Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

CHEMISTRY **0620/53**

Paper 5 Practical Test **October/November 2016**

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.
Practical notes 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	
Total	

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

This document consists of **9** printed pages and **3** blank pages.

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CAMBRIDGE International Examinations

1 You are going to investigate what happens when two different metals, iron and magnesium, react with aqueous copper(II) sulfate.

Read all the instructions carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

View solution

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup provided. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the iron to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time / s	0	30	60	90	120	150	180	210	240	270	300
temperature / °C											

[2]

(b) *Experiment 2*

View solution

Empty the polystyrene cup and rinse it with water.

Use a measuring cylinder to pour 25 cm^3 of aqueous copper(II) sulfate into the polystyrene cup. Put the polystyrene cup into a 250 cm^3 beaker for support. Measure the initial temperature of the solution and then the temperature after 30 seconds and 60 seconds. Record your results in the table.

At 60 seconds add all of the magnesium to the aqueous copper(II) sulfate and stir the mixture continuously with the thermometer.

Measure the temperature of the mixture every 30 seconds for 300 seconds (5 minutes). Record your results in the table.

time / s	0	30	60	90	120	150	180	210	240	270	300
temperature / °C											

[2]

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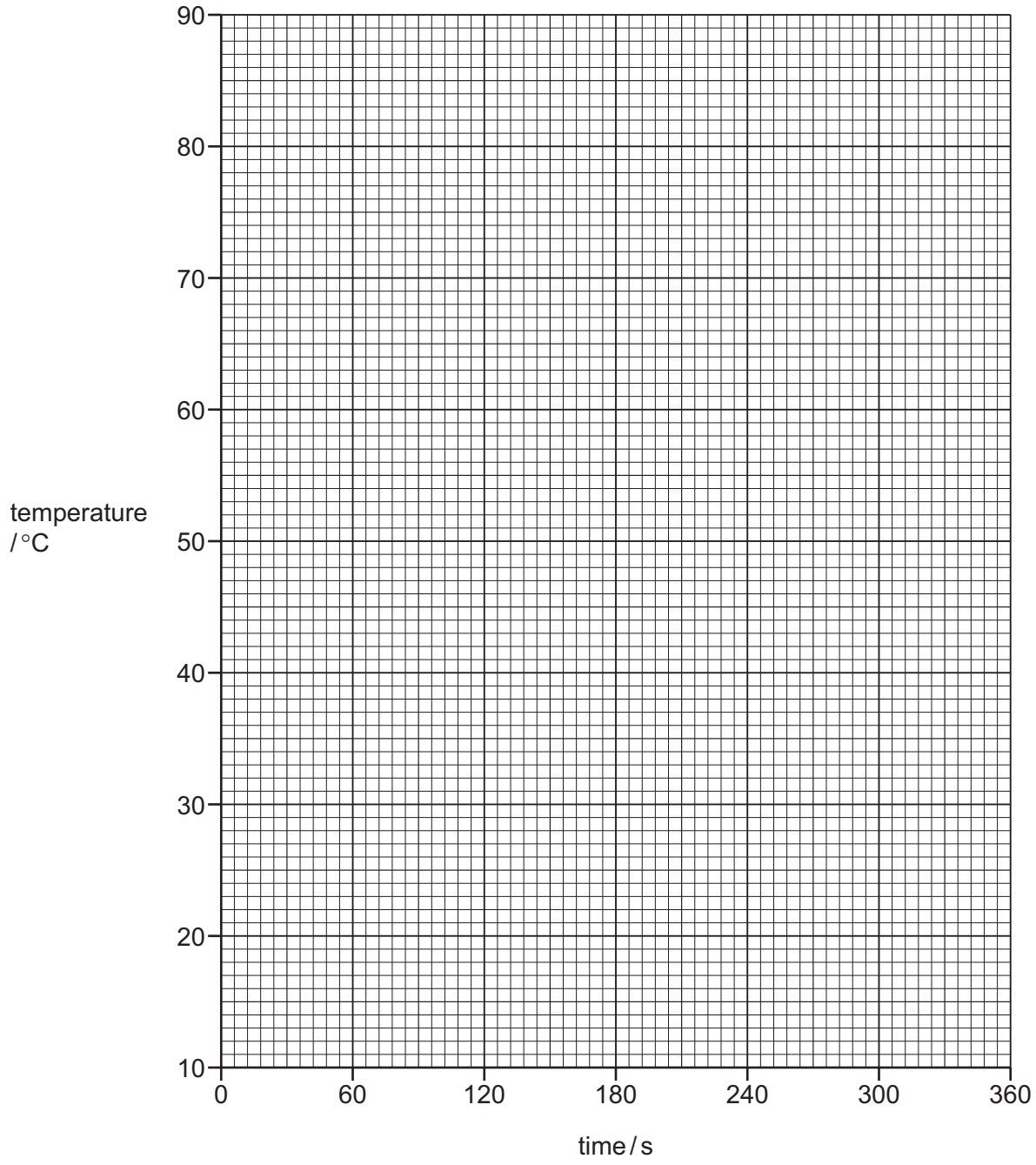
(c) Plot the results for Experiments 1 and 2 on the grid and draw **two** smooth line graphs. Clearly label the graphs.

View solution



[4]

(d) (i) **From your graph**, deduce the temperature of the mixture in Experiment 1 after 135 seconds.
Show clearly **on the grid** how you worked out your answer.

View solution

..... °C [2]

(ii) **From your graph**, deduce the time taken for the temperature of the mixture in Experiment 2 to change by 30 °C **after the magnesium was added**.
Show clearly **on the grid** how you worked out your answer.

View solution

..... s [2]

(e) Predict the temperature of the mixture in Experiment 2 after one hour. Explain your answer.

.....

..... [2]

(f) Suggest an advantage of taking the temperature readings every 15 seconds.

View solution

.....

..... [2]

(g) Explain why a polystyrene cup is used in the experiments and **not** a copper can.

View solution

.....

..... [2]

[Total: 18]

2 You are provided with two solutions, solution **Q** and solution **R**.
Carry out the following tests on solution **Q** and solution **R**, recording all of your observations at each stage.

tests on solution Q

(a) Divide solution **Q** into four equal portions in four test-tubes. Carry out the following tests.

View solution

(i) Use pH indicator paper to measure the pH of the first portion of solution **Q**.

pH ..... [1]

(ii) Add a 2 cm strip of magnesium ribbon to the second portion of solution **Q**. Test the gas given off.
Record your observations.

View solution

.....

..... [2]

(iii) Add a spatula measure of sodium carbonate to the third portion of solution **Q**. Test the gas given off.
Record your observations.

View solution

.....

..... [2]

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

..... [1]

View solution

tests on solution R

(b) Divide solution **R** into four equal portions in four test-tubes. Carry out the following tests.

View solution

(i) Measure the pH of the first portion of solution **R**.

pH ..... [1]

(ii) Add several drops of aqueous sodium hydroxide to the second portion of solution **R** and shake the test-tube.
Then add excess aqueous sodium hydroxide to the test-tube.
Record your observations.

View solution

.....

..... [2]

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(iii) Add aqueous silver nitrate to the third portion of solution **R** and leave to stand for about 5 minutes.
Record your observations.

View solution

.....

..... [2]

(iv) Add a spatula measure of iron(II) sulfate crystals to the fourth portion of solution **R** and shake the mixture.
Record your observations.

View solution

..... [1]

(c) Identify solution **Q**.

View solution

..... [2]

(d) Identify solution **R**.

View solution

..... [2]

[Total: 16]

3 A liquid cleaner is a mixture of three substances. These substances are shown in the table.

View solution

name of substance	properties of substance
water	liquid, boiling point 100 °C
sodium carbonate	solid, soluble in water
silica	solid, insoluble in water

Plan experiments to obtain separate pure samples of each substance from the mixture in the liquid cleaner. You are provided with common laboratory apparatus.

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..... [6]

[Total: 6]

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NOTES FOR USE IN QUALITATIVE ANALYSIS
Test 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

Test 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 (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

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Test for gases

gas	test and test results
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

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