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 2

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 05.3 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	
TOTAL	

This is an original practice paper written for sciencegcse.co.uk to match the style and demand of AQA GCSE Combined Science: Trilogy (8464) Chemistry Paper 1 (Foundation Tier). It is not an AQA examination paper and has not been produced or endorsed by AQA. It is not a prediction of a future examination.

0 1 The periodic table has changed as scientists have found out more about the elements.

0 1 . 1 In the modern periodic table, the elements are arranged in order of atomic number. [1 mark]

What is the atomic number of an atom?

Tick (✓) **one** box.

- The number of electrons in the outer shell ☐
- The number of neutrons ☐
- The number of protons ☐
- The number of protons and neutrons ☐

0 1 . 2 Mendeleev left gaps in his periodic table. [1 mark]

Give the reason why.

.....

.....

0 1 . 3 Mendeleev sometimes changed the order of the elements from the order of their atomic weights. [1 mark]

Suggest why.

.....

.....

0 1 . 4 The elements in Group 0 are unreactive. [2 marks]

Explain why.

Use ideas about electrons.

.....

.....

.....

.....

Question 1 continues on the next page

Do not write outside the box

sciencegcse.co.uk

Table 1 shows the boiling points of some Group 0 elements.

Table 1

Element	Boiling point in °C
Helium	−269
Neon	−246
Argon	−186
Krypton	−153

0 1 . 5 Describe the trend in boiling point down Group 0 [1 mark]

.....

.....

0 1 . 6 Xenon is below krypton in Group 0 [1 mark]

Predict the boiling point of xenon.

Boiling point = ... °C

0 1 . 7 Argon is used inside some light bulbs instead of air. [1 mark]

Suggest why.

.....

.....

Turn over for the next question

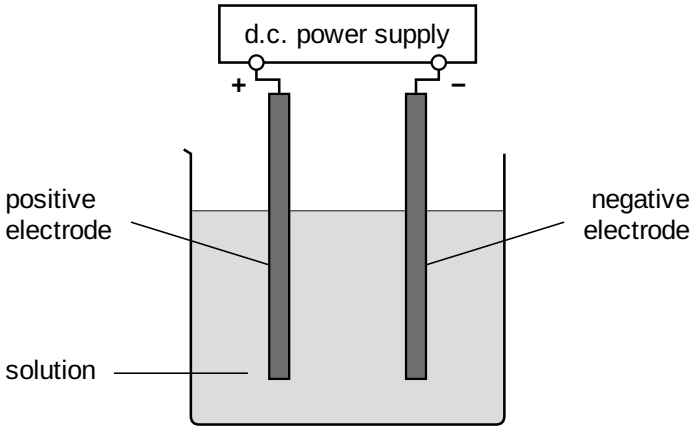
Do not write outside the box

sciencegcse.co.uk

0 2 A student electrolysed five different solutions.

Figure 1 shows the apparatus.

Figure 1



0 2 . 1 The electrodes are inert. [1 mark]

Name a substance used to make inert electrodes.

.....

Table 2 shows the products.

Table 2

Solution	Product at the negative electrode	Product at the positive electrode
Copper chloride	copper	chlorine
Copper sulfate	copper	oxygen
Potassium chloride	hydrogen	chlorine
Silver nitrate	silver	oxygen
Magnesium sulfate	hydrogen	oxygen

0 2 . 2 A student said: [2 marks]

'A metal is always produced at the negative electrode.'

Give **one** result from **Table 2** that supports the student's statement and **one** result that does **not**.

Supports

.....

Does not support

.....

Do not write outside the box

sciencegcse.co.uk

0 2 . 3 Oxygen is produced at the positive electrode when silver nitrate solution and magnesium sulfate solution are electrolysed. [2 marks]

Explain why oxygen, and not a halogen, is produced.

.....

.....

.....

.....

0 2 . 4 A student says the metal ion in the solution is enough to predict the product at the positive electrode. [2 marks]

Use the results for copper chloride and copper sulfate in **Table 2** to explain why this is incorrect.

.....

.....

.....

.....

0 3 Magnesium reacts with oxygen to produce magnesium oxide.

The electronic structure of a magnesium atom is 2,8,2

The electronic structure of an oxygen atom is 2,6

0 3 . 1 Describe what happens to the electrons when magnesium reacts with oxygen. [2 marks]

.....

.....

.....

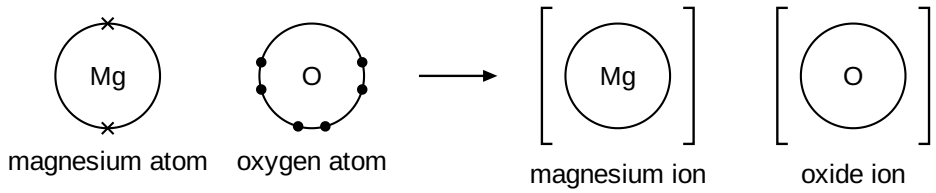
.....

Do not write outside the box

Question 3 continues on the next page

Figure 2 shows the outer shell electrons of a magnesium atom and an oxygen atom.

Figure 2



0 3 . 2 Complete **Figure 2** to show the outer shell electrons of the ions formed. [3 marks]

Use crosses (×) for electrons from magnesium and dots (•) for electrons from oxygen.

Give the charge on each ion.

0 3 . 3 Give the formula of magnesium oxide. [1 mark]

.....

0 3 . 4 Magnesium oxide has a high melting point. [2 marks]

Explain why.

.....

.....

.....

.....

0 4 A student investigated how the pH changes when sodium hydroxide solution is added to hydrochloric acid.

This is the method used.

1. Put 25 cm^3 of hydrochloric acid into a beaker.
2. Measure the pH with a pH meter.
3. Add sodium hydroxide solution 5 cm^3 at a time.
4. Measure the pH after each addition.

0 4 . 1 Which ion is present in all acidic solutions? [1 mark]

.....

0 4 . 2 Give **one** advantage of using a pH meter rather than universal indicator. [1 mark]

.....

.....

Do not write outside the box

sciencegcse.co.uk

Table 3 shows the results.

Table 3

Volume of sodium hydroxide solution added in cm^3	0	5	10	15	20	25	30	35
pH	1.0	1.2	1.4	1.6	2.0	7.0	12.0	12.2

0 4 . 3 What volume of sodium hydroxide solution was needed to neutralise the hydrochloric acid? [1 mark]

Volume = ... cm^3

0 4 . 4 Describe how the pH changed as the sodium hydroxide solution was added. [2 marks]

Use data from **Table 3**.

.....

.....

.....

.....

0 4 . 5 Name the salt produced in this reaction. [1 mark]

.....

0 4 . 6 Complete the equation for the reaction between hydrogen ions and hydroxide ions. [1 mark]

$$H^+(aq) + OH^-(aq) \longrightarrow \text{.....}$$

0 4 . 7 The student repeated the investigation with sodium hydroxide solution that was twice as concentrated. [1 mark]

Predict the volume of this sodium hydroxide solution needed to neutralise 25 cm^3 of the hydrochloric acid.

Volume = ... cm^3

0 5 Rock salt is a mixture of salt (sodium chloride) and sand.

0 5 . 1 What is meant by a **mixture**? [1 mark]

.....

.....

Do not write outside the box

sciencegcse.co.uk

0 5 . 2 Draw **one** line from each mixture to the method used to separate it. [2 marks]

Mixture	Separation method
Pure water from sea water	Chromatography
Different coloured dyes in ink	Crystallisation
Sand from a mixture of sand and water	Distillation
	Filtration

0 5 . 3 Salt dissolves in water. Sand does not dissolve in water. [6 marks]

Describe how a student could obtain pure, dry crystals of salt from rock salt.

Do not write outside the box

sciencegcse.co.uk

0 5 . 4 A student separated 40.0 g of rock salt. [2 marks]

The mass of the dry sand was 11.0 g

Calculate the percentage by mass of sand in the rock salt.

Percentage of sand = ... %

0 6 **Table 4** shows the melting points and boiling points of three substances, **A**, **B** and **C**.

Table 4

Substance	Melting point in °C	Boiling point in °C	State at 25 °C
A	−7	59	
B	801	1413	
C	−218	−183	

0 6 . 1 Complete **Table 4** to show the state of each substance at 25 °C [2 marks]

0 6 . 2 Describe the arrangement and movement of the particles in a liquid. [2 marks]

.....

.....

.....

.....

0 6 . 3 Which substance in **Table 4** has the strongest forces between its particles? [1 mark]

Substance .....

Question 6 continues on the next page

Do not write outside the box

sciencegcse.co.uk

0 6 . 4 Poly(ethene) is a polymer. It is a solid at room temperature. [2 marks]

Explain why.

Use ideas about the molecules and the forces between them.

.....

.....

.....

.....

0 6 . 5 A student said: [1 mark]

'When poly(ethene) melts, the covalent bonds in its molecules break.'

Explain why the student is wrong.

.....

.....

0 7 Sodium carbonate reacts with dilute nitric acid.

0 7 . 1 Calculate the relative formula mass (M_r) of sodium carbonate, Na_2CO_3 [2 marks]

Relative atomic masses (A_r): C = 12 O = 16 Na = 23

M_r = ...

0 7 . 2 Name the salt produced when sodium carbonate reacts with nitric acid. [1 mark]

.....

0 7 . 3 Bubbles of a gas are produced. [1 mark]

Name the gas.

.....

0 7 . 4 Balance the equation for the reaction. [1 mark]

..... Na_2CO_3 + ... HNO_3 ⟶ ..... $NaNO_3$ + H_2O + CO_2

Question 7 continues on the next page

Do not write outside the box

sciencegcse.co.uk

0 7 . 5 The reaction was done in an open flask on a balance. [1 mark]

Explain why the mass of the flask and its contents decreased during the reaction.

.....

.....

0 7 . 6 A student dissolved 5.30 g of sodium carbonate in water to make 250 cm^3 of solution. [3 marks]

The student calculated the concentration of the solution like this:

concentration = 5.30 ÷ 250 = 0.0212 g/dm^3

Explain the student's mistake.

Calculate the correct concentration in g/dm^3

.....

.....

Concentration = ... g/dm^3

Do not write outside the box

Turn over for the next question

sciencegcse.co.uk

0 8 Some cold packs use an endothermic reaction.

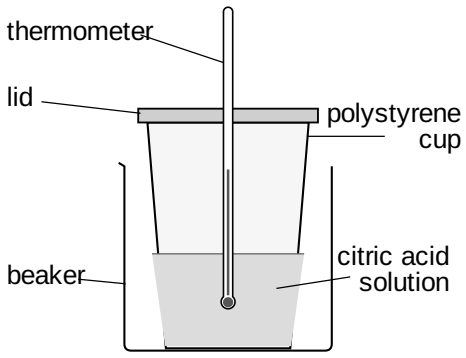
A student investigated how the mass of sodium hydrogencarbonate affects the temperature decrease when it reacts with citric acid solution.

This is the method used.

1. Pour 25 cm^3 of citric acid solution into a polystyrene cup.
2. Measure the temperature of the solution.
3. Add 1.0 g of sodium hydrogencarbonate and stir.
4. Record the lowest temperature.
5. Repeat steps 1 to 4 with fresh citric acid solution and different masses of sodium hydrogencarbonate.

Figure 3 shows the apparatus.

Figure 3



0 8 . 1 Why did the student put the citric acid solution in a polystyrene cup and not directly in a glass beaker? [1 mark]

.....

.....

Table 5 shows the results.

Table 5

Mass of sodium hydrogencarbonate in g		1.0	2.0	3.0	4.0	5.0	6.0
Temperature decrease in °C	**Trial 1**	2.1	3.8	6.1	7.9	8.6	8.8
	Trial 2	1.9	4.2	5.7	7.7	8.8	8.6
	Mean	2.0	4.0	5.9	**X**	8.7	8.7

0 8 . 2 Calculate mean **X**. [1 mark]

X = ... °C

Do not write outside the box

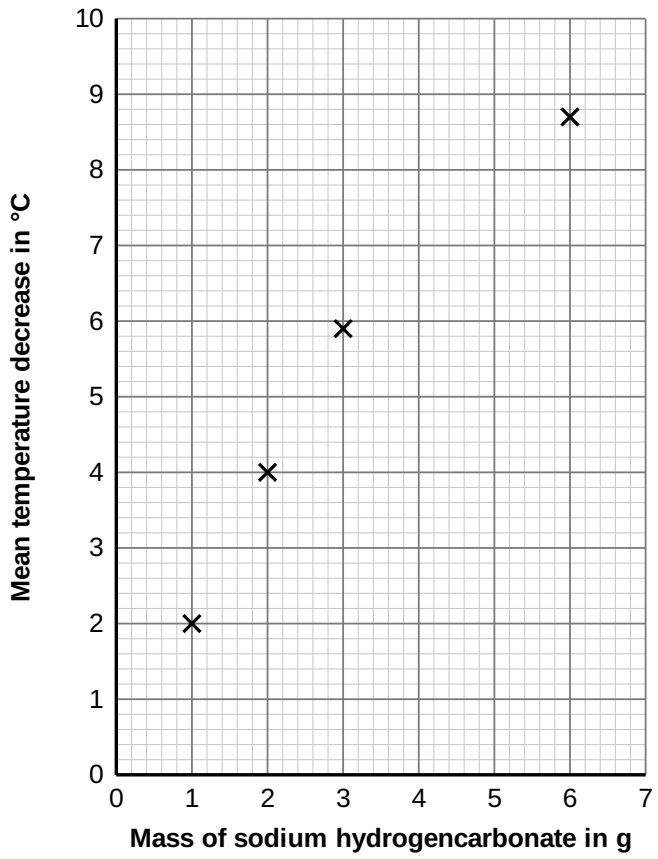
sciencegcse.co.uk

0 8 . 3 **Figure 4** shows some of the results. [3 marks]

Complete **Figure 4**:

- plot the mean results for 4.0 g and 5.0 g
- draw a line of best fit.

Figure 4



0 8 . 4 Describe the relationship between the mass of sodium hydrogencarbonate and the temperature decrease. [2 marks]

0 8 . 5 Suggest why the temperature decrease did **not** increase when more than 5.0 g of sodium hydrogencarbonate was used. [2 marks]

Do not write outside the box

sciencegcse.co.uk

0 8 . 6 Explain why the temperature of the solution decreased. [2 marks]

Use ideas about energy.

.....

.....

.....

.....

END OF QUESTIONS

Do not write outside the box

sciencegcse.co.uk

Additional page, if required.

Write the question numbers in the left-hand margin.

Do not write outside the box

Additional page, if required.

Write the question numbers in the left-hand margin.

Do not write outside the box

sciencegcse.co.uk

There are no questions printed on this page

Do not write outside the box

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.