UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

8508882337

CHEMISTRY **0620/53**

Paper 5 Practical Test **May/June 2013**

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.
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 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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Total	

This document consists of **6** printed pages and **2** blank pages.

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1 You are going to investigate the reaction between potassium hydrogen carbonate and two aqueous solutions of dilute hydrochloric acid of different concentrations, labelled **F** and **G**.

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 20 cm^3 of distilled water into a conical flask. Add a 0.3 g sample of potassium hydrogen carbonate to the conical flask and shake the flask to dissolve the solid.
Add five drops of methyl orange indicator to the conical flask.

Fill the burette provided up to the 0.0 cm^3 mark with the solution **F** of dilute hydrochloric acid. Add acid **F** from the burette 1 cm^3 at a time, while shaking the flask, until the solution just changes colour. Record the burette readings in the table below and complete the table.

(b) *Experiment 2*

Empty the conical flask and rinse it with distilled water.

Pour away the contents of the burette and rinse the burette with the solution **G** of dilute hydrochloric acid.
Repeat Experiment 1, using solution **G** instead of solution **F**.
Record the burette readings in the table below and complete the table.

	Experiment 1	Experiment 2
final reading / cm^3		
initial reading / cm^3		
difference / cm^3		

[6]

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(c) What colour change was observed in the contents of the flask after the hydrochloric acid was added to the flask?

from ..... to ..... [2]

(d) What type of chemical reaction occurs when hydrochloric acid reacts with potassium hydrogen carbonate?

..... [1]

(e) Complete the sentence below.

Experiment ..... needed the smallest volume of hydrochloric acid to change the colour of the methyl orange. [1]

(f) **(i)** Compare the volumes of hydrochloric acid used in Experiments 1 and 2.

..... [1]

(ii) The most concentrated solution of hydrochloric acid is solution ..... . [1]

(g) If Experiment 2 was repeated using 0.6 g of potassium hydrogen carbonate, what volume of hydrochloric acid would be needed?

..... [2]

(h) What would be a more accurate method of measuring the volume of the distilled water?

..... [1]

(i) What would be the effect on the results if the solutions of potassium hydrogen carbonate were warmed before adding the hydrochloric acid? Give a reason for your answer.

effect on results .....

reason..... [2]

(j) Describe a **different** method of finding out which of the solutions of hydrochloric acid, **F** or **G**, is the more concentrated.

.....

.....

.....

.....

..... [3]

[Total: 20]

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[Turn over

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2 You are provided with two solids, **H** and **I**, which are both salts.
Carry out the following tests on each solid, recording all of your observations in the table.
Conclusions must not be written in the table.

tests	observations
tests on solid **H** Add all of **H** to about 10 cm^3 of distilled water in a test-tube and shake to dissolve.	
Divide the solution into three equal portions in test-tubes, and carry out the following tests. **(a)** Describe the appearance of the solution. Add about 1 cm^3 of dilute hydrochloric acid to the first portion of the solution.	..... [1] ..... [1]
(b) To the second portion of the solution, add drops of aqueous sodium hydroxide until a change is seen. Heat the mixture **gently** for two minutes and stir the mixture. Allow the mixture to settle. Remove the liquid with a teat pipette. Add about 2 cm^3 of dilute nitric acid to the solid and heat the mixture **gently**.	..... [2] .... [2] ..... [1]
(c) To the third portion of the solution, add drops of aqueous ammonia until a change is seen. Now add an excess of aqueous ammonia to the mixture.	..... [2] .... [2]

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tests	observations
tests on solid **I**	
(d) Place about half of solid **I** into a dry test-tube. Heat the test-tube gently, then strongly. Test the gas given off with a lighted splint.	.... [2]
Leave the test-tube to cool for five minutes and then add about 1 cm^3 of dilute hydrochloric acid to the test-tube. Test the gas with a lighted splint.	.... [2]
(e) Add the rest of solid **I** to about 2 cm^3 of dilute nitric acid in a test-tube. Warm the solution and smell the mixture.	..... [1]

(f) What conclusions can you draw about solid **H**?

.....

..... [2]

(g) What conclusions can you draw about solid **I**?

.....

..... [2]

[Total: 20]

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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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