

# AQA Style

## GCSE

## COMBINED SCIENCE: TRILOGY

Foundation Tier

Chemistry Paper 1

# F

Time allowed: 1 hour 15 minutes

### Materials

- A ruler
- A pen and pencil
- A calculator
- Periodic Table of Elements

### Instructions and Information

- Answer all the questions using a black pen.
- Answer the questions in the space available and cross out any work you do not want to be marked.
- In any calculations make sure you show your working out.
- The marks for each question are shown in brackets.
- The maximum mark for the paper is 70.
- You must make your work as neat as possible and use good English in your answers.
- You should make sure you leave time to check your answers.

Question	Mark
1	
2	
3	
4	
5	
6	
7	
<b>Total</b>	

Name \_\_\_\_\_

Date \_\_\_\_\_

0 1 Sodium is found in Group 1 of the periodic table.

0 1 . 1 What name is given to the elements in Group 1?

Tick **one** box.

acidic metals

alkali metals

non-metals

transition metals

[1 mark]

0 1 . 2 Sodium reacts with chlorine.

Chlorine is a halogen.

Which group in the periodic table contains the halogens?

Tick **one** box.

Group 0

Group 2

Group 6

Group 7

[1 mark]

0 1 . 3 **Figure 1** shows part of a dot and cross diagram to represent the formation of sodium chloride.

Complete the dot and cross diagram.

You should only show the electrons in the outer shells.

[2 mark]

**Figure 1**



0 1 . 4 Complete the sentence. Choose the answer from the box.

[1 mark]

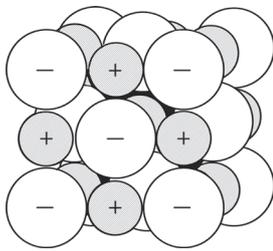
covalent	ionic	metallic
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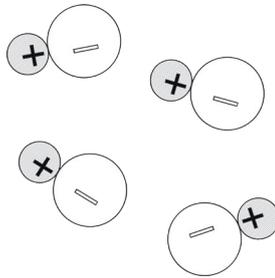
The type of bonding in sodium chloride is \_\_\_\_\_ bonding.

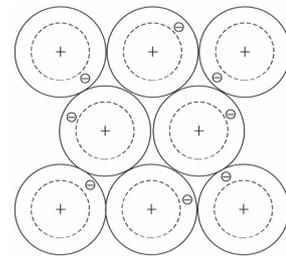
0 1 . 5 Which structure represents the arrangement of particles in sodium chloride?

Tick **one** box.

[1 mark]








0 1 . 6 Complete the sentences. Choose answers from the box.

[2 marks]

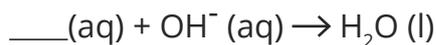
atoms	electrostatic	ions	magnetic	metallic	molecules
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The compound is held together by \_\_\_\_\_ forces.

These forces act between oppositely charged \_\_\_\_\_ .

0 | 2

A neutralisation reaction can be represented by the equation:



0 | 2 | . | 1

Which ion is missing from the equation?

Tick **one** box.

H<sup>+</sup>

Na<sup>+</sup>

O<sup>-</sup>

SO<sub>4</sub><sup>-</sup>

[1 mark]

0 | 2 | . | 2

What does the state symbol (aq) mean?

Tick **one** box.

dissolved in water

liquid

insoluble

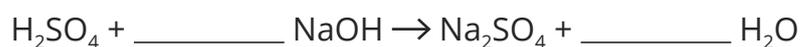
ionic

[1 mark]

0 | 2 | . | 3

The reaction between sulfuric acid and sodium hydroxide is an example of a neutralisation reaction.

Balance the chemical equation for the reaction.



[2 marks]

0 | 2 | . | 4

A teacher demonstrated the reaction and then added universal indicator to the solution produced.

[1 mark]

What colour did the universal indicator turn?

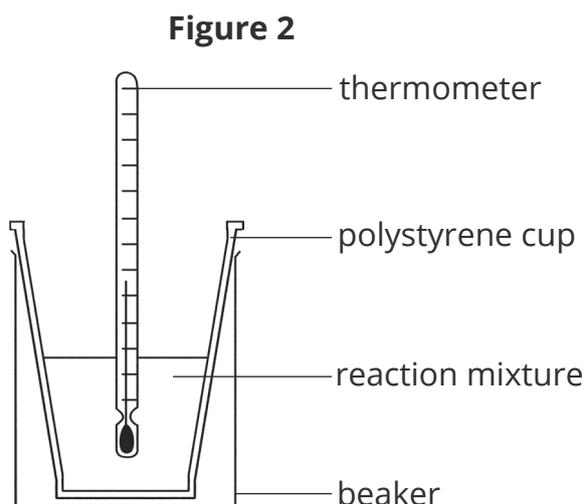
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02.5 Some students investigated how the temperature change of the reaction mixture was affected by the volume of sodium hydroxide added.

They used the following method:

1. Pour  $30\text{cm}^3$  of dilute sulfuric acid into a polystyrene cup.
2. Measure the temperature of the acid using a thermometer.
3. Add  $5\text{cm}^3$  sodium hydroxide to the polystyrene cup and stir gently.
4. When the reading on the thermometer stops changing, record the maximum temperature reached.
5. Rinse out the polystyrene cup with water.
6. Repeat the experiment 5 more times, increasing the volume of the sodium hydroxide by  $5\text{cm}^3$  each time.

A diagram of the equipment is shown in **Figure 2**.



Complete the sentence to explain why the students used a polystyrene cup in the investigation.

Choose the answer from the box.

[1 mark]

conductor      indicator      insulator      transmitter

Polystyrene is a good thermal \_\_\_\_\_ .

0 2 . 6 Give **one** other way that the students could reduce heat loss to the surroundings.

[1 mark]

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0 2 . 7 **Table 1** shows the students' results.

**Table 1**

Volume of Sodium Hydroxide Added (cm <sup>3</sup> )	Start Temperature (°C)	Mean Maximum Temperature (°C)
5	19	22
10	19	23
15	19	24
20	20	26
25	20	27
30	20	28

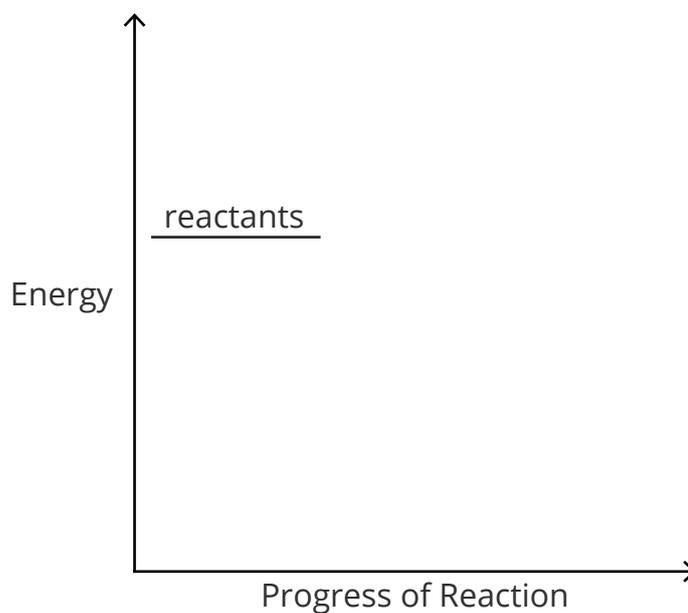
**Figure 3** shows part of the reaction profile for the reaction between sulfuric acid and sodium hydroxide.

The reaction is exothermic.

Complete the reaction profile in **Figure 3**.

[2 marks]

**Figure 3**



0 3

This question is about carbon.

0 3 . 1

Give the electronic structure of carbon.

Use the periodic table to help you.

[1 mark]

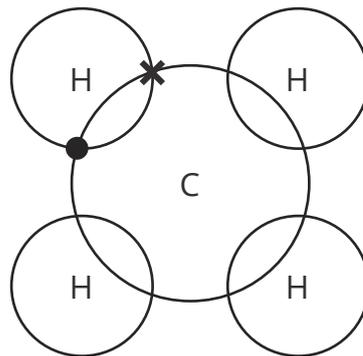
0 3 . 2

Methane is formed when a carbon atom forms bonds with four hydrogen atoms.

Complete the dot and cross diagram in **Figure 4** to show the bonds in methane.

You should only show the electrons in the outer shells.

[1 mark]

**Figure 4**

0 3 . 3

Methane is a small molecule.

What are the properties of small molecules?

Tick **two** boxes.

[2 marks]

conduct electricity

high melting point

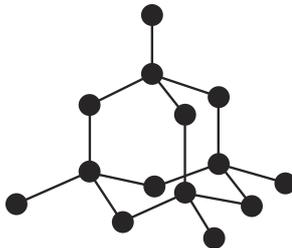
low boiling point

weak intermolecular forces

03.4 Diamond is formed when carbon atoms bond to other carbon atoms.

Figure 5 shows part of the structure of diamond.

Figure 5



Explain why diamond is very hard.

[2 marks]

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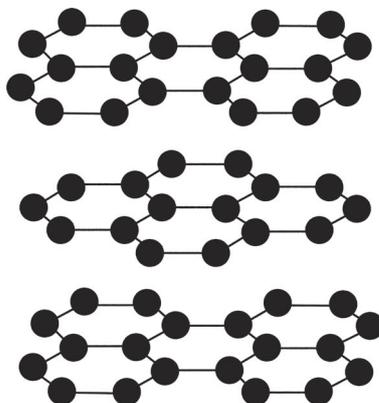
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03.5 Figure 6 shows part of the structure of graphite.

Figure 6



Explain why graphite can conduct electricity.

[2 marks]

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0 3 . 6 Fullerenes are molecules of carbon with hollow shapes.

Give **one** use of fullerenes.

[1 mark]

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9

**Turn over for the next question**

0 4 Magnesium carbonate is a compound with the formula  $\text{MgCO}_3$ .

0 4 . 1 Calculate the relative formula mass ( $M_r$ ) of magnesium carbonate.

[3 marks]

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relative formula mass = \_\_\_\_\_

0 4 . 2 Magnesium carbonate reacts with hydrochloric acid to produce a salt, water and a gas.

Complete the word equation for the reaction.

[2 marks]

hydrochloric acid + magnesium carbonate  $\rightarrow$  \_\_\_\_\_ + water + \_\_\_\_\_

0 4 . 3 A student added 84g of magnesium carbonate to 73g of hydrochloric acid.

Calculate the total mass of the products of the reaction.

[1 mark]

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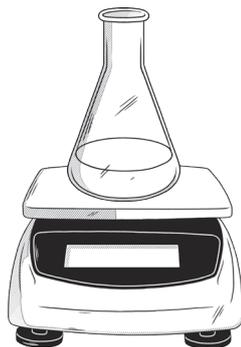


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mass of products = \_\_\_\_\_ g

- 0 4 . 4 When the reaction was complete, the students measured the mass of the products. The equipment they used is shown in **Figure 7**.

**Figure 7**



The students' measurement of the mass of the products was lower than they expected.

Explain why.

[2 marks]

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- 0 4 . 5 Describe a method that the student could use to prepare a solid sample of the salt from the solution.

[3 marks]

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0 5

**Table 2** shows the melting and boiling points of the halogens.

**Table 2**

Halogen	Melting Point	Boiling Point
fluorine	-220	-188
chlorine	-101	-35
bromine	-7	59
iodine	114	184

0 5 . 1

What is the state of chlorine at room temperature?

Tick **one** box.

[1 mark]

gas

liquid

solid

0 5 . 2

**Table 3** describes how the halogens react with hydrogen.

**Table 3**

Halogen	Observation of Reaction
fluorine	explosive
chlorine	explosive in light, reacts slowly in the dark
bromine	only reacts at temperatures over 300°C in the presence of a catalyst

Explain the trend in reactivity.

[4 marks]

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05.3 Chlorine reacts with potassium bromide.

Complete the word equation to show the products of the reaction.

[2 marks]



05.4 What is the name of the type of reaction shown by the equation in **05.3**?

[1 mark]

\_\_\_\_\_

05.5 A student adds iodine to potassium bromide.

Explain what will happen.

[2 marks]

\_\_\_\_\_  
\_\_\_\_\_

10

**Turn over for the next question**



06.2 We now know that atoms contain protons, neutrons and electrons.

A boron atom has the symbol  ${}^{11}_5\text{B}$ .

Determine the number of neutrons in an atom of boron.

[1 mark]

\_\_\_\_\_

\_\_\_\_\_

number of neutrons = \_\_\_\_\_

06.3 There are two isotopes of boron.



Give **one** similarity and **one** difference between the two isotopes of boron.

[2 marks]

Similarity \_\_\_\_\_

\_\_\_\_\_

Difference \_\_\_\_\_

\_\_\_\_\_

06.4 The abundance of  ${}^{10}_5\text{B}$  is 20%.

The abundance of  ${}^{11}_5\text{B}$  is 80%.

Calculate the relative atomic mass of boron.

[2 marks]

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

relative atomic mass = \_\_\_\_\_

07

**Table 4** describes the reactions of some metals in water and in acid at room temperature.

**Table 4**

Metal	Reaction with Water	Reaction with Dilute Acid
A	very slow reaction	fizzes
B	no reaction	no reaction
C	fizzes	violent reaction

07.1

Identify each metal.

Draw **one** line from each box.

[2 marks]

**Metal**

A

B

C

**Name**

copper

lithium

zinc

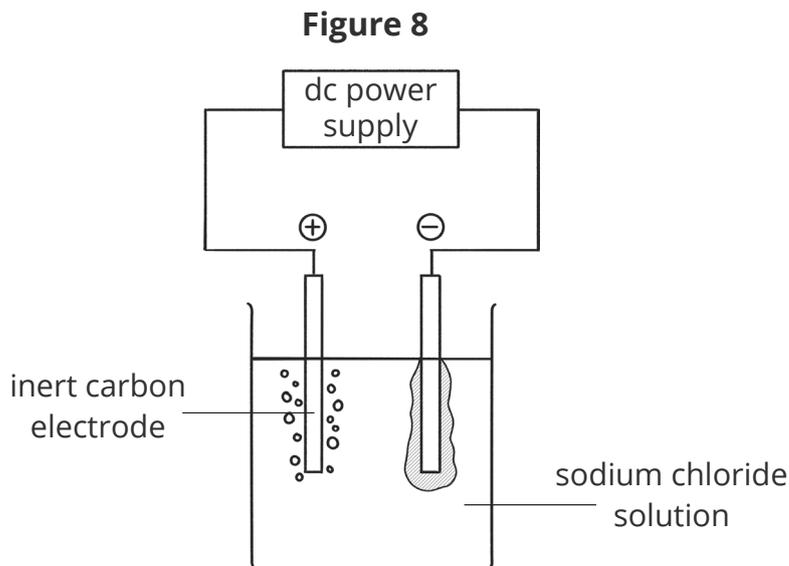
07.2

Name the gas that is released when metal **A** reacts with dilute acid.

[1 mark]

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07.3 **Figure 8** shows the apparatus used for the electrolysis of  $100\text{cm}^3$  sodium chloride.



The sodium chloride solution has a concentration of 300 grams per  $\text{dm}^3$ .

Calculate the mass of sodium chloride used in the experiment.

[3 marks]

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mass of sodium chloride = \_\_\_\_\_ g

07.4 Determine the gas produced at each electrode.

Draw **one** line from each electrode to the gas produced.

[2 marks]

<b>Electrode</b>	<b>Gas</b>
positive electrode (anode)	chlorine
negative electrode (cathode)	hydrogen
	oxygen
	sodium hydroxide

