Cambridge IGCSE

Cambridge Assessment International Education
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

4580138827

CHEMISTRY **0620/53**

Paper 5 Practical Test **May/June 2019**

1 hour 15 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.
Notes for use in qualitative analysis are provided on pages 11 and 12.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

For Examiner's Use	
1	
2	
3	
Total	

This syllabus is regulated for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **10** printed pages and **2** blank pages.

1 You are going to investigate the temperature changes when two different metals, zinc and magnesium, react with aqueous copper(II) sulfate.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to do three experiments.

(a) *Experiment 1*

- Put the cup provided into the 250 cm^3 beaker for support.
- Use the measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the cup.
- Measure the initial temperature of the solution and start the timer.
- Measure the temperature of the solution at 30 seconds and at 60 seconds.
- Record the temperatures in the table.
- At 60 seconds, add all of the zinc powder to the aqueous copper(II) sulfate. Stir the mixture continuously with the thermometer.
- Continue to stir the mixture and measure the temperature of the mixture every 30 seconds for a total of 180 seconds.
- Record your results in the table.
- Empty the cup and rinse it with distilled water.

time / s	0	30	60	90	120	150	180
temperature of mixture / °C							

[2]

(b) *Experiment 2*

- Repeat Experiment 1 but using magnesium powder instead of zinc powder.
- Record your results in the table.

time / s	0	30	60	90	120	150	180
temperature of mixture / °C							

[2]

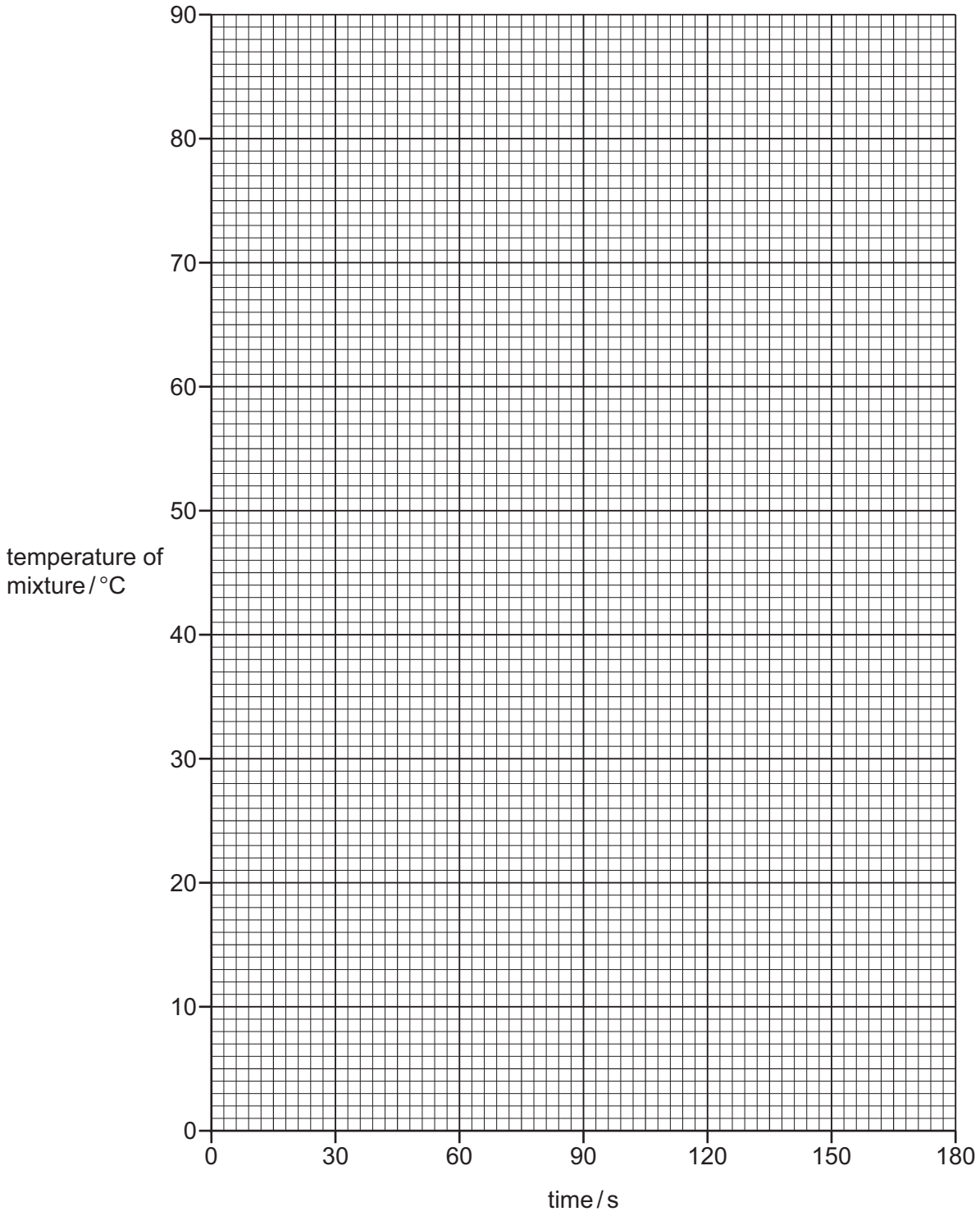
(c) *Experiment 3*

- Repeat Experiment 1 but using zinc granules instead of zinc powder.
- Record your results in the table.

time / s	0	30	60	90	120	150	180
temperature of mixture / °C							

[1]

(d) Plot your results for Experiments 1–3 on the grid. Draw **three** smooth line graphs. Clearly label your lines.



[3]

(e) **From your graph**, deduce the temperature of the mixture in Experiment 2 after 75 seconds.

Show clearly **on the grid** how you worked out your answer.

..... °C [2]

[Turn over

(f) **(i)** From your results, which experiment was the most exothermic? Explain your answer.

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..... [2]

(ii) Compare the rates of reaction in Experiments 1 and 3. Explain why the rates of reaction are different.

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..... [2]

(g) Predict the temperature of the mixture in Experiment 2 after 2 hours. Explain your answer.

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..... [2]

(h) When doing the experiments, what would be an advantage of taking the temperature readings every 15 seconds?

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..... [2]

(i) Explain why a copper can should **not** be used in place of the cup in these experiments.

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..... [1]

[Total: 19]

Question 2 starts on the next page.

2 You are provided with solid **M**, which is a salt.
Do the following tests on solid **M**, recording all of your observations at each stage.

tests on solid M

(a) Describe the appearance of solid **M**.

..... [1]

Use a spatula to divide solid **M** into two approximately equal portions.

(b) Heat the first portion of solid **M** in a hard-glass test-tube. Test any gas produced with cobalt(II) chloride paper.
Record your observations.

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..... [4]

Add the second portion of solid **M** to about 10 cm^3 of distilled water in a boiling tube. Stopper the boiling tube and shake the mixture to dissolve solid **M** and form solution **M**. Divide solution **M** into three approximately equal portions in three test-tubes.

(c) (i) Add drops of aqueous sodium hydroxide to the first portion of solution **M**.
Record your observations.

..... [2]

(ii) Now add an excess of aqueous sodium hydroxide to the mixture from **(c)(i)**.
Record your observations.

..... [1]

(d) (i) Add drops of aqueous ammonia to the second portion of solution **M**.
Record your observations.

..... [1]

(ii) Now add an excess of aqueous ammonia to the mixture from **(d)(i)**.
Record your observations.

..... [1]

(e) Add a few drops of dilute nitric acid and about 1 cm^3 of aqueous barium nitrate to the third portion of solution **M**.
Record your observations.

..... [2]

(f) What does the test in **(b)** tell you about solid **M**?

..... [1]

(g) Identify solid **M**.

.....

..... [2]

[Total: 15]

3 Calcium carbonate, calcium hydroxide and calcium oxide can be used to neutralise the acid in soil.

Plan an investigation to find out which of these calcium compounds neutralises acid most effectively.

You are provided with the three calcium compounds, dilute hydrochloric acid and common laboratory apparatus and chemicals.

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..... [6]

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Notes for use in qualitative analysis
Tests for anions

anion	test	test result
carbonate (CO_3^{2-})	add dilute acid	effervescence, carbon dioxide produced
chloride (Cl^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
bromide (Br^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	cream ppt.
iodide (I^-) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify, then add aqueous barium nitrate	white ppt.
sulfite (SO_3^{2-})	add dilute hydrochloric acid, warm gently and test for the presence of sulfur dioxide	sulfur dioxide produced will turn acidified aqueous potassium manganate(VII) from purple to colourless

Tests for aqueous cations

cation	effect of aqueous sodium hydroxide	effect of aqueous ammonia
aluminium (Al^{3+})	white ppt., soluble in excess, giving a colourless solution	white ppt., insoluble in excess
ammonium (NH_4^+)	ammonia produced on warming	–
calcium (Ca^{2+})	white ppt., insoluble in excess	no ppt., or very slight white ppt.
chromium(III) (Cr^{3+})	green ppt., soluble in excess	grey-green ppt., insoluble in excess
copper(II) (Cu^{2+})	light blue ppt., insoluble in excess	light blue ppt., soluble in excess, giving a dark blue solution
iron(II) (Fe^{2+})	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe^{3+})	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn^{2+})	white ppt., soluble in excess, giving a colourless solution	white ppt., soluble in excess, giving a colourless solution

Tests for gases

gas	test and test result
ammonia (NH_3)	turns damp red litmus paper blue
carbon dioxide (CO_2)	turns limewater milky
chlorine (Cl_2)	bleaches damp litmus paper
hydrogen (H_2)	'pops' with a lighted splint
oxygen (O_2)	relights a glowing splint
sulfur dioxide (SO_2)	turns acidified aqueous potassium manganate(VII) from purple to colourless

Flame tests for metal ions

metal ion	flame colour
lithium (Li^+)	red
sodium (Na^+)	yellow
potassium (K^+)	lilac
copper(II) (Cu^{2+})	blue-green