Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/03**

Paper 3 Practical Test

October/November 2005

1 hour 30 minutes

Candidates answer on the Question Paper.
Additional Materials: As listed in the Instructions to Supervisors.

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 in the spaces provided on the Question Paper.
You may use a pencil for any diagrams, graphs or rough work.
Do not use staples, paper clips, highlighters, glue or correction fluid.
You may use a calculator.

Answer **all** questions.
The number of marks is given in brackets [ ] at the end of each question or part question.
Qualitative analysis notes are printed on page 8.
You should show the essential steps in any calculation and record experimental results in the spaces provided on the question paper.
At the end of the examination, fasten all your work securely together.

For Examiner's Use	
1	
2	
TOTAL	

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

1 **P** is a solution containing hydrochloric acid (HC*l*) or nitric acid (HNO_3) or sulphuric acid (H_2SO_4). You are to identify the acid and determine its concentration by titration.

(a) Identification of the acid in **P**

Carry out the following tests on solution **P** and record your observations in the table. You should test and name any gas evolved.

test no.	test	observations
1	To a portion of **P**, add an equal volume of aqueous sodium hydroxide and a small piece of aluminium foil. Warm **gently**.	
2	To a portion of **P**, add an equal volume of aqueous barium nitrate.	
3	To a portion of **P**, add an equal volume of aqueous silver nitrate.	

The acid present in **P** is ..... [6]

(b) **Q** is a solution of 0.100 mol/dm^3 sodium hydroxide. You are to determine the concentration of the acid in **P** as follows.

Fill the burette with solution **P**.
Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **Q** into a flask and titrate with **P**, using the indicator provided.

Record your results in the table, repeating the titration as many times as you consider necessary to achieve consistent results.

Results

Burette readings

titration number	1	2	
final reading / cm^3			
initial reading / cm^3			
volume of **P** used / cm^3			
best titration results (✓)			

Summary

Tick (✓) the best titration results.

Using these results, the average volume of **P** required was …… cm^3.

Volume of solution **Q** used was …… cm^3. [12]

(c) **Q** is 0.100 mol/dm^3 sodium hydroxide.

Using your results from **(b)**, calculate the concentration, in mol/dm^3, of the acid in **P**.

Concentration of acid in **P** is …… mol/dm^3. [2]

2 You are provided with three solutions **S**, **T** and **U**. Carry out the following tests and record your observations in the table.

test no.	test	observations with solution **S**
1	**(a)** To a portion of the solution, add aqueous sodium hydroxide until a change is seen. Divide the mixture from **(a)** into two test-tubes.	
	(b) Add excess aqueous sodium hydroxide to one of the test-tubes containing the mixture from **(a)**.	
	(c) Add excess aqueous ammonia to the other test-tube containing the mixture from **(a)**.	
2	To a portion of the solution, add an equal volume of dilute hydrochloric acid.	
3	To a portion of the solution, add an equal volume of aqueous potassium iodide.	

Conclusion

Give the formulae of the cations (positive ions) present in any **two** of the solutions, stating which solution (**S**, **T** or **U**).

(i) The cation present in solution ……. is ……

(ii) The cation present in solution ……. is …… [2]

observations with solution **T**	observations with solution **U**	test no.
		1
		2
		3

[18]

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CHEMISTRY PRACTICAL NOTES

Tests 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 lead(II) nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulphate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt.

Tests 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(II) (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
lead(II) (Pb^{2+})	white ppt., soluble in excess giving a colourless solution	white 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

[Lead(II) ions can be distinguished from aluminium ions by the insolubility of lead(II) chloride.]

Tests for gases

gas	*test and test result*
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
sulphur dioxide (SO_2)	turns aqueous potassium dichromate(VI) from orange to green