

Please write clearly in block capitals.

F

Centre number

Candidate
number

Surname

Forename(s)

Candidate signature

I declare this is my own work.

GCSE

COMBINED SCIENCE: TRILOGY

Foundation Tier Chemistry Paper 1

Practice Paper Series – Set 1

Time allowed: 1 hour 15 minutes

Materials

For this paper you must have:

- a ruler
- a scientific calculator
- the periodic table (printed at the back of this booklet).

Instructions

- Use black ink or black ball-point pen.
- Pencil should only be used for drawing.
- Fill in the boxes at the top of this page.
- Answer **all** questions in the spaces provided.
- Do not write outside the box around each page or on blank pages.
- If you need extra space for your answer(s), use the lined pages at the end of this book. Write the question number against your answer(s).
- 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 marks for questions are shown in brackets.
- The maximum mark for this paper is 70.
- You are expected to use a calculator where appropriate.
- You are reminded of the need for good English and clear presentation in your answers.
- When answering question 09.1 you need to make sure that your answer:
 - is clear, logical, sensibly structured
 - fully developed
 - shows how the points that you make are related or follow on from each other where appropriate.

For Examiner's Use

Question	Mark
1	
2	
3	
4	
5	
6	
7	
8	
9	
TOTAL	

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sciencegcse.co.uk | Practice Paper Series – Set 1 | SGC/S1/C/1F

0 1 Atoms contain protons, neutrons and electrons.

0 1 . 1 Complete **Table 1** to show the relative mass and relative charge of each particle. [3 marks]

Table 1

Particle	Relative mass	Relative charge
Proton	1	
Neutron		0
Electron	very small	

An atom of aluminium can be represented as:



0 1 . 2 How many protons are there in one atom of aluminium? [1 mark]

Number of protons = ...

0 1 . 3 How many neutrons are there in one atom of aluminium? [1 mark]

Number of neutrons = ...

0 1 . 4 Give the electronic structure of an aluminium atom. [1 mark]

Electronic structure:

0 1 . 5 Where is most of the mass of an atom? [1 mark]

Tick (✓) **one** box.

- | | |
|--------------------------------|--------------------------|
| In the electrons | ☐ |
| In the nucleus | ☐ |
| In the outer shell | ☐ |
| Spread evenly through the atom | ☐ |

0 1 . 6 The radius of an atom is about 0.1 nm. [1 mark]

$$1 \text{ nm} = 1 \times 10^{-9} \text{ m}$$

Give the radius of an atom in metres.

Radius = ... m

Turn over for the next question

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0 2 Lithium, sodium and potassium are in Group 1 of the periodic table.

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

0 2 . 1 Which of these would the students observe? [1 mark]

Tick (✓) **one** box.

The sodium sinks and slowly dissolves

☐

The sodium fizzes and moves around on the surface

☐

The water freezes

☐

A white precipitate forms

☐

0 2 . 2 Complete the word equation for the reaction of sodium with water. [2 marks]

sodium + water → + ...

0 2 . 3 Which of the three metals reacts most vigorously with water? [1 mark]

0 2 . 4 Explain why the reactivity of the Group 1 metals increases down the group. [2 marks]

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0 2 . 5 After the reaction, universal indicator was added to the water in the trough. [2 marks]

Give the colour of the indicator **and** explain why it changes to this colour.

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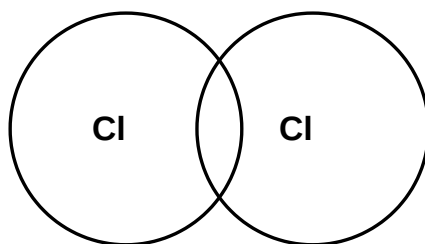
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Turn over for the next question

0 3 Chlorine exists as molecules, Cl₂.

Figure 1 shows the outer shells of two chlorine atoms.

Figure 1



0 3 . 1 Complete the dot and cross diagram in **Figure 1** to show the bonding in a chlorine molecule. [2 marks]

Show only the outer shell electrons.

0 3 . 2 What type of bond holds the two chlorine atoms together? [1 mark]
Tick (✓) **one** box.

- | | |
|----------------|--------------------------|
| Covalent | ☐ |
| Ionic | ☐ |
| Metallic | ☐ |
| Intermolecular | ☐ |

0 3 . 3 Chlorine is a gas at room temperature. [2 marks]
Explain why chlorine has a low boiling point.

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0 3 . 4 Sodium reacts with chlorine to form sodium chloride, an ionic compound. [1 mark]

Describe how a sodium atom changes into a sodium ion, Na⁺.

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Question 3 continues on the next page

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- 0 3 . 5** Solid sodium chloride does **not** conduct electricity. [2 marks]
 Molten sodium chloride does conduct electricity.
 Explain why.

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- 0 4** Calcium carbonate, CaCO_3 , breaks down when it is heated.



- 0 4 . 1** Calculate the relative formula mass (M_r) of calcium carbonate, CaCO_3 . [2 marks]
 Relative atomic masses (A_r): C = 12 O = 16 Ca = 40

Relative formula mass = ...

- 0 4 . 2** In a chemical reaction the total mass of the products is equal to the total [1 mark]
 mass of the reactants.
 Explain why.

.....

.....

A student heated 10.0 g of calcium carbonate in an open crucible.

After heating, the mass of the solid in the crucible was 5.6 g.

- 0 4 . 3** Explain why the mass of the solid decreased. [1 mark]

.....

.....

- 0 4 . 4** Calculate the percentage decrease in the mass of the solid. [2 marks]

Percentage decrease = ... %

- 0 4 . 5** Calculate the percentage by mass of calcium in calcium carbonate. [2 marks]
Use your answer to **04.1**.

Percentage of calcium = ... %

- 0 4 . 6** The student made 200 cm³ of a solution containing 8.0 g of salt. [2 marks]
Calculate the concentration of the solution in g/dm³.

Concentration = ... g/dm³

- 0 5** A student added small pieces of four metals to dilute hydrochloric acid.
Table 2 shows the observations.

Table 2

Metal	Observation
Copper	No bubbles
Iron	A few bubbles
Magnesium	Many bubbles, very fast
Zinc	Steady stream of bubbles

- 0 5 . 1** Use **Table 2** to put the four metals in order of reactivity. [2 marks]

Most reactive

.....

.....

Least reactive

.....

Question 5 continues on the next page

- 0 5 . 2** Some metals are extracted from their oxides by heating with carbon. [1 mark]
Which metal **cannot** be extracted by heating its oxide with carbon?
Tick (✓) **one** box.

Aluminium

☐

Copper

☐

Iron

☐

Zinc

☐

- 0 5 . 3** Zinc is extracted by heating zinc oxide with carbon. [2 marks]
Complete the word equation for this reaction.

zinc oxide + carbon → + ...

- 0 5 . 4** In this reaction zinc oxide is reduced. [2 marks]
What is meant by **reduced**?
Explain your answer.

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- 0 6** A student made copper sulfate crystals.
This is the method used.

1. Warm some dilute sulfuric acid in a beaker.
2. Add copper oxide powder and stir until no more reacts.
3. Remove the unreacted copper oxide.
4. Obtain crystals from the solution.

- 0 6 . 1** Name the type of reaction that takes place between copper oxide and [1 mark]
sulfuric acid.
Tick (✓) **one** box.

Combustion

☐

Displacement

☐

Electrolysis

☐

Neutralisation

☐

- 0 6 . 2** Copper sulfate is one product of the reaction. [1 mark]
Name the other product.

.....

06.3 Explain why the student added copper oxide until no more reacted. [1 mark]

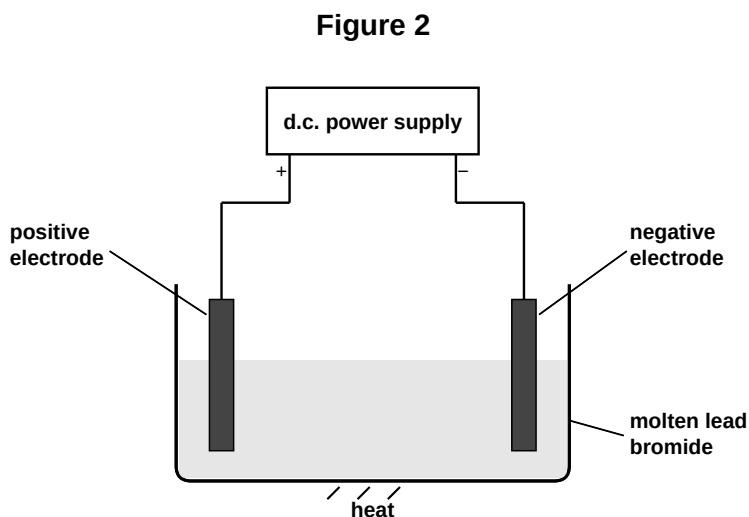
06.4 How should the student remove the unreacted copper oxide in step 3? [1 mark]

06.5 Describe how the student should obtain dry copper sulfate crystals from the solution in step 4. [2 marks]

06.6 The solution is acidic. [1 mark]
Give a possible pH of the solution.

pH = ...

07 A teacher passed electricity through molten lead bromide.
Figure 2 shows the apparatus.



07.1 Explain why the lead bromide must be molten for electrolysis to happen. [1 mark]

0 7 . 2 Complete the sentences.

[2 marks]

Use words from the box.

bromine hydrogen lead oxygen

At the negative electrode is formed.

At the positive electrode is formed.

0 7 . 3 The electrodes are made of graphite.

[1 mark]

Give **one** reason why graphite is a suitable material for the electrodes.

Aluminium is extracted from aluminium oxide by electrolysis.

0 7 . 4 Explain why aluminium **cannot** be extracted by heating aluminium oxide with carbon. [1 mark]

0 7 . 5 The aluminium oxide is mixed with cryolite. [1 mark]

Why is cryolite used?

0 7 . 6 Give **one** reason why extracting aluminium by electrolysis is expensive. [1 mark]

Turn over for the next question

08

A student investigated the temperature change when different metals react with dilute hydrochloric acid.

The student added 1 g of each metal to 25 cm³ of acid and measured the temperature rise. Each test was repeated three times.

Table 3 shows the results.

Table 3

Metal	Temperature rise in °C			Mean temperature rise in °C
	Test 1	Test 2	Test 3	
Magnesium	32	30	34	32
Zinc	12	14	13	
Iron	4	5	6	5
Copper	0	0	0	0

08.1

The temperature of the acid increased when magnesium was added.

[1 mark]

What type of reaction is this?

Tick (✓) **one** box.

Endothermic

☐

Exothermic

☐

Reversible

☐

Thermal decomposition

☐

08.2

Calculate the mean temperature rise for zinc.

[1 mark]

Write your answer in **Table 3**.

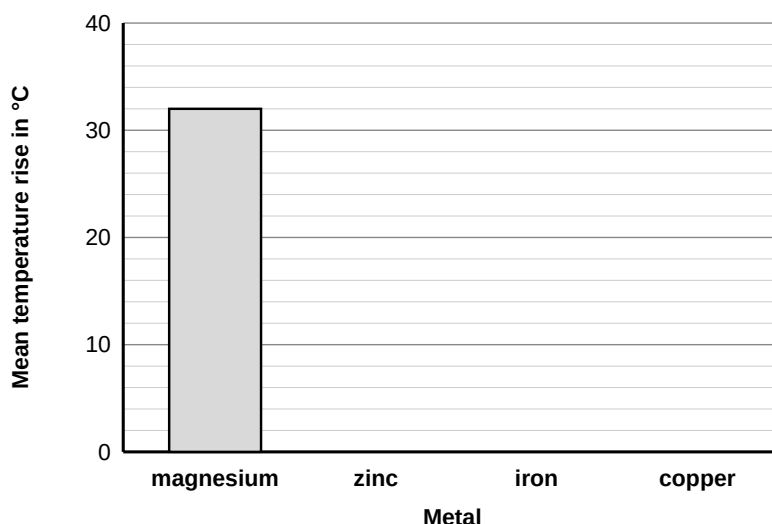
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Question 8 continues on the next page

- 0 8 . 3** Complete the bar chart in **Figure 3** to show the mean temperature rise for zinc and for iron. [2 marks]

The bar for magnesium has been drawn for you. Copper has no bar because its temperature rise was 0 °C.

Figure 3



- 0 8 . 4** Hand warmers use a reaction between a metal and another substance to release energy. [2 marks]

Which of the four metals would be best to use in a hand warmer?

Give a reason for your answer.

Metal

.....

- 0 8 . 5** Suggest why there was no temperature rise for copper. [1 mark]

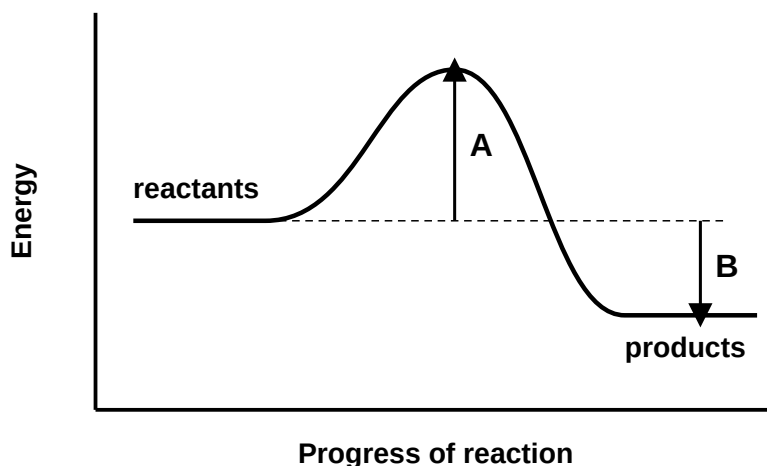
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- 0 8 . 6** How many times greater is the mean temperature rise for magnesium than the mean temperature rise for iron? [1 mark]

Number of times greater = ...

Figure 4 shows the reaction profile for the reaction of magnesium with hydrochloric acid.

Figure 4



08.7 Which letter, **A** or **B**, shows the activation energy? [1 mark]

Letter

09 Diamond and graphite are both made of carbon atoms.
Table 4 shows some properties of diamond and graphite.

Table 4

Property	Diamond	Graphite
Hardness	Very hard	Soft, slippery
Conducts electricity?	No	Yes
Melting point	Very high	Very high

09.1 Explain the properties of diamond and graphite shown in **Table 4**. [6 marks]
 Use ideas about structure and bonding in your answer.

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END OF QUESTIONS

Additional page, if required.

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Write the question numbers in the left-hand margin.

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There are no more questions in this paper. Original practice paper © sciencegcse.co.uk – free to use for non-commercial education. Not an AQA paper.

The Periodic Table of Elements

1	2											3	4	5	6	7	0
relative atomic mass atomic symbol name atomic (proton) number Key												1 H hydrogen 1					4 He helium 2
7 Li lithium 3	9 Be beryllium 4											11 B boron 5	12 C carbon 6	14 N nitrogen 7	16 O oxygen 8	19 F fluorine 9	20 Ne neon 10
23 Na sodium 11	24 Mg magnesium 12											27 Al aluminium 13	28 Si silicon 14	31 P phosphorus 15	32 S sulfur 16	35.5 Cl chlorine 17	40 Ar argon 18
39 K potassium 19	40 Ca calcium 20	45 Sc scandium 21	48 Ti titanium 22	51 V vanadium 23	52 Cr chromium 24	55 Mn manganese 25	56 Fe iron 26	59 Co cobalt 27	59 Ni nickel 28	63.5 Cu copper 29	65 Zn zinc 30	70 Ga gallium 31	73 Ge germanium 32	75 As arsenic 33	79 Se selenium 34	80 Br bromine 35	84 Kr krypton 36
85 Rb rubidium 37	88 Sr strontium 38	89 Y yttrium 39	91 Zr zirconium 40	93 Nb niobium 41	96 Mo molybdenum 42	[98] Tc technetium 43	101 Ru ruthenium 44	103 Rh rhodium 45	106 Pd palladium 46	108 Ag silver 47	112 Cd cadmium 48	115 In indium 49	119 Sn tin 50	122 Sb antimony 51	128 Te tellurium 52	127 I iodine 53	131 Xe xenon 54
133 Cs caesium 55	137 Ba barium 56	139 La* lanthanum 57	178 Hf hafnium 72	181 Ta tantalum 73	184 W tungsten 74	186 Re rhenium 75	190 Os osmium 76	192 Ir iridium 77	195 Pt platinum 78	197 Au gold 79	201 Hg mercury 80	204 Tl thallium 81	207 Pb lead 82	209 Bi bismuth 83	[209] Po polonium 84	[210] At astatine 85	[222] Rn radon 86
[223] Fr francium 87	[226] Ra radium 88	[227] Ac* actinium 89	[261] Rf rutherfordium 104	[262] Db dubnium 105	[266] Sg seaborgium 106	[264] Bh bohrium 107	[277] Hs hassium 108	[268] Mt meitnerium 109	[271] Ds darmstadtium 110	[272] Rg roentgenium 111	[285] Cn copernicium 112	[286] Nh nihonium 113	[289] Fl flerovium 114	[289] Mc moscovium 115	[293] Lv livermorium 116	[294] Ts tennessine 117	[294] Og oganesson 118

* The lanthanides (atomic numbers 58–71) and the actinides (atomic numbers 90–103) have been omitted. Relative atomic masses for Cu and Cl have not been rounded to the nearest whole number.