

Candidate Name	Centre Number				Candidate Number				



GCSE CHEMISTRY
COMPONENT 2
Applications in Chemistry
FOUNDATION TIER
SAMPLE PAPER
(1 hour 15 minutes)



	For Examiner's use only		
	Question	Maximum Mark	Mark Awarded
Section A	1	5	
	2	11	
	3	6	
	4	6	
	5	7	
	6	4	
	7	6	
Section B	8	15	
	Total	60	

ADDITIONAL MATERIALS

In addition to this examination paper you will need a resource booklet, a calculator and a ruler.

INSTRUCTIONS TO CANDIDATES

Use black ink or black ball-point pen. Do not use gel pen. Do not use correction fluid. Write your name, centre number and candidate number in the spaces at the top of this page. Answer **all** questions. Write your answers in the spaces provided in this booklet.

INFORMATION FOR CANDIDATES

This paper is in two Sections, Section **A** and Section **B**.

Section **A**: 45 marks. Answer **all** questions. You are advised to spend about 50 minutes on this section.

Section **B**: 15 marks. Read the article in the resource booklet carefully then answer **all** questions. You are advised to spend about 25 minutes on this section.

The number of marks is given in brackets at the end of each question or part-question.

The assessment of the quality of extended response (QER) will take place in question **7**.

SECTION A

Answer all questions.

- 1 (a) Draw lines to match each diagram below with the correct name of the apparatus. One has been done for you. [2]



balance



Bunsen burner



burette



pipette



measuring cylinder

(b) Choose a method from the box to answer parts (i) to (iii).

chromatography	distillation	electrolysis	filtration
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Name the method you would use to separate:

(i) two liquids (water and ethanol) [1]

(ii) the colourings in a food dye [1]

(iii) a precipitate from water [1]

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GCSE CHEMISTRY Sample Assessment Materials 104

2. (a) The following table shows the colours of universal indicator at different pH values.

colour	red	orange	yellow	green	blue	navy blue	purple
pH	0-2	3-4	5-6	7	8-9	10-12	13-14

Use this information to help you complete the table below. [3]

Substance	Colour with universal indicator	pH value	Acid, alkali or neutral?
detergent	purple		
distilled water		7	
soap		8	

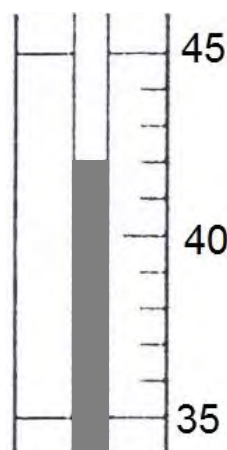
- (b) Different lengths of magnesium ribbon were put into separate beakers each containing 25 cm³ dilute hydrochloric acid and the temperature measured. The initial temperature of the acid in each beaker was 16 °C.

The results are shown in the table below. Two temperatures are missing.

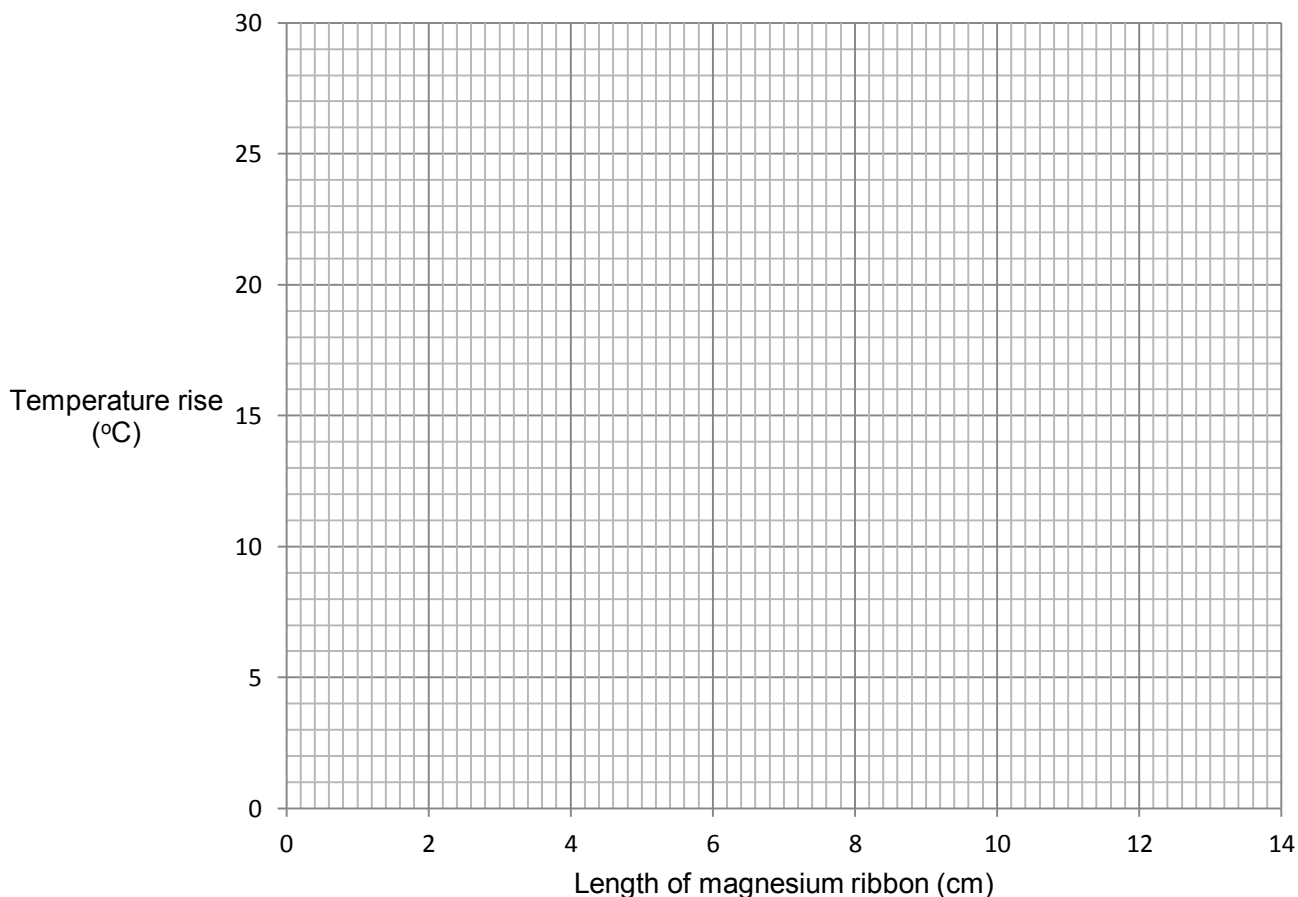
Length of magnesium ribbon (cm)	2	4	6	8	10	12
Final temperature (°C)	20	23	28	33	35
Initial temperature (°C)	16	16	16	16	16	16
Temperature rise (°C)	4	7	12	17	19

- (i) Complete the table by using the thermometer reading shown below. [2]

Thermometer reading when 12 cm of magnesium was used.



- (ii) Plot the length of magnesium ribbon against the temperature rise and draw a suitable line. [3]



- (iii) Use your graph to find the temperature rise if 5 cm of magnesium was added to 25 cm³ dilute hydrochloric acid. [1]

temperature rise °C

- (iv) Put a tick (✓) next to the statement which describes the temperature rise you would expect if the hydrochloric acid was replaced with vinegar. Give a reason for your choice. [2]

temperature rise will be higher with vinegar than with hydrochloric acid

temperature rise will be lower with vinegar than with hydrochloric acid

temperature rise will be the same with vinegar as with hydrochloric acid

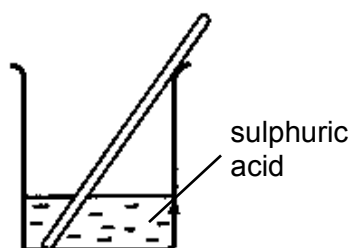
Reason for choice

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GCSE CHEMISTRY Sample Assessment Materials 106

3. The diagrams below show the stages in making the compound zinc sulfate by reacting zinc carbonate with dilute sulfuric acid. The diagram showing the apparatus for **Stage 2** is missing.

Stage 1

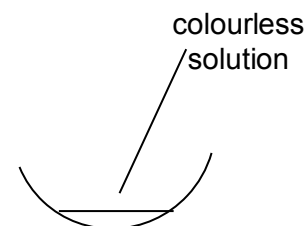


Excess zinc carbonate is added to dilute sulfuric acid, the mixture being continuously stirred

Stage 2

Excess zinc carbonate is removed

Stage 3



Colourless solution is left in an evaporating basin at room temperature to obtain white crystals of zinc sulfate

- (a) State what you would **see** when excess zinc carbonate is added. [1]

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- (b) State why **excess** zinc carbonate is added. [1]

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- (c) Draw the apparatus you would use to carry out stage 2. [3]
Label the excess zinc carbonate on your diagram.

- (d) Put a tick (✓) next to the box that shows the estimated time it would take for **all** the water to evaporate from 25 cm³ of zinc sulfate solution in stage 3. [1]

1 hour

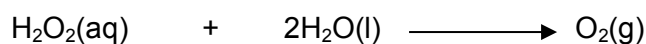
1 week

1 school term

1 year

6

4. Hydrogen peroxide solution decomposes very slowly at room temperature.



This reaction can be catalysed using manganese(IV) oxide.

The statement below shows the definition of a catalyst.

*“A **catalyst** will change the speed of a chemical reaction but will not be used up during the reaction.”*

A student carried out an investigation to find out if it is true that a catalyst is not used up in a reaction.

1.50 g of manganese(IV) oxide powder was accurately weighed and put into 20 cm³ of hydrogen peroxide solution. After the reaction had stopped, the reaction mixture was filtered into a pre-weighed filter paper. The filtered manganese(IV) oxide and filter paper was dried in an oven.

The mass readings are shown below.

	Mass (g)
filter paper	1.26
manganese(IV) oxide and filter paper after drying	2.74
recovered manganese(IV) oxide	1.48

- (a) Calculate the percentage (%) mass of manganese(IV) oxide recovered to one decimal place. [3]

% mass of manganese(IV) oxide recovered = %

- (b) Do you agree with the statement that ‘a catalyst is not used up in a reaction’
Give the reason for your decision. [1]

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- (c) Suggest why not all of the manganese(IV) oxide was recovered and how this problem could be overcome. [2]

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5. (a) A compound was dissolved in water and tested as described below. Use the information to complete the table and name the compound. [3]

Solution of unknown compound	Observation	Conclusion
dilute hydrochloric acid was added, the gas produced was passed through limewater	limewater turned milky
a flame test was carried out	an orange flame

The compound is

- (b) A solution contains barium ions. It may also contain magnesium ions. Use the information below to decide how to remove the barium ions and then test to find if magnesium ions are present. [4]

You are also given a solution of sodium sulfate and a solution of sodium carbonate which you can use.

Compound	Soluble or insoluble?
barium sulfate	insoluble
barium carbonate	insoluble
magnesium sulfate	soluble
magnesium carbonate	insoluble
sodium sulfate	soluble
sodium carbonate	soluble

Method to remove barium ions

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Test for magnesium ions

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GCSE CHEMISTRY Sample Assessment Materials 110

6. A student measured out 25 cm^3 of a sodium carbonate solution. The sodium carbonate solution had a concentration of 1.06 g / dm^3 . Calculate the mass of sodium carbonate (Na_2CO_3) that was in 25 cm^3 of this solution. Give your answer in units of g and mg. [4]

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7. Describe and explain an investigation you would carry out to find the relative positions of copper, iron and magnesium in the reactivity series. Include equations where appropriate.

You are provided with:

- solid samples of copper, iron and magnesium
- solid samples of copper(II) sulfate, iron(II) sulfate and magnesium sulfate.

[6 QER]

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SECTION B

Read the article in the resource booklet and answer **all** the questions that follow.

8. (a) Describe the bonding between carbon atoms in diamond. [3]
Include a dot and cross diagram in your answer.
Details of the structure of diamond are not required.

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- (b) (i) Explain why graphene is a good conductor of electricity. [2]

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- (ii) Explain why graphite is soft and slippery and can act as a lubricant. [2]

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- (iii) Diamond is a very dense allotrope of carbon because the carbon atoms are tightly packed. Calculate the volume of the cube containing carbon atoms in **Diagram 2**. Give the unit. [1]

volume =

- (c) Determine the molecular formula of the fullerene identified using mass spectroscopy in the article.
Show your working. [2]

molecular formula =

- (d) (i) Calculate the specific strength of Kevlar (**Table 1**) and use this value to **estimate** the breaking length. [3]

specific strength kN m/kg

breaking length km

- (ii) Explain why carbon nanotubes may eventually replace materials like steel and aluminium in the manufacture of power lines. [2]

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FORMULAE FOR SOME COMMON IONS

POSITIVE IONS		NEGATIVE IONS	
Name	Formula	Name	Formula
Aluminium	Al^{3+}	Bromide	Br^-
Ammonium	NH_4^+	Carbonate	CO_3^{2-}
Barium	Ba^{2+}	Chloride	Cl^-
Calcium	Ca^{2+}	Fluoride	F^-
Copper(II)	Cu^{2+}	Hydroxide	OH^-
Hydrogen	H^+	Iodide	I^-
Iron(II)	Fe^{2+}	Nitrate	NO_3^-
Iron(III)	Fe^{3+}	Oxide	O^{2-}
Lithium	Li^+	Sulfate	SO_4^{2-}
Magnesium	Mg^{2+}		
Nickel	Ni^{2+}		
Potassium	K^+		
Silver	Ag^+		
Sodium	Na^+		
Zinc	Zn^{2+}		

