UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5913063841

CHEMISTRY **0620/51**

Paper 5 Practical Test **October/November 2011**

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 a pencil for any diagrams, graphs or rough working.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Practical notes are provided on page 8.

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.

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1	
2	
Total	

This document consists of **7** printed pages and **1** blank page.

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

Read all the instructions below carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

Use a measuring cylinder to pour 25 cm^3 of the aqueous copper(II) sulfate provided into the polystyrene cup. Put the cup into a 250 cm^3 beaker for support. Measure the temperature of the solution and record it in the table below. Start the timer and record the temperature every half a minute for one minute.

At exactly 1 minute, add the 5 g of zinc powder provided to the cup and stir the mixture with the thermometer. Measure and record the temperature of the mixture every half minute for an additional three minutes. Pour the solution away and rinse the polystyrene cup.

time / min	0.0	0.5	1.0	1.5	2.0	2.5
temperature / °C						
time / min	3.0	3.5	4.0			
temperature / °C						

[3]

(b) *Experiment 2*

Repeat Experiment 1 using 5 g of the iron powder provided instead of the zinc powder. Record your results in the table below.

time / min	0.0	0.5	1.0	1.5	2.0	2.5
temperature / °C						
time / min	3.0	3.5	4.0			
temperature / °C						

[3]

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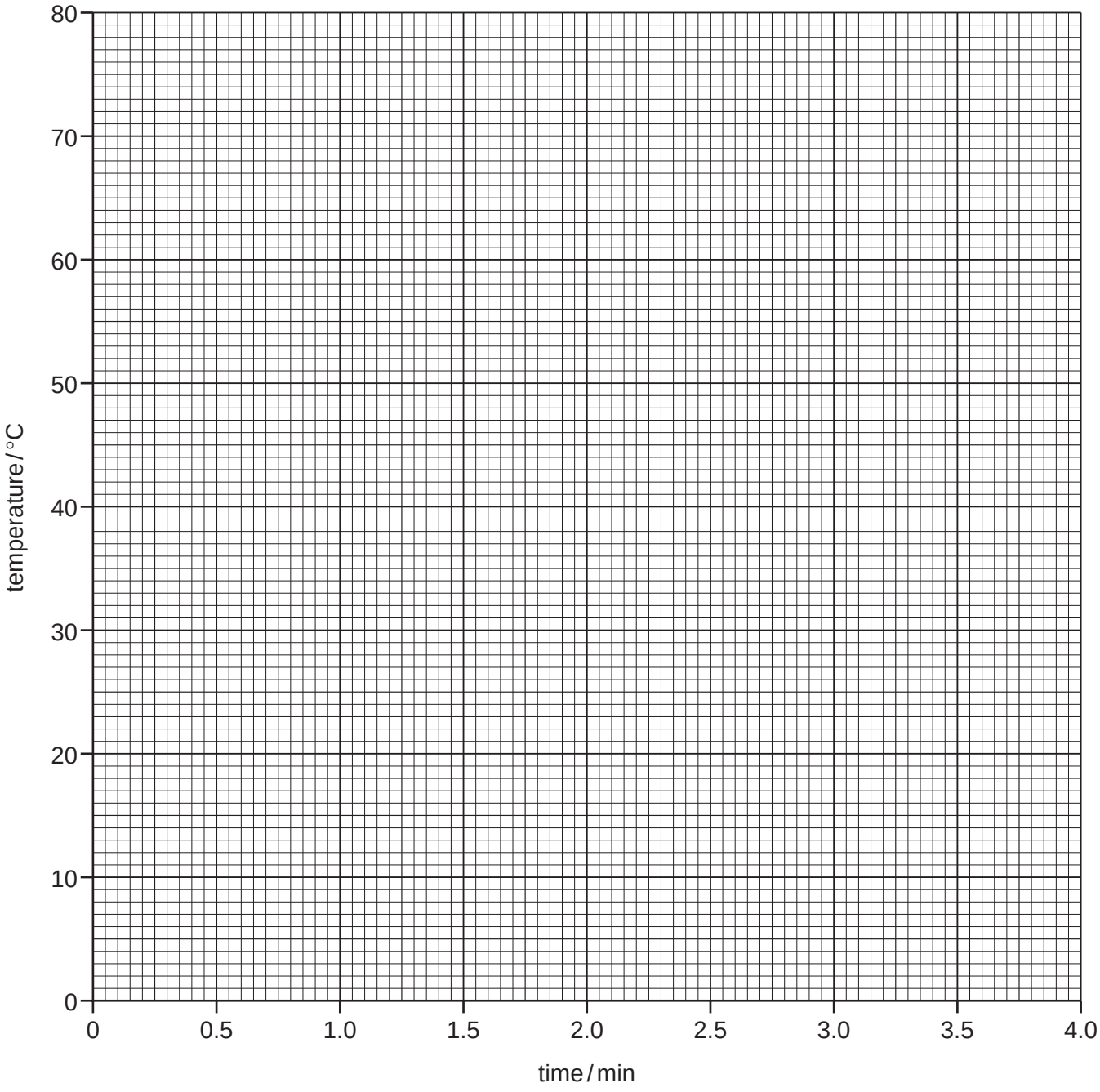
(c) Plot the results of both experiments on the grid below. Draw two smooth line graphs. Clearly label your graphs.



[5]

(d) From your graph, work out the temperature of the reaction mixture in Experiment 1 after 1 minute 15 seconds.

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

..... [3]

(e) What type of chemical reaction occurs when zinc and iron react with aqueous copper(II) sulfate?

..... [1]

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(f) **(i)** Compare the temperature changes in Experiments 1 and 2.

..... [1]

(ii) Suggest an explanation for the difference in temperature changes.

.....

..... [1]

(g) Explain how the temperature changes would differ in the experiments if 12.5 cm^3 of copper(II) sulfate solution were used.

.....

.....

..... [2]

(h) Predict the effect of using lumps of zinc in Experiment 1. Explain your answer.

.....

..... [2]

[Total: 21]

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2 You are provided with three different liquids **P**, **Q** and **R**.
P and **R** are aqueous solutions and **Q** is a pure liquid.
Carry out the following tests on **P**, **Q** and **R**, recording all of your observations in the table.
Conclusions must **not** be written in the table.

tests	observations
(a) (i) Add about 1 cm^3 of each liquid to separate test-tubes. Describe the colour and smell of each liquid.	**P** ..... **Q** ..... **R** ..... [2]
(ii) Using a teat pipette, add a few drops of each liquid to separate pieces of Universal Indicator paper. Describe the colour and the pH.	**P** ..... **Q** ..... **R** ..... [2]
(b) To about 2 cm^3 of each liquid, add a piece of magnesium ribbon. Test the gas given off by liquid **P**.	**P** .... [3] **Q** ..... [1] **R** ..... [1]
(c) To about 2 cm^3 of each liquid, add a marble chip.	**P** ..... [1] **Q** ..... [1] **R** ..... [1]
(d) To about 5 cm^3 of liquid **P** add a spatula measure of copper oxide. Heat the mixture to boiling. Leave to settle for 1 minute. Decant off the liquid and add 1 cm^3 of dilute nitric acid and 1 cm^3 of aqueous barium nitrate to this liquid.	..... [1] ..... [1]
(e) Add about 2 cm^3 of liquid **Q** to a boiling tube. Heat the liquid to boiling and use a thermometer to record the constant temperature of the **vapour** produced just above the surface of the liquid.	temperature .....°C [1]

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[Turn over

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(f) Identify liquid **P**.

..... [2]

(g) Identify liquid **Q**.

..... [1]

(h) What conclusion can you draw about liquid **R**?

..... [1]

[Total: 19]

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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.
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 with dilute nitric acid, then aqueous barium nitrate	white ppt.

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.
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

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

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