UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

5551322464

CHEMISTRY **5070/03**

Paper 3 Practical Test **May/June 2008**

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.
You may use a pencil for any diagrams, graphs or rough work.
Do **not** use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
You should show the essential steps in any calculations and record experimental results in the spaces provided on the question paper.
Qualitative Analysis Notes are printed 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 **P** is a solution containing either hydrochloric acid (HC*l*) or sulphuric acid (H_2SO_4). You are to identify the acid and determine its concentration by titrating it against solution **Q**, which is 0.100 mol/dm^3 sodium hydroxide.

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

Carry out the following tests on solution **P** and record your observations in the table.

test no.	test	observations
1	To a portion of **P**, add an equal volume of aqueous lead(II) nitrate.	
2	To a portion of **P**, add an equal volume of aqueous silver nitrate.	
3	To a portion of **P**, add an equal volume of aqueous barium nitrate.	

The acid present in **P** is .....[4]

(b) Determination of the concentration of the acid in **P**

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Put **P** into the burette.
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**..... mol/dm^3. [2]

[Total: 18]

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

For Examiner's Use

test no.	test	observations with solution **S**
1	**(a)** To a portion of the solution, add aqueous sodium hydroxide until a change is seen. **(b)** Add excess aqueous sodium hydroxide to the mixture from **(a)**.	
2	**(a)** To a portion of the solution, add aqueous ammonia until a change is seen. **(b)** Add excess aqueous ammonia to the mixture from **(a)**.	
3	To a portion of the solution, add an equal volume of aqueous potassium iodide and allow the mixture to stand for a few minutes.	
4	To a portion of solution **S** and a portion of solution **T**, add an equal volume of aqueous barium nitrate and allow the mixture to stand for a few minutes.	
5	To a portion of solution **S** and a portion of solution **T**, add an equal volume of aqueous silver nitrate and allow the mixture to stand for a few minutes.	

observations with solution **T**	observations with solution **U**	test no.
		1
		2
		3
		4
		5

[20]

Conclusion

Give the formulae of the compounds present in solutions **S** and **T**.

The formula of the compound present in solution **S** is .....

The formula of the compound present in solution **T** is .....

[2]

[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 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.

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(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
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 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