# UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

	CHEMISTRY	
0620/05	Paper 5 Practical Test	
October/November 2006		
1 hour 15 minutes	Candidates answer on the Question Paper.  Additional Materials: As listed in Instructions to Supervisors	
		Candidate Name
Candidate Number		Centre Number

#### **READ THESE INSTRUCTIONS FIRST**

Write your name, Centre number and candidate number on all the work you hand in.

Write in dark blue or black pen in the spaces provided on the Question Paper.

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 THE BARCODE.

DO NOT WRITE IN THE GREY AREAS BETWEEN THE PAGES.

Answer all questions.

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

Practical notes are provided on page 8.

FOR EXAMINER'S USE		
1		
2		
Total		

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



# **BLANK PAGE**

You are going to investigate the reactions of three different metals.
 Magnesium, iron and zinc will be used.
 Read all the **instructions** below carefully before starting the experiments.

For Examiner's Use

#### **Instructions**

#### Experiment 1

By using a measuring cylinder, pour 5 cm³ of the aqueous copper(II) sulphate into the test-tube provided. Measure the initial temperature of the solution and record it in the table below. Add the 1 g sample of zinc powder to the solution in the test-tube and stir the mixture with the thermometer. Record the maximum temperature reached and any observations in the table.

Remove the thermometer and rinse with water.

#### **Experiment 2**

Repeat Experiment 1, using 1 g of iron filings instead of zinc. Record the maximum temperature reached and any observations in the table.

#### Experiment 3

Repeat Experiment 1, using the 0.5 g sample of magnesium. Test the gas given off with a lighted splint.

#### Table of results

experiment	metal	temperature of solution/°C		observations
		initial	maximum	
1	zinc			
2	iron			
3	magnesium			

[9]

(a)	Use your results and observations to answer the following questions.			
	(i)	Which metal is most reactive with aqueous copper(II) sulphate?		
			[1]	
	(ii)	Give two reasons why you chose this metal.		
		1		
		2	[2]	
	(iii)	Name the gas given off in Experiment 3.		
			[1]	

You are now going to investigate the reaction between two of the metals and aqueous copper(II) sulphate in more detail.

#### Experiment 4

Rinse the thermometer with water at room temperature. By using a measuring cylinder pour 10 cm³ of aqueous copper(II) sulphate into a polystyrene cup. Measure the initial temperature of the solution and record it in the table below.

Add the 1 g sample of magnesium powder to the cup and record the temperature every 10 seconds for 1 minute. Record all of your results in the table.

#### Experiment 5

Repeat Experiment 4 using the 2g sample of zinc powder instead of magnesium.

Record all of your results in the table.

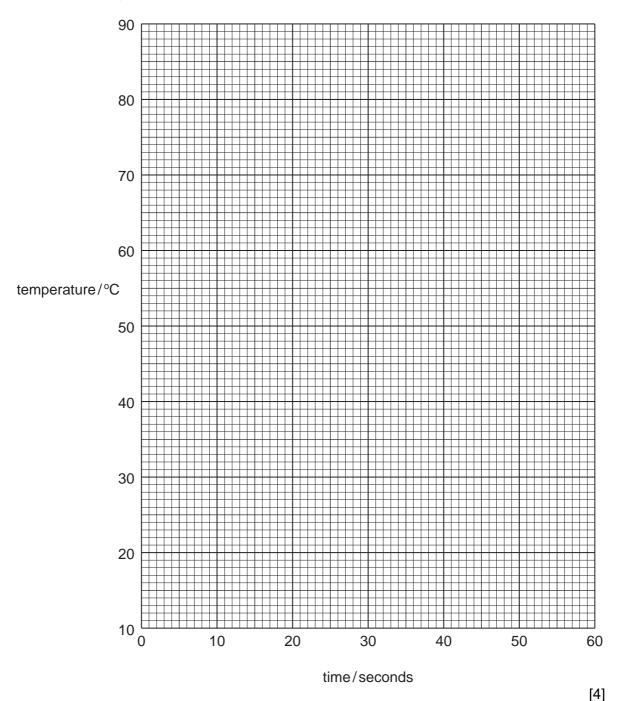
#### Table of results

time/seconds	temperature/°C		
	Experiment 4	Experiment 5	
0			
10			
20			
30			
40			
50			
60			

[3]

For Examiner's Use **(b)** Plot the results of Experiments 4 and 5 on the grid below. Draw two smooth line graphs. Clearly label the graphs.

For Examiner's Use



(c) Use your graph to estimate the temperature of the reaction mixture in Experiment 4 after 5 seconds. Indicate clearly on the graph how you obtained your answer.

[2

2 You are provided with solid **F** and solid **G**.

Carry out the following tests on  ${\bf F}$  and  ${\bf G}$ , recording all of your observations in the table.

Conclusions must not be written in the table.

For
Examiner's
Use

tests	observations
(a) Place a little of solid F in a hard glass test-tube. Insert a damp piece of pH paper in the mouth of the tube. Heat the solid gently, then more strongly.	
	[3]
<ul> <li>(b) Place the rest of solid F in a boiling-tube. Add 10 cm³ of distilled water and shake to dissolve.</li> <li>Divide the solution into 4 equal portions in test-tubes.</li> </ul>	
(c) (i) Test the pH of the first portion of the solution using Universal Indicator solution.	colour
(ii) To the second portion, add about 1 cm³ of aqueous sodium hydroxide. Heat <b>gently</b> and test the gas given off with damp litmus paper.	[2]
(c) (iii) To the third portion of solution, add a few drops of dilute nitric acid and then aqueous lead(II) nitrate.	[2]

tests observations (c) (iv) To the fourth portion of solution, add a few drops of dilute nitric acid followed by aqueous silver nitrate. Dissolve solid G in about 5 cm<sup>3</sup> of distilled water in a test-tube. Divide the solution into two equal portions in two test-tubes. (ii) Repeat (c)(iii) using the first portion of the solution. (iii) Repeat (c)(iv) using the second portion of the solution. (e) Name the gas given off in (c)(ii). [1] (f) Identify solid F. [2] (g) Name the anion in solid G. [1]

For Examiner's Use

#### **NOTES FOR USE IN QUALITATIVE ANALYSIS**

#### **Test for anions**

anion	test	test result
carbonate (CO <sub>3</sub> <sup>2-</sup> )	add dilute acid	effervescence, carbon dioxide produced
chloride (C $l^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
iodide (I <sup>-</sup> ) [in solution]	acidify with dilute nitric acid, then aqueous lead(II) nitrate	yellow ppt.
nitrate (NO <sub>3</sub> ) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulphate (SO <sub>4</sub> <sup>2-</sup> ) [in solution]	acidify with dilute nitric acid, then add 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 <sub>4</sub> <sup>+</sup> )	ammonia produced on warming	-
calcium (Ca <sup>2+</sup> )	white., insoluble in excess	no ppt., or very slight white ppt.
copper(Cu <sup>2+</sup> )	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) (Fe <sup>2+</sup> )	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) (Fe <sup>3+</sup> )	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc (Zn <sup>2+</sup> )	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 <sub>3</sub> )	turns damp red litmus paper blue
carbon dioxide (CO <sub>2</sub> )	turns limewater milky
chlorine (Cl <sub>2</sub> )	bleaches damp litmus paper
hydrogen (H <sub>2</sub> )	"pops" with a lighted splint
oxygen (O <sub>2</sub> )	relights a glowing splint

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.