

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

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

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.



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<sup>3</sup> mark.

Using a measuring cylinder, pour 25 cm<sup>3</sup> 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<sup>3</sup> 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<sup>3</sup> mark.

Empty the conical flask and rinse it with water. Using a measuring cylinder, pour 25 cm<sup>3</sup> 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<sup>3</sup> 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/cm³
1	F	
2	G	

[4]

(C)	flas	at colour change was observed when hydrochloric acid was added to the conical k?
	fron	n to [2]
(d)	(i)	Which ion is present in all alkaline solutions?
	(ii)	solutions?
(e)	(i)	In which Experiment was the greatest volume of hydrochloric acid used?
	(ii)	Compare the volumes of hydrochloric acid used in Experiments 1 and 2.
	(iii)	Suggest an explanation for the difference in volumes.
		[2]
(f)		experiment 2 were repeated using 12.5 cm³ of solution <b>G</b> , what volume of hydrochloric I would be used? Explain your answer.
		[2]
(g)	(i)	State <b>two</b> sources of error in the experiments.
		1
		2[2]
	(ii)	Suggest <b>two</b> improvements to reduce the sources of error in the experiments.
		1
		2
		[Total: 18]

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	s on solid <b>W</b>	
(a)	Describe the appearance of solid <b>W</b> .	[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 <b>W</b> to about 6 cm³ 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 cm³ of dilute hydrochloric acid to the first portion of the solution and then add aqueous barium chloride.	[2]
	Add about 1 cm <sup>3</sup> of dilute nitric acid to the second portion of the solution and then add silver nitrate solution.	[1]
(i	ii) To the third portion of the solution add about 1 cm³ of aqueous sodium hydroxide. Heat the mixture gently and test any gases given off with damp pH indicator paper.	[2]

	tests	observations
tests on solid X		
(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 <b>X</b> in about 4 cm <sup>3</sup> 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]
W	sing a teat pipette, add drops of cold ater to the test-tube and contents om test (d).	[2]
(g	Identify the gas given off in test (b)	).
(h	What conclusions can you draw ab	pout solid <b>W</b> ?
		[2]
(i)	Identify solid X.	
		[3]

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## 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 <i>l</i> <sup>-</sup> ) [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 add aqueous silver nitrate	yellow ppt.
nitrate (NO <sub>3</sub> <sup>-</sup> ) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate (SO <sub>4</sub> <sup>2-)</sup> [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 (Al³+)	white ppt., soluble in excess giving a colourless solution	white ppt., insoluble in excess
ammonium (NH <sub>4</sub> +)	ammonia produced on warming	_
calcium (Ca <sup>2+</sup> )	white ppt., 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	

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