UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME			
CENTRE NUMBER		CANDIDATE NUMBER	

3216989122

CHEMISTRY **0620/53**

Paper 5 Practical Test **October/November 2010**

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.

For Examiner's Use	
1	
2	
Total	

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

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1 You are going to investigate what happens when dilute hydrochloric acid reacts with two different alkaline solutions, **F** and **G**.

Read all instructions below carefully before starting the experiments.

Instructions
You are going to carry out two experiments.

(a) *Experiment 1*

Fill the burette with the dilute hydrochloric acid provided to the 0.0 cm^3 mark.

Using a measuring cylinder, pour 25 cm^3 of solution **F** into a conical flask. Add 4 to 6 drops of phenolphthalein indicator to the conical flask.

Add the hydrochloric acid from the burette 1 cm^3 at a time while shaking the flask. When the colour of the phenolphthalein changes, record in the table the volume of acid added.

(b) *Experiment 2*

Fill the burette with dilute hydrochloric acid to the 0.0 cm^3 mark.

Empty the conical flask and rinse it with water. Using a measuring cylinder, pour 25 cm^3 of solution **G** into the conical flask. Add 4 to 6 drops of phenolphthalein to the conical flask.

Add the hydrochloric acid from the burette 1 cm^3 at a time while shaking the flask. When the colour of the phenolphthalein changes, record in the table the volume of acid added.

experiment	solution	volume of hydrochloric acid added / cm^3
1	**F**	
2	**G**	

[4]

(c) What colour change was observed when hydrochloric acid was added to the conical flask?

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

(d) (i) Which ion is present in all alkaline solutions?

.... [1]

(ii) What type of chemical reaction occurs when hydrochloric acid reacts with alkaline solutions?

.... [1]

(e) (i) In which Experiment was the greatest volume of hydrochloric acid used?

.... [1]

(ii) Compare the volumes of hydrochloric acid used in Experiments 1 and 2.

.... [1]

(iii) Suggest an explanation for the difference in volumes.

....

....

.... [2]

(f) If Experiment 2 were repeated using 12.5 cm^3 of solution **G**, what volume of hydrochloric acid would be used? Explain your answer.

....

.... [2]

(g) (i) State **two** sources of error in the experiments.

1 ....

2 .... [2]

(ii) Suggest **two** improvements to reduce the sources of error in the experiments.

1 ....

2 .... [2]

[Total: 18]

[Turn over

2 You are provided with two different salts, **W** and **X**.
Carry out the following tests on each salt, recording all of your observations in the table.
Conclusions must **not** be written in the table.

tests	**observations**
tests on solid **W** **(a)** Describe the appearance of solid **W**.	.... [1]
(b) Place half of solid **W** in a test-tube. Heat the test-tube **gently**. Test any gas given off with damp pH indicator paper.	.... [2]
(c) Add the rest of solid **W** to about 6 cm^3 of distilled water in a test-tube. Cork the test-tube and shake the contents until dissolved. Divide the solution into 3 equal portions in test-tubes and carry out the following tests. **(i)** Add about 1 cm^3 of dilute hydrochloric acid to the first portion of the solution and then add aqueous barium chloride. **(ii)** Add about 1 cm^3 of dilute nitric acid to the second portion of the solution and then add silver nitrate solution. **(iii)** To the third portion of the solution add about 1 cm^3 of aqueous sodium hydroxide. Heat the mixture gently and test any gases given off with damp pH indicator paper.	.... [2] .... [1] .... [2]

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tests	observations
<u>tests on solid **X**</u> **(d)** Repeat experiment **(b)** using about half of the solid **X**. Leave the test-tube and contents to cool. This will be used in test **(f)**.	.... [2]
(e) Dissolve the rest of solid **X** in about 4 cm^3 of distilled water in a test-tube. Divide the solution into 3 equal portions in test-tubes and carry out the following tests.	
(i) To the first portion, add excess aqueous sodium hydroxide.	.... [2]
(ii) To the second portion, add a few drops of hydrochloric acid, followed by aqueous barium chloride.	.... [1]
(iii) To the third portion, add aqueous potassium manganate(VII) drop by drop.	.... [1]
(f) Using a teat pipette, add drops of cold water to the test-tube and contents from test **(d)**.	.... [2]

(g) Identify the gas given off in test **(b)**.

.... [1]

(h) What conclusions can you draw about solid **W**?

....

.... [2]

(i) Identify solid **X**.

....

....

.... [3]

[Total: 22]

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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