

Please write clearly in block capitals.

Centre number

| | | | | |
|--|--|--|--|--|
| | | | | |
|--|--|--|--|--|

Candidate number

| | | | |
|--|--|--|--|
| | | | |
|--|--|--|--|

Surname

Forename(s)

Candidate signature

GCSE COMBINED SCIENCE: TRILOGY

H

Higher Tier
Chemistry Paper 1H

Thursday 17 May 2018

Morning

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the periodic table (enclosed).

Instructions

- Use black ink or black ball-point pen.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do all rough work in this book. Cross through any work you do not want to be marked.
- In all calculations, show clearly how you work out your answer.

Information

- The maximum mark for this paper is 70.
- The marks for questions are shown in brackets.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.

| For Examiner's Use | |
|--------------------|------|
| Question | Mark |
| 1 | |
| 2 | |
| 3 | |
| 4 | |
| 5 | |
| 6 | |
| 7 | |
| 8 | |
| TOTAL | |

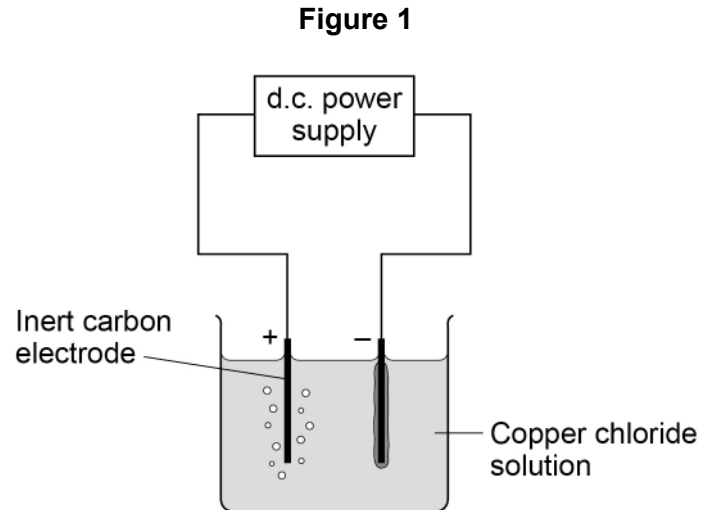


0 1

This question is about electrolysis.

A student investigates the mass of copper produced during electrolysis of copper chloride solution.

Figure 1 shows the apparatus.



0 1 . 1

Which gas is produced at the positive electrode (anode)?

[1 mark]

Tick **one** box.

carbon dioxide

chlorine

hydrogen

oxygen



0 1 . 2 Copper is produced at the negative electrode (cathode).

What does this tell you about the reactivity of copper?

[1 mark]

Tick **one** box.

Copper is less reactive than hydrogen

Copper is less reactive than oxygen

Copper is more reactive than carbon

Copper is more reactive than chlorine

Table 1 shows the student's results.

Table 1

| Time in mins | Total mass of copper produced in mg | | | |
|--------------|-------------------------------------|--------------|--------------|------|
| | Experiment 1 | Experiment 2 | Experiment 3 | Mean |
| 1 | 0.60 | 0.58 | 0.62 | 0.60 |
| 2 | 1.17 | 1.22 | 1.21 | 1.20 |
| 4 | 2.40 | 2.41 | 2.39 | 2.40 |
| 5 | 3.02 | X | 3.01 | 3.06 |

0 1 . 3 Determine the **mean** mass of copper produced after 3 minutes.

[1 mark]

Mass = _____ mg

Question 1 continues on the next page

Turn over ►



0 1 . 4 Calculate the mass **X** of copper produced in **Experiment 2** after 5 minutes.

Use **Table 1** on page 3

[2 marks]

Mass **X** = _____ mg

0 1 . 5 The copper chloride solution used in the investigation contained 300 grams per dm^3 of solid CuCl_2 dissolved in 1 dm^3 of water.

The student used 50 cm^3 of copper chloride solution in each experiment.

Calculate the mass of solid copper chloride used in each experiment.

[3 marks]

Mass = _____ g

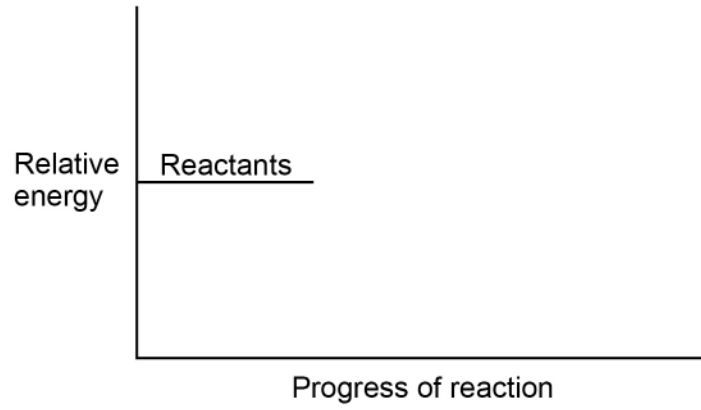


0 2 . 3 The reaction between sodium and chlorine is an exothermic reaction.

Complete the reaction profile for the reaction between sodium and chlorine.

[2 marks]

Figure 3



8



0 4 This question is about the halogens.

0 4 . 1 Write the state symbol for chlorine at room temperature.

[1 mark]

Cl₂ (_____)

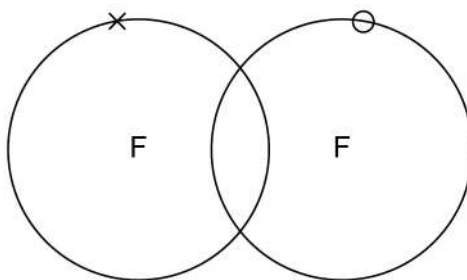
0 4 . 2 **Figure 4** represents one molecule of fluorine.

Complete the dot and cross diagram on **Figure 4**

You should show only the electrons in the outer shells.

[2 marks]

Figure 4



0 4 . 3 A fluorine atom can be represented as ${}_{9}^{19}\text{F}$

What is the total number of electrons in a fluorine molecule (F₂)?

[1 mark]

Tick **one** box.

9

14

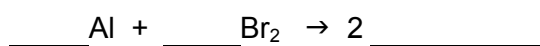
18

38

0 4 . 4 Aluminium reacts with bromine to produce aluminium bromide.

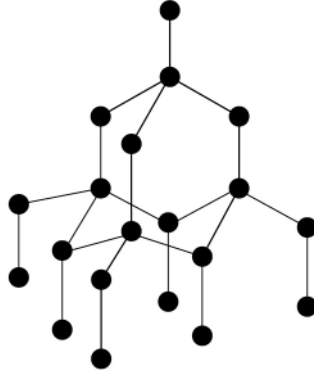
Complete the balanced chemical equation for this reaction.

[2 marks]



0 5

This question is about structure and bonding.

0 5 . 1**Figure 5** shows part of the structure and bonding in diamond.**Figure 5**

Explain why diamond has a high melting point.

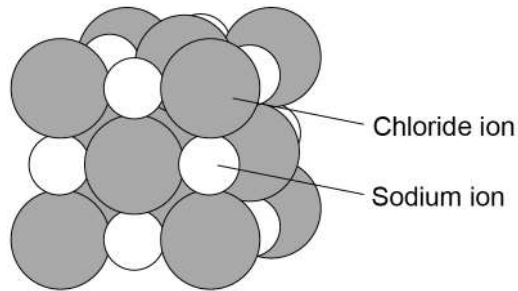
[3 marks]



0 5 . 2

Figure 6 shows part of the structure and bonding in sodium chloride (NaCl).

Figure 6



Explain the conditions needed for sodium chloride to conduct electricity.

[3 marks]

Question 5 continues on the next page

Turn over ►



0 6

Group 2 metal carbonates thermally decompose to produce a metal oxide and a gas.

0 6 . 1Give the formula of each product when calcium carbonate (CaCO_3) is heated.**[2 marks]**

_____ and _____

0 6 . 2The relative formula mass (M_r) of a Group 2 metal carbonate is 197Relative atomic masses (A_r): C = 12 O = 16Calculate the relative atomic mass (A_r) of the Group 2 metal in the metal carbonate.

Name the Group 2 metal.

[3 marks]

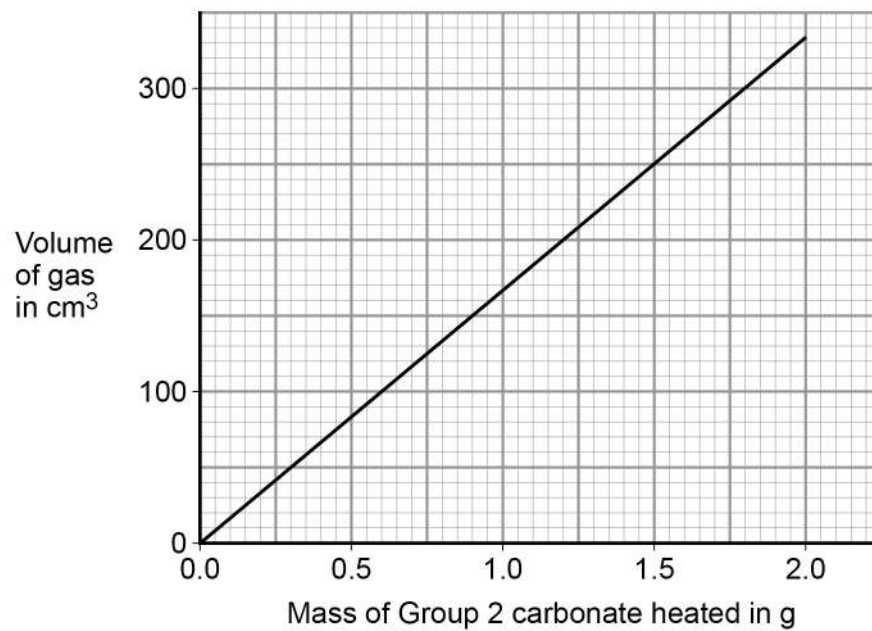
Relative atomic mass (A_r) = _____

Metal _____

Question 6 continues on the next page**Turn over ►**

Figure 8 shows the volume of gas produced when a different Group 2 carbonate, **W**, is heated.

Figure 8



0 6 . 3 Calculate the gradient of the line in **Figure 8**

Give the unit.

[3 marks]

Gradient _____

Unit _____



07

A scientist does two tests on four white solids. The solids are labelled **A**, **B**, **C** and **D**.

Test 1 Adds the sample of the solid to distilled water and stirs.

Test 2 Measures the pH of the solution after **Test 1**

Table 2 shows the results.

Table 2

| Solid | Appearance after stirring | pH |
|----------|------------------------------------|----|
| A | colourless solution, no solid | 14 |
| B | colourless solution, no solid | 3 |
| C | colourless solution, solid remains | 9 |
| D | colourless liquid, solid remains | 7 |

These four solids are:

- magnesium oxide
- phosphorus oxide
- silicon dioxide
- sodium oxide.

Table 3 shows the solubility of these four solids in water.

Table 3

| Solid | Solubility in grams per 100 cm ³ of water |
|------------------|--|
| Magnesium oxide | 0.01 |
| Phosphorus oxide | 52 |
| Silicon dioxide | 0 |
| Sodium oxide | 109 |

Do not write
outside the
box



0 7 . 2 10 cm³ of solution **B** is added to a beaker.

Distilled water is added to the beaker until the final volume in the beaker is 1000 cm³

The pH of the solution is measured before and after distilled water is added.

Table 4 shows the results.

Table 4

| Volume of solution in beaker | pH of solution B |
|------------------------------|------------------|
| 10 cm ³ | 3 |
| 1000 cm ³ | X |

Calculate the value of **X**.

[2 marks]

X = _____



0 8

This question is about iron.

Iron reacts with dilute hydrochloric acid to produce iron chloride solution and one other product.

0 8 . 1

Name the other product.

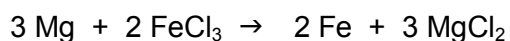
[1 mark]

0 8 . 2

Suggest how any unreacted iron can be separated from the mixture.

[1 mark]

Magnesium reacts with iron chloride solution.

**0 8 . 3**

0.120 g of magnesium reacts with excess iron chloride solution.

Relative atomic masses (A_r): Mg = 24 Fe = 56

Calculate the mass of iron produced, in mg

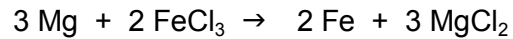
[5 marks]

Mass of iron = _____ mg

Question 8 continues on the next page**Turn over ►**

08.4

Explain which species is reduced in the reaction between magnesium and iron chloride.



Your answer should include the half equation for the reduction.

[3 marks]

10**END OF QUESTIONS****Copyright information**

For confidentiality purposes, from the November 2015 examination series, acknowledgements of third party copyright material will be published in a separate booklet rather than including them on the examination paper or support materials. This booklet is published after each examination series and is available for free download from www.aqa.org.uk after the live examination series.

Permission to reproduce all copyright material has been applied for. In some cases, efforts to contact copyright-holders may have been unsuccessful and AQA will be happy to rectify any omissions of acknowledgements. If you have any queries please contact the Copyright Team, AQA, Stag Hill House, Guildford, GU2 7XJ.

Copyright © 2018 AQA and its licensors. All rights reserved.

