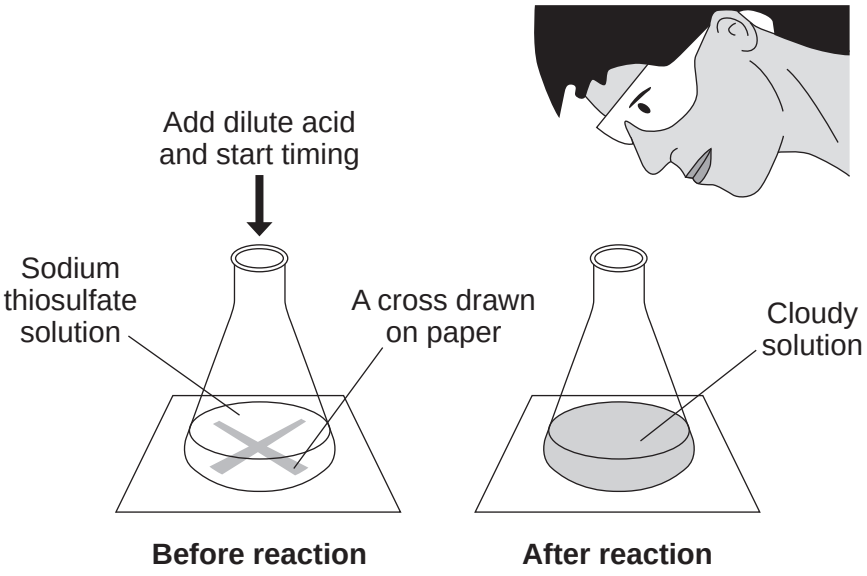
Question 32

June 2016 | CH2FP | Original Q4 | Legacy

4 A student investigated the effect of temperature on the rate of a reaction.

Figure 9 shows an experiment.

Figure 9



The student:

- put 50 cm^3 sodium thiosulfate solution into a conical flask
- heated the sodium thiosulfate solution to the required temperature
- put the flask on a cross drawn on a piece of paper
- added 5 cm^3 dilute hydrochloric acid and started a stopclock
- stopped the stopclock when the cross could no longer be seen
- repeated the experiment at different temperatures.

4.1.2.5 Group 1

Question 32 · continued

The equation for the reaction is:

$$Na_2S_2O_3(aq) + 2HCl(aq) \longrightarrow 2NaCl(aq) + H_2O(l) + SO_2(g) + S(s)$$

sodium thiosulfate	hydrochloric acid	sodium chloride	water	sulfur dioxide	sulfur

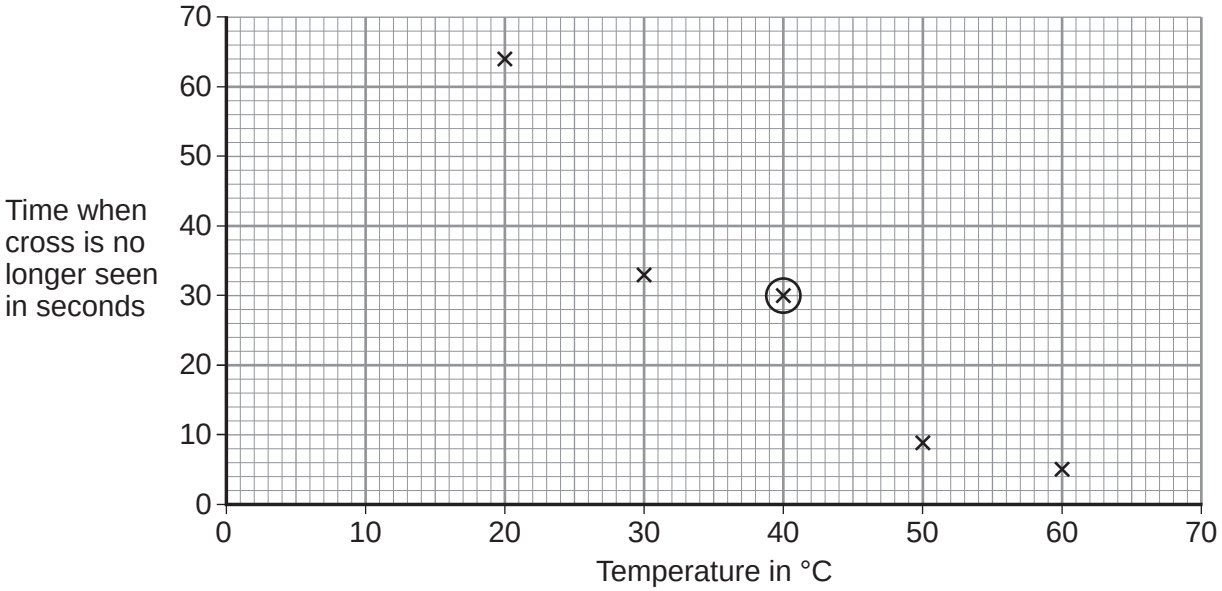
4 (a) Which product is a gas?

[1 mark]

_____

4 (b) **Figure 10** shows the results of this experiment at five different temperatures. The circled result point is anomalous.

Figure 10



4 (b) (i) Draw a line of best fit on **Figure 10** to show how the reaction time varied with reaction temperature.

[1 mark]

4 (b) (ii) Give a possible reason for the anomalous result at 40 °C.

[1 mark]

_____

_____

Question 4 continues on the next page

4.1.2.5 Group 1

Question 32 · continued

4 (b) (iii) The reaction at 20 °C produced 0.32 g of sulfur in 64 seconds.

Calculate the rate of the reaction at 20 °C using the equation:

$$\text{Rate of reaction} = \frac{\text{mass of sulfur}}{\text{time}}$$

[2 marks]

Rate of reaction = _____ grams per second

4 (b) (iv) Give **two** reasons why the rate of the reaction increases as the temperature increases.

[2 marks]

Tick (✓) **two** boxes.

- The particles move faster. ☐
- The particles collide less often. ☐
- All the particles have the same energy. ☐
- The particles collide with more energy. ☐
- The number of particles increases. ☐

4 (b) (v) Use the correct answer from the box to complete the sentence.

[1 mark]

activation	collision	exothermic

The minimum amount of energy particles must have to react is called

the _____ energy.

8

4.1.2.5 Group 1

Question 33

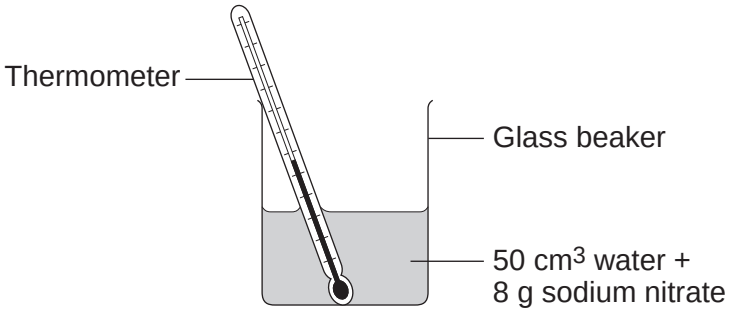
June 2016 | CH2FP | Original Q5 | Legacy

5 This question is about temperature changes.

5 (a) A student investigated the temperature change when 8 g of sodium nitrate dissolves in 50 cm^3 of water.

Figure 11 shows the apparatus the student used.

Figure 11



The student did the experiment five times.
Table 2 shows the results.

Table 2

Experiment	Decrease in temperature of water in °C
1	5.9
2	5.7
3	7.2
4	5.6
5	5.8

4.1.2.5 Group 1

Question 33 · continued

5 (a) (i) Calculate the mean decrease in temperature.
Do not use the anomalous result in your calculation.

[2 marks]

Mean decrease in temperature = _____ °C

5 (a) (ii) Suggest **one** change in the apparatus in **Figure 11** which would improve the accuracy of the results.
Give a reason for your answer.

[2 marks]

Question 5 continues on the next page

4.1.2.5 Group 1

Question 33 · continued

5 (b) The student investigated the temperature change when different masses of sodium carbonate were added to 50 cm^3 of water at 20 °C.

Table 3 shows the results.

Table 3

Mass of sodium carbonate in g	Final temperature of solution in °C
2.0	21.5
4.0	23.0
6.0	24.5
8.0	26.0
10.0	26.6
12.0	26.6
14.0	26.6

Describe the relationship between the mass of sodium carbonate added and the final temperature of the solution.

Use values from **Table 3** in your answer.

[3 marks]

7

4.1.2.5 Group 1

Question 34

June 2016 | CH3FP | Original Q1 | Legacy

1 This question is about elements and the periodic table.

1 (a) Use the correct answers from the box to complete the sentences.

[3 marks]

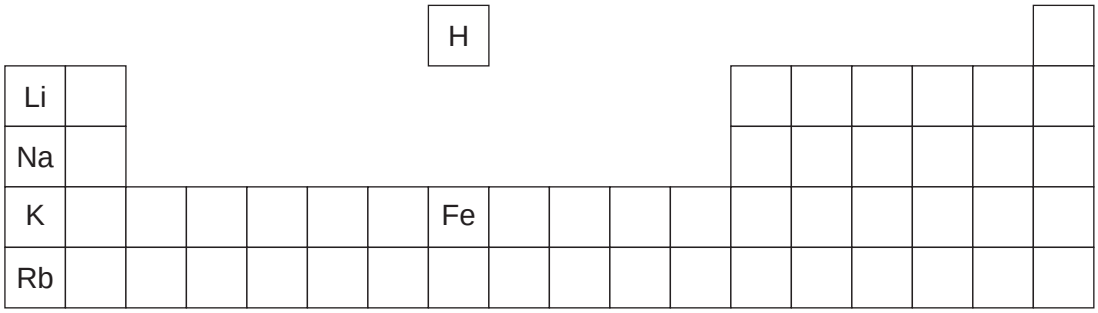
atoms	atomic weights	electrons	proton numbers

Newlands' and Mendeleev's periodic tables show the elements in order of their _____ .

Following the discovery of protons and _____, the modern periodic table shows the elements in order of their _____ .

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

Figure 1



1 (b) (i) Which **one** of these six elements has the lowest boiling point?

[1 mark]

_____

1 (b) (ii) Complete the sentence.

[1 mark]

In the periodic table, rubidium (Rb) is in Group _____ .

4.1.2.5 Group 1

Question 34 · continued

1 (b) (iii) Which of these three elements is the most reactive?

[1 mark]

Tick (✓) **one** box.

Lithium (Li) ☐

Sodium (Na) ☐

Potassium (K) ☐

1 (b) (iv) Which **two** statements are correct?

[2 marks]

Tick (✓) **two** boxes.

Iron has a higher density than potassium. ☐

Iron is softer than potassium. ☐

Iron reacts vigorously with water. ☐

Iron forms ions that have different charges. ☐

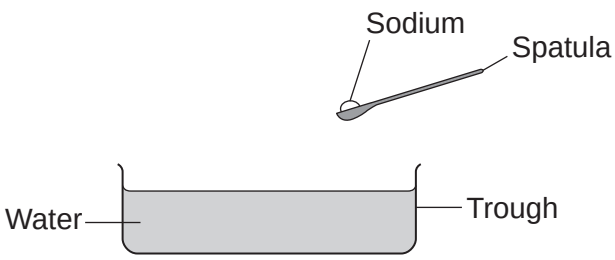
Question 1 continues on the next page

4.1.2.5 Group 1

Question 34 · continued

1 (c) **Figure 2** shows sodium being put into water.

Figure 2



Describe **three** observations that can be seen when sodium is put into water.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

11

4.1.2.5 Group 1

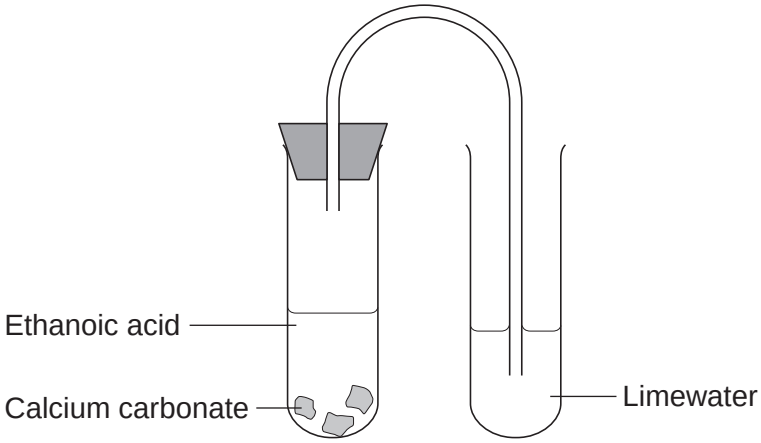
Question 35

June 2016 | CH3FP | Original Q5 | Legacy

5 This question is about reactions of ethanoic acid and the analysis of salts.

5 (a) **Figure 7** shows the apparatus used to investigate the reaction of ethanoic acid with calcium carbonate.

Figure 7



5 (a) (i) Describe a change that would be seen in each test tube.

Give a reason for each change.

[4 marks]

Test tube 1 _____

_____

_____

_____

Test tube 2 _____

_____

_____

_____

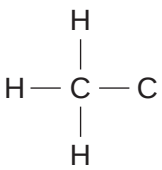
Question 5 continues on the next page

4.1.2.5 Group 1

Question 35 · continued

5 (a) (ii) Complete the displayed structure of ethanoic acid.

[1 mark]



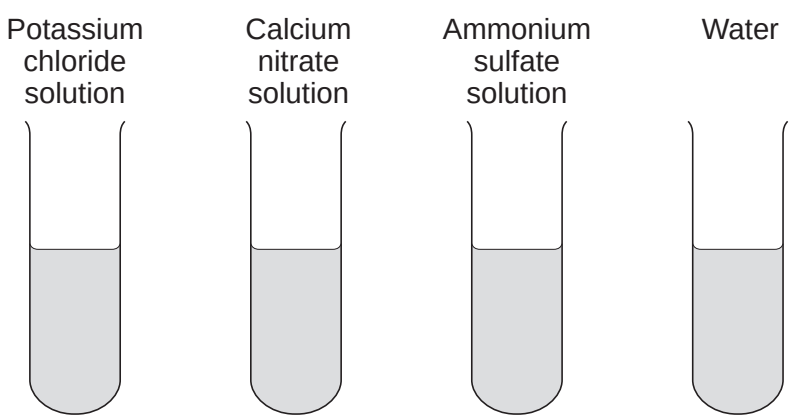
5 (a) (iii) Ethanoic acid is a carboxylic acid.
Complete the sentence.

[2 marks]

Carboxylic acids react with alcohols in the presence of an _____ catalyst to produce pleasant-smelling compounds called _____ .

5 (b) **Figure 8** shows four test tubes containing three different salt solutions and water.

Figure 8



Each solution and the water was tested with:

- silver nitrate in the presence of dilute nitric acid
- barium chloride in the presence of dilute hydrochloric acid.

4.1.2.5 Group 1

Question 35 · continued

Complete the table of results.

[2 marks]

	Potassium chloride solution	Calcium nitrate solution	Ammonium sulfate solution	Water
Test with silver nitrate in the presence of dilute nitric acid			no change	no change
Test with barium chloride in the presence of dilute hydrochloric acid		no change	white precipitate	

5 (c) Flame tests can be used to identify metal ions.

5 (c) (i) Complete the following sentences.

[2 marks]

The flame colour for potassium ions is _____ .

The flame colour for calcium ions is _____ .

5 (c) (ii) Give **one** reason why a flame test would **not** show the presence of both potassium ions and calcium ions in a mixture.

[1 mark]

_____

_____

_____

12

4.1.2.5 Group 1

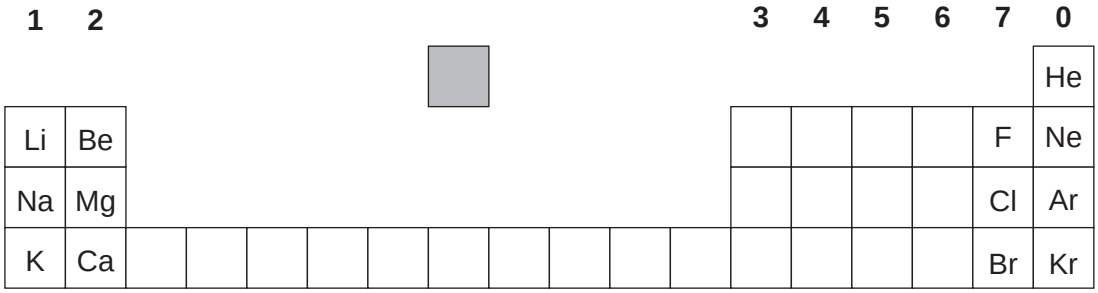
Question 36

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 ☐

4.1.2.5 Group 1

Question 36 · 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

4.1.2.5 Group 1

Question 37

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.

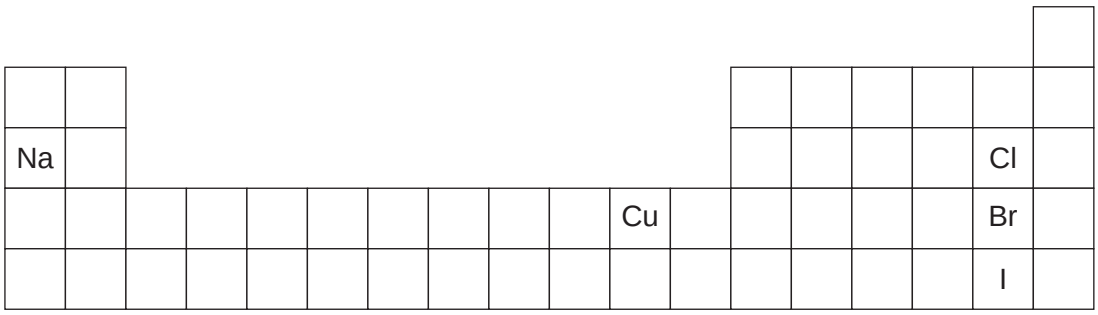
[1 mark]

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]

_____

4.1.2.5 Group 1

Question 37 · 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

4.1.2.5 Group 1

Question 37 · 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 ☐

4.1.2.5 Group 1

Question 37 · continued

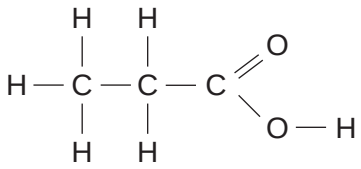
1 (e) Propanoic acid is a compound containing carbon atoms.

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

4.1.2.5 Group 1

Question 38

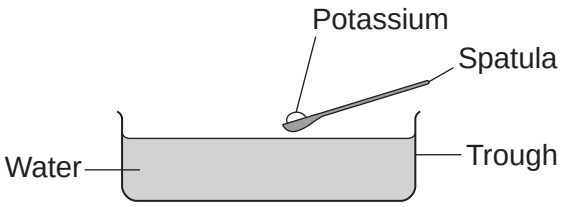
June 2017 | CH3FP | Original Q4 | Legacy

4 This question is about potassium and its compounds.

4 (a) Potassium reacts with water.

Figure 5 shows potassium being added to water.

Figure 5



The word equation for the reaction is:

potassium + water ⟶ potassium hydroxide + hydrogen

Give **two** observations that can be seen when potassium is added to water.

[2 marks]

Question 4 continues on the next page

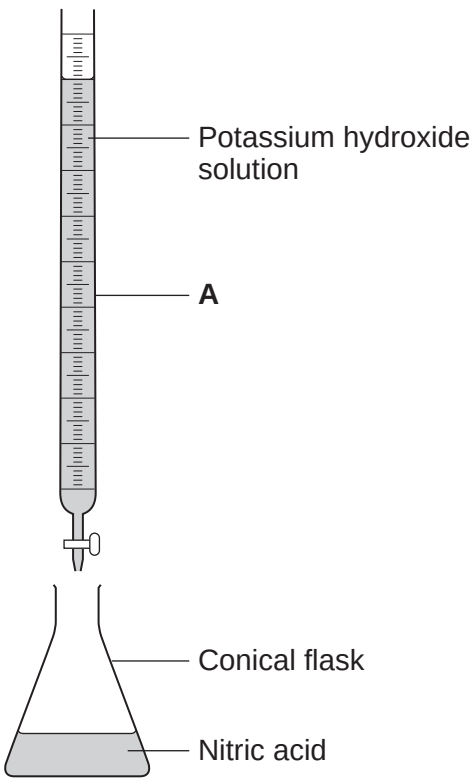
4.1.2.5 Group 1

Question 38 · continued

4 (b) Potassium hydroxide solution is used in titrations.

A student used the apparatus in **Figure 6** to do a titration to find the concentration of some nitric acid.

Figure 6



4 (b) (i) Name the piece of apparatus labelled **A**.

[1 mark]

_____

4 (b) (ii) What should the student add to the nitric acid before starting the titration?

[1 mark]

_____

4.1.2.5 Group 1

Question 38 · continued

4 (b) (iii) Describe how the student could use the apparatus in **Figure 6** to complete the titration.

[3 marks]

4 (b) (iv) The student did the titration four times.

Give **one** variable the student should keep the same for each titration.

[1 mark]

Question 4 continues on the next page

4.1.2.5 Group 1

Question 38 · continued

4 (c) **Table 2** shows the student's results.

Table 2

	Volume of potassium hydroxide solution used in cm^3
Titration 1	23.8
Titration 2	18.2
Titration 3	19.0
Titration 4	18.6
Mean value	

4 (c) (i) Calculate the mean volume of potassium hydroxide solution used.

Do not use any anomalous results in your calculation.

[2 marks]

Mean volume of potassium hydroxide solution used = _____ cm^3

4.1.2.5 Group 1

Question 38 · continued

4 (c) (ii) A second student repeated the experiment and recorded the results in **Table 3**.

Table 3

	Volume of potassium hydroxide solution used in cm^3
Titration 1	24
Titration 2	18

Look at **Table 2** and **Table 3**.

Suggest **two** improvements the second student could make to obtain results that are more accurate.

[2 marks]

_____

_____

_____

_____

12

4.1.2.5 Group 1

Question 39

June 2018 | 8462/1F | Original Q7

0 7 This question is about elements in Group 1.

A teacher burns sodium in oxygen.

0 7 . 1 Complete the word equation for the reaction.

[1 mark]

sodium + oxygen → _____

0 7 . 2 What is the name of this type of reaction?

[1 mark]

Tick **one** box.

Decomposition ☐

Electrolysis ☐

Oxidation ☐

Precipitation ☐

0 7 . 3 The teacher dissolves the product of the reaction in water and adds universal indicator.

The universal indicator turns purple.

What is the pH value of the solution?

[1 mark]

Tick **one** box.

1	☐	4	☐	7	☐	13	☐

4.1.2.5 Group 1

Question 39 · continued

0 7 . 4 The solution contains a substance with the formula NaOH

Give the name of the substance.

[1 mark]

0 7 . 5 All alkalis contain the same ion.

What is the formula of this ion?

[1 mark]

Tick **one** box.

H^+ ☐

Na^+ ☐

OH^- ☐

O^{2-} ☐

0 7 . 6 A solution of NaOH had a concentration of 40 g/dm^3

What mass of NaOH would there be in 250 cm^3 of the solution?

[2 marks]

Mass = _____ g

4.1.2.5 Group 1

Question 39 · continued

0 7 . 7 The melting points of the elements in Group 1 show a trend.

Table 6 shows the atomic numbers and melting points of the Group 1 elements.

Table 6

Element	Atomic number	Melting point in °C
Lithium	3	181
Sodium	11	98
Potassium	19	63
Rubidium	37	**X**
Caesium	55	29

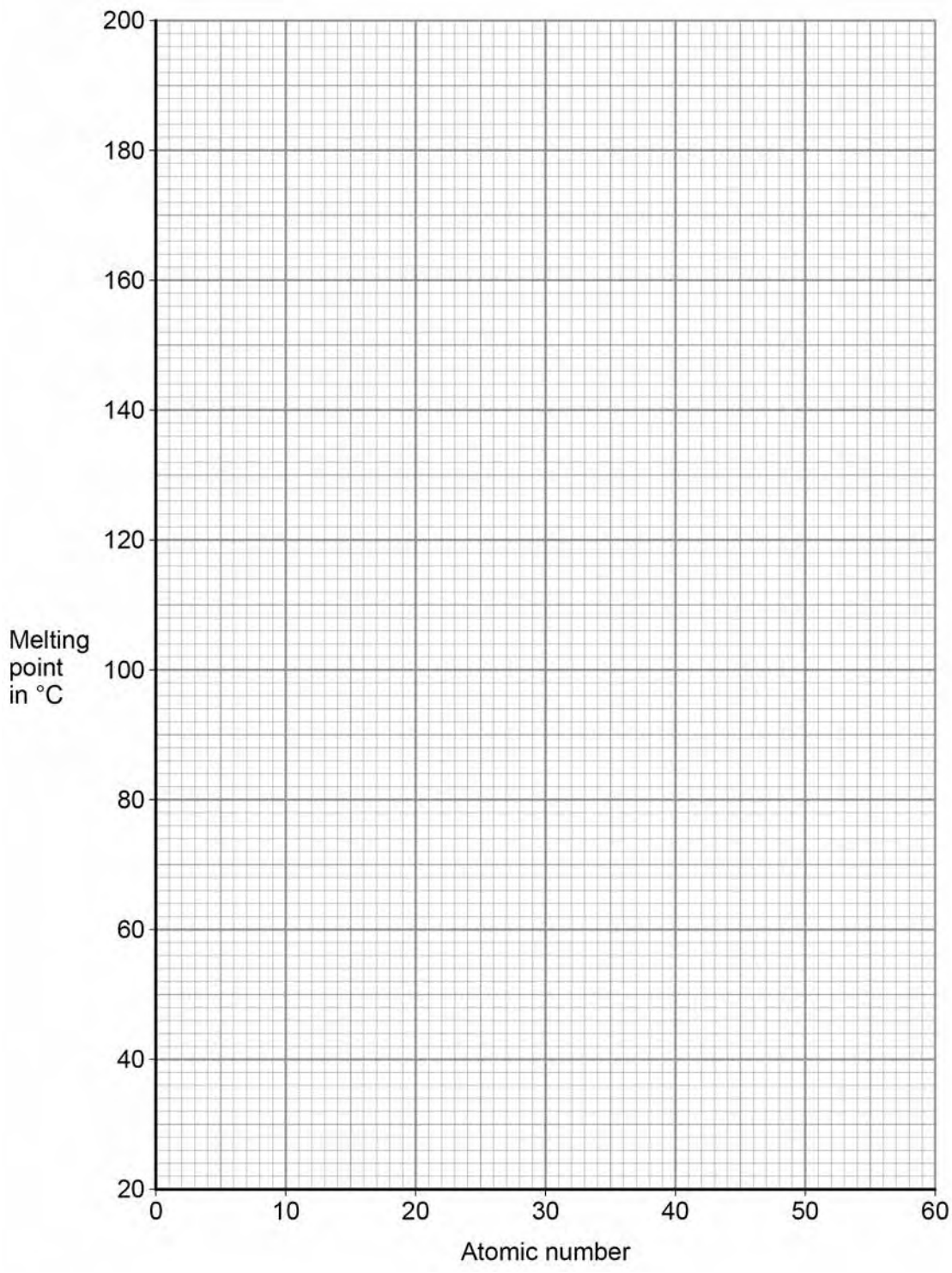
Plot the data from **Table 6** on **Figure 11**.

[2 marks]

4.1.2.5 Group 1

Question 39 · continued

Figure 11



0 7 . 8 Predict the melting point, **X**, of rubidium, atomic number 37

Use **Figure 11**.

[1 mark]

Melting point = _____ °C

10

4.1.2.5 Group 1

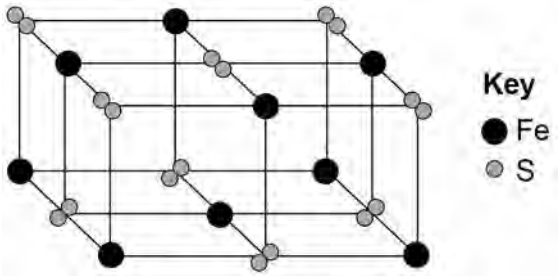
Question 40

0 9 This question is about metals and metal compounds.

0 9 . 1 Iron pyrites is an ionic compound.

Figure 12 shows a structure for iron pyrites.

Figure 12



Determine the formula of iron pyrites.

Use **Figure 12**.

[1 mark]

_____

0 9 . 2 An atom of iron is represented as $^{56}_{26}Fe$

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

[3 marks]

Number of protons _____

Number of neutrons _____

Number of electrons _____

0 9 . 3 Iron is a transition metal.

Sodium is a Group 1 metal.

Give **two** differences between the properties of iron and sodium.

[2 marks]

1 _____

_____

2 _____

_____

4.1.2.5 Group 1

Question 40 · continued

Nickel is extracted from nickel oxide by reduction with carbon.

0 9 . 4 Explain why carbon can be used to extract nickel from nickel oxide.

[2 marks]

0 9 . 5 An equation for the reaction is:

$$NiO + C \rightarrow Ni + CO$$

Calculate the percentage atom economy for the reaction to produce nickel.

Relative atomic masses (A_r): C = 12 Ni = 59

Relative formula mass (M_r): NiO = 75

Give your answer to 3 significant figures.

[3 marks]

Percentage atom economy = _____ %

11

4.1.2.5 Group 1

Question 41

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]

4.1.2.5 Group 1

Question 41 · 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

_____.

4.1.2.5 Group 1

Question 41 · 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

4.1.2.5 Group 1

Question 42

0 1 This question is about drinking water.

There are two main steps in producing drinking water from fresh water.

0 1 . 1 Draw **one** line from each step to the reason for the step.

[2 marks]

Step	Reason for step
	Desalination
Filtration	Improve taste
	Increase pH
Sterilisation	Kill bacteria
	Remove solids

0 1 . 2 Which **two** substances are used to sterilise fresh water?

[2 marks]

Tick (✓) **two** boxes.

- Ammonia ☐
- Chlorine ☐
- Hydrogen ☐
- Nitrogen ☐
- Ozone ☐

4.1.2.5 Group 1

Question 42 · continued

A large amount of aluminium sulfate was accidentally added to the drinking water supply at a water treatment works.

0 1 . 3 Scientists tested a sample of the drinking water to show that it contained dissolved solids.

Which **two** methods show the presence of dissolved solids in the sample of drinking water?

[2 marks]

Tick (✓) **two** boxes.

- Add damp litmus paper to the sample. ☐
- Evaporate all water from the sample. ☐
- Measure the sample's boiling point. ☐
- Test the sample with a glowing splint. ☐

4.1.2.5 Group 1

Question 42 · continued

0 1 . 4 Scientists tested two water samples from the drinking water supply.

The scientists tested one sample for aluminium ions and the other sample for sulfate ions.

Draw **one** line from each ion to the compound needed to identify the ion.

[2 marks]

Ion	**Compound needed to identify ion**
	Barium chloride
Aluminium ion	Copper sulfate
	Silver nitrate
Sulfate ion	Sodium hydroxide
	Sulfuric acid

0 1 . 5 How could pure water be produced from drinking water that contained dissolved solids?

[1 mark]

Tick (✓) **one** box.

- Chromatography ☐
- Cracking ☐
- Distillation ☐
- Sedimentation ☐

9

4.1.2.5 Group 1

Question 43

June 2019 | 8462/2F | Original Q9

0 9 This question is about lithium carbonate.

Lithium carbonate is used in medicines.

Figure 7 shows a tablet containing lithium carbonate.

Figure 7



0 9 . 1 Lithium carbonate contains lithium ions and carbonate ions.

A student tested the tablet for lithium ions and for carbonate ions.

The student used:

- a metal wire
- dilute hydrochloric acid
- limewater.

Plan an investigation to show the presence of lithium ions **and** of carbonate ions in the tablet.

You should include the results of the tests for the ions.

[6 marks]

4.1.2.5 Group 1

Question 43 · continued

0 9 . 2 The tablet also contains other substances.

The substances in tablets are present in fixed amounts.

What name is given to mixtures like tablets?

[1 mark]

0 9 . 3 The tablet has a mass of 1.20 g and contains 700 mg of lithium carbonate.

Calculate the percentage by mass of lithium carbonate in this tablet.

[3 marks]

Percentage by mass of lithium carbonate = _____ %

10

4.1.2.5 Group 1

Question 44

November 2021 | 8462/1F | Original Q3

0 3 This question is about Group 1 elements.

0 3 . 1 Complete **Table 2** to show the electronic structure of a potassium atom.

[1 mark]

Table 2

Atom	Number of electrons	Electronic structure
Sodium	11	2,8,1
Potassium	19	

0 3 . 2 Why do Group 1 elements have similar chemical properties?

[1 mark]

Tick (✓) **one** box.

They have the same number of electron shells. ☐

They have the same number of outer shell electrons. ☐

They have two electrons in the first shell. ☐

0 3 . 3 What is the type of bonding in sodium?

[1 mark]

Tick (✓) **one** box.

Covalent ☐

Ionic ☐

Metallic ☐

4.1.2.5 Group 1

Question 44 · continued

Table 3 shows observations made when lithium, potassium and rubidium react with water.

Table 3

Element	Observations
Lithium	Bubbles slowly Floats Moves slowly
Sodium	1 _____ 2 _____
Potassium	Bubbles very quickly Melts into a ball Floats Moves very quickly Flame
Rubidium	Sinks Melts into a ball Explodes with a flame

0 3 . 4 Give **two** observations you could make when sodium reacts with water.

Write your answers in **Table 3**.

[2 marks]

4.1.2.5 Group 1

Question 44 · continued

0 3 . 5 How does the reactivity of the elements change going down Group 1?

[1 mark]

0 3 . 6 Give **two** ways in which the observations in **Table 3** show the change in reactivity going down Group 1.

[2 marks]

1

2

0 3 . 7 Which gas is produced when Group 1 elements react with water?

[1 mark]

Tick (✓) **one** box.

- Carbon dioxide ☐
- Hydrogen ☐
- Nitrogen ☐
- Oxygen ☐

0 3 . 8 Sodium fluoride is an ionic compound.

Figure 5 shows dot and cross diagrams for a sodium atom and a fluorine atom.

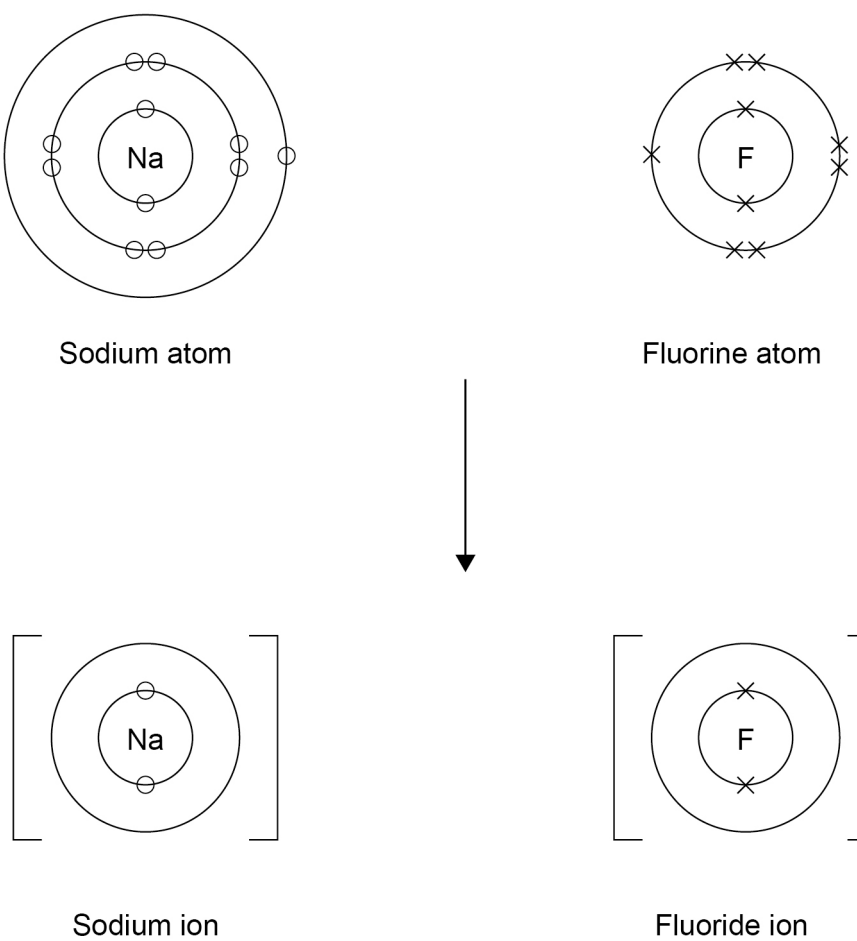
Complete **Figure 5** to show what happens when a sodium atom and a fluorine atom react to produce sodium fluoride.

You should:

- complete the electronic structures of the sodium ion and the fluoride ion
- give the charges on the sodium ion and the fluoride ion.

[3 marks]

Figure 5



12

4.1.2.5 Group 1

Question 45

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 ☐

4.1.2.5 Group 1

Question 45 · 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

4.1.2.5 Group 1

Question 45 · 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]

_____

_____

4.1.2.5 Group 1

Question 45 · 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

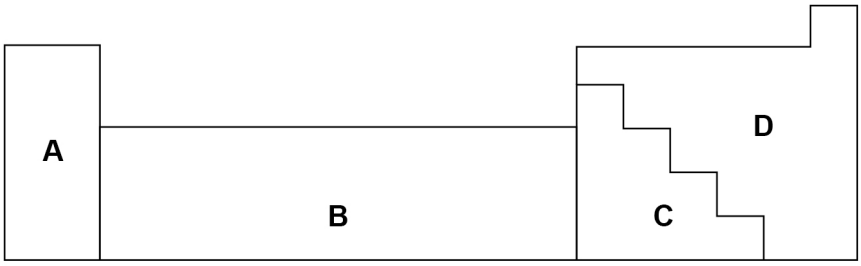
4.1.2.5 Group 1

Question 46

0 9 This question is about metals and non-metals.

Figure 15 shows an outline of part of the periodic table.

Figure 15



0 9 . 1 Element **Q** is a dull solid with a melting point of 44 °C.

Element **Q** does not conduct electricity.

Which section of the periodic table in **Figure 15** is most likely to contain element **Q**?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 9 . 2 Element **R** forms ions of formula R^{2+} and R^{3+}

Which section of the periodic table in **Figure 15** is most likely to contain element **R**?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 9 . 3 Give **two** differences between the physical properties of the elements in Group 1 and those of the transition elements.

[2 marks]

1 _____

_____

2 _____

_____

4.1.2.5 Group 1

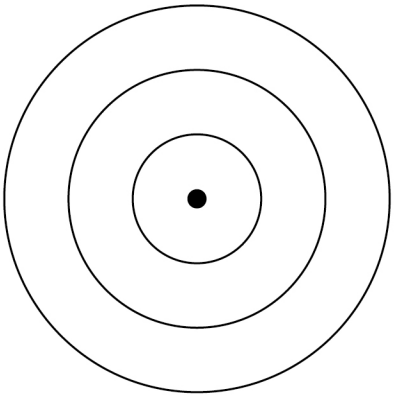
Question 46 · continued

0 9 . 4 Complete **Figure 16** to show the electronic structure of an aluminium atom.

Use the periodic table.

[1 mark]

Figure 16



0 9 . 5 Aluminium is a metal.

Describe how metals conduct electricity.

Answer in terms of electrons.

[3 marks]

0 9 . 6 Name the type of bonding in compounds formed between metals and non-metals.

[1 mark]

4.1.2.5 Group 1

Question 46 · continued

0 9 . 7 Magnesium oxide is a compound formed from the metal magnesium and the non-metal oxygen.

Describe what happens when a magnesium atom reacts with an oxygen atom.

You should refer to electrons in your answer.

[4 marks]

13

4.1.2.5 Group 1

Question 47

0 1 This question is about water.

A student investigated pure water.

The student measured:

- the boiling point of pure water
- the pH of pure water.

0 1 . 1 Complete the sentences.

Choose answers from the box.

[2 marks]

0	**4**	**7**	**10**	**25**	**100**

Pure water has a boiling point of _____ °C.

Pure water has a pH of _____.

0 1 . 2 What could the student use to measure the pH of pure water?

[1 mark]

_____

_____

4.1.2.5 Group 1

Question 47 · continued

A different student investigated sea water.

Sea water contains dissolved solids.

This is the method used.

1. Measure a 50 cm^3 sample of the sea water.
2. Heat the sample until all the water has evaporated.
3. Measure the mass of solid that remains.
4. Repeat steps 1 to 3 three more times.

0 1 . 3 Which **two** pieces of equipment were needed in this investigation?

[2 marks]

Tick (✓) **two** boxes.

- Balance ☐
- Measuring cylinder ☐
- Ruler ☐
- Thermometer ☐
- Timer ☐

Question 1 continues on the next page

Question 47 · continued

0 1 . 4 **Table 1** shows the results.

Table 1

Sea water sample	Mass of solid that remained in grams
1	1.73
2	1.70
3	1.75
4	1.78

Calculate the mean mass of solid that remained.

[2 marks]

Mean mass = _____ g

0 1 . 5 A 50 cm^3 sample of sea water from a different source contained 1.50 g of dissolved solids.

Calculate the mass of dissolved solids in 1000 cm^3 of this sea water.

[2 marks]

Mass = _____ g

4.1.2.5 Group 1

Question 47 · continued

Sodium chloride is a dissolved solid in sea water.

Sodium chloride contains sodium ions and chloride ions.

0 1 . 6 Complete the sentence.

Choose the answer from the box.

[1 mark]

crimson	**lilac**	**yellow**

The student tested sea water for sodium ions using a flame test.

The colour of the flame was _____.

0 1 . 7 Complete the sentence.

Choose the answer from the box.

[1 mark]

brown	**green**	**white**

The student tested sea water for chloride ions by adding nitric acid and silver nitrate solution.

The colour of the precipitate formed was _____.

11

4.1.2.5 Group 1

Question 48

June 2023 | 8462/1F | Original Q6

0 6 This question is about metals.

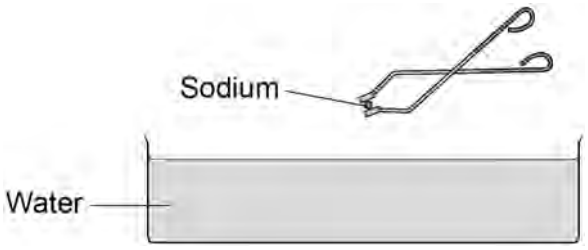
0 6 . 1 Platinum is used to make jewellery.

Suggest **one** reason why platinum is used to make jewellery.

[1 mark]

0 6 . 2 **Figure 7** shows a piece of sodium being added to water.

Figure 7



Give **two** observations that could be seen when sodium is added to water.

[2 marks]

1

2

Question 6 continues on the next page

4.1.2.5 Group 1

Question 48 · continued

0 6 . 3 Copper is a transition element.

Sodium is a Group 1 element.

What are **two** differences between copper and sodium?

[2 marks]

Tick (✓) **two** boxes.

- Copper has a lower melting point. ☐
- Copper is harder. ☐
- Copper is less dense. ☐
- Copper is less reactive. ☐
- Copper is less strong. ☐

4.1.2.5 Group 1

Question 48 · continued

0 6 . 4 The metals aluminium and copper can be used to make pans for cooking.

Table 2 shows information about the two metals.

The higher the value for thermal conductivity, the better the metal conducts thermal energy.

Table 2

	Aluminium	Copper
Thermal conductivity in arbitrary units	250	400
Density in g/cm^3	2.7	8.9
Cost of metal per kg in £	1.50	7.00

Evaluate the use of pans made of aluminium and of copper.

Use **Table 2**.

[4 marks]

9

4.1.2.5 Group 1

Question 49

June 2023 | 8462/2F | Original Q10

1 0 This question is about chemical analysis.

Potassium bromide is used in medicine.

A scientist tested a sample of medicine to show the presence of potassium ions and of bromide ions.

The sample is soluble in water.

1 0 . 1 Plan a method the scientist could use to show that the sample of medicine contains potassium ions **and** bromide ions.

The scientist has:

- a Bunsen burner
- a metal wire
- test tubes
- a dropping pipette
- distilled water
- dilute nitric acid
- silver nitrate solution.

You should give the results of the tests.

[6 marks]

4.1.2.5 Group 1

Question 49 · continued

The scientist could also use an instrumental method to show the presence of potassium ions in the medicine.

10.2 Which instrumental method could be used to show the presence of potassium ions in the medicine?

[1 mark]

10.3 Give **one** advantage of using this instrumental method instead of a chemical test.

[1 mark]

8

4.1.2.5 Group 1

Question 50

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 _____

_____

4.1.2.5 Group 1

Question 50 · continued

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

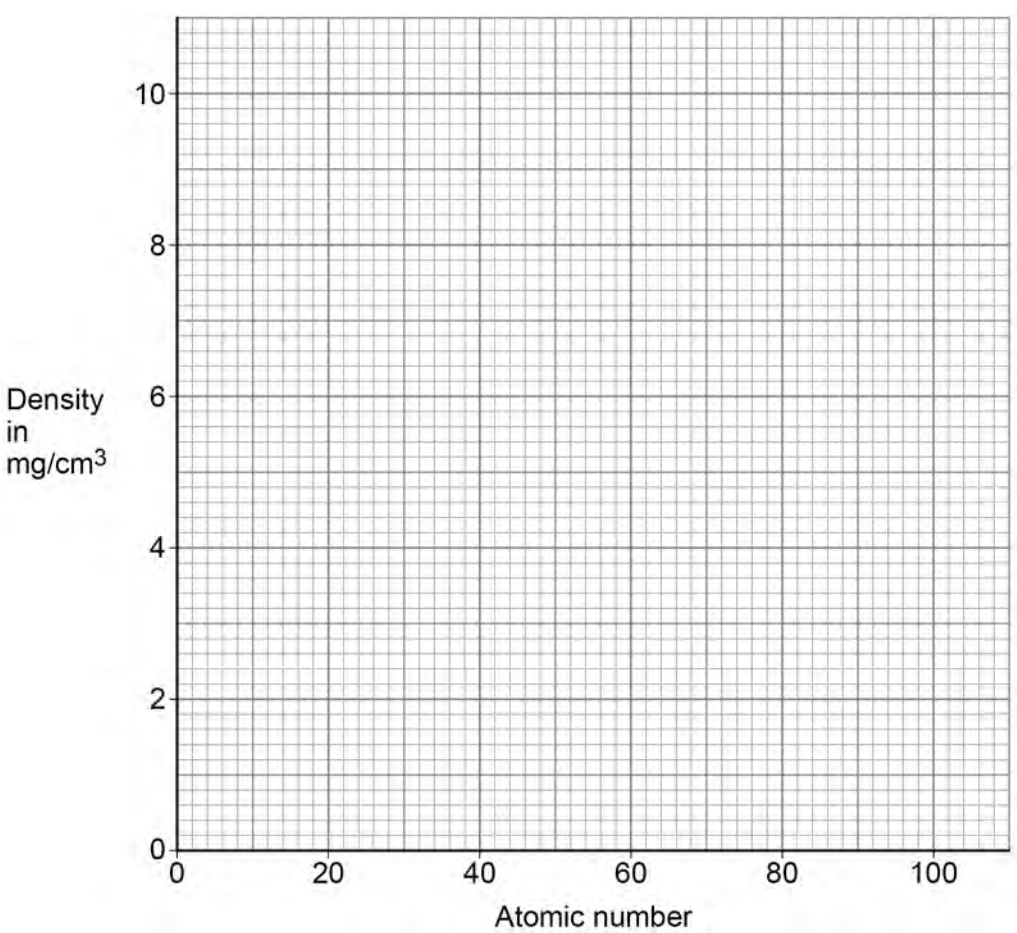
Table 4

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



4.1.2.5 Group 1

Question 50 · 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

4.1.2.5 Group 1

Question 51

June 2025 | 8462/1F | Original Q10

1 0 This question is about metals and metal oxides.

Tin (Sn) is extracted from tin oxide using carbon.

The equation for the reaction is:

$$SnO_2 + C \longrightarrow Sn + CO_2$$

1 0 . 1 Which substance is reduced in this reaction?

Give **one** reason for your answer.

Answer in terms of oxygen.

[2 marks]

Substance reduced _____

Reason _____

_____

1 0 . 2 Why can carbon be used to extract tin from tin oxide?

[1 mark]

_____

_____

Question 10 continues on the next page

4.1.2.5 Group 1

Question 51 · continued

1 0 . 3 Cadmium (Cd) can be extracted by the reaction of cadmium oxide with carbon.

The equation for the reaction is:

$$CdO + C \longrightarrow Cd + CO$$

Calculate the percentage atom economy for the production of cadmium in this reaction.

Relative atomic masses (A_r): C = 12 Cd = 112

Relative formula mass (M_r): CdO = 128

[3 marks]

Percentage atom economy = _____ %

1 0 . 4 Tungsten is a transition metal.

Potassium is a Group 1 metal.

Give **two** differences between the properties of tungsten and the properties of potassium.

[2 marks]

1 _____

2 _____

4.1.2.5 Group 1

Question 51 · continued

Tungsten oxide reacts with hydrogen to give tungsten (W) and water.

10.5 The equation for the reaction is:

$$WO_3 + 3\,H_2 \longrightarrow W + 3\,H_2O$$

The law of conservation of mass states:

'The mass of the products equals the mass of the reactants during a chemical reaction.'

Show that the equation obeys the law of conservation of mass.

Relative atomic mass (A_r): W = 184

Relative formula masses (M_r): H_2 = 2 WO_3 = 232 H_2O = 18

[2 marks]

10.6 The reaction producing tungsten has a high atom economy.

Why is it important to use reactions with a high atom economy in industry?

[1 mark]

11