UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

0637573378

CHEMISTRY **0620/53**

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.

For Examiner's Use	
1	
2	
Total	

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

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UNIVERSITY *of* CAMBRIDGE International Examinations

1 You are going to investigate the reaction between dilute sulfuric acid and three a... solutions of sodium hydroxide of different concentrations, labelled **A**, **B** and **C**.

Read all the instructions below carefully before starting the experiments.

Instructions
You are going to carry out three experiments.

(a) *Experiment 1*

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

Use a measuring cylinder to pour 20 cm^3 of solution **A** into a conical flask. Add a few drops of phenolphthalein indicator to the flask.

Add the sulfuric acid from the burette 1 cm^3 at a time, while shaking the flask, until the colour of the phenolphthalein changes. Record the burette readings in the table.

(b) *Experiment 2*

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

Empty the conical flask and rinse it with water. Use a measuring cylinder to pour 20 cm^3 of solution **B** into the conical flask. Add a few drops of phenolphthalein to the flask.
Add the sulfuric acid from the burette 1 cm^3 at a time, while shaking the flask, until the colour of the phenolphthalein changes. Record the burette readings in the table.

(c) *Experiment 3*

Repeat Experiment 2, using solution **C** instead of solution **B**. Record your burette readings in the table and complete the table.

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

[6]

(d) What colour change was observed after the sulfuric acid was added to the flask?

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

(e) What type of chemical reaction occurs when sulfuric acid reacts with sodium hydroxide?

.... [1]

(f) **(i)** Complete the sentences below.

Aqueous sodium hydroxide labelled .... needed the smallest volume of sulfuric acid to change the colour of the phenolphthalein.

Aqueous sodium hydroxide labelled .... needed the largest volume of sulfuric acid to change the colour of the phenolphthalein. [1]

(ii) The order of concentration of the solutions of sodium hydroxide is

least concentrated ....

↓ ....

most concentrated .... [2]

(g) Compare the volumes of sulfuric acid used in Experiments 1 and 2.

.... [1]

(h) If Experiment 3 was repeated using 40 cm^3 of solution **C**, what volume of sulfuric acid would be used?

.... [2]

(i) What would be a more accurate method of measuring the volume of the aqueous sodium hydroxide?

.... [1]

(j) What would be the effect on the results if the solutions of sodium hydroxide were warmed before adding the sulfuric acid? Give a reason for your answer.

effect on results ....

reason .... [2]

(k) Suggest a different method of finding the order of concentrations of the solutions of sodium hydroxide.

....

....

....

....

.... [3]

[Total: 21]

2 You are provided with two different salts, **D** and **E**.
D is an aqueous solution of the salt and **E** is a solid.
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
(a) Describe the appearance of	
(i) solution **D**,	.... [1]
(ii) solid **E**.	.... [1]
<u>tests on solution **D**</u>	
(b) Divide the solution into five equal portions in test-tubes, and carry out the following tests.	
(i) Add about 1 cm^3 of dilute nitric acid to the first portion of the solution and then aqueous barium nitrate.	.... [1]
(ii) To the second portion of the solution, add about 1 cm^3 of dilute nitric acid and aqueous silver nitrate.	.... [2]
(iii) To the third portion of the solution, add an excess of aqueous sodium hydroxide.	.... [2]
(iv) Add an excess of aqueous ammonia solution to the fourth portion.	.... [1]
Keep the remaining portion of the solution for use in test **(c)(ii)**.	
<u>tests on solid **E**</u>	
(c) (i) Place about half of solid **E** in a test-tube. Heat the test-tube gently, then strongly. Test any gas given off.	.... [3]
Leave the test-tube to cool for five minutes. Then add about 1 cm^3 of dilute nitric acid to the test-tube.	.... [1]
(ii) Add the rest of solid **E** to the remaining portion of solution **D** in a test-tube.	.... [1]

(d) Identify salt **D**.

.... [1]

(e) Identify the gas given off in test **(c)(i)**.

.... [1]

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

....

.... [2]

[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