Centre Number	Candidate Number	Name

UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY **5070/03**

Paper 3 Practical Test

May/June 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 in the spaces at the top of this page.
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.

If you have been given a label, look at the details. If any details are incorrect or missing, please fill in your correct details in the space given at the top of this page.

Stick your personal label here, if provided.

For Examiner's Use	
1	
2	
TOTAL	

This document consists of **5** printed pages and **3** blank pages.

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1 **P** is a solution of hydrochloric acid (HC*l*) of unknown concentration. You are to deter concentration by titrating it against solution **Q,** which is 0.100 mol/dm^3 sodium hydroxide

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

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 ……. cm^3. [12]

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

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

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

2 You are provided with solutions of two sodium salts, **R** and **S**. Carry out the following tests and record your observations in the table. You should test and name any gas evolved.

Tests on Solution R

Test no.	Test	Observations
1	**(a)** To a portion of solution **R**, add an equal volume of dilute hydrochloric acid and allow the mixture to stand for a few minutes. **(b)** Warm the mixture from **(a)** gently.	
2	To a portion of acidified potassium manganate(VII), add an equal volume of solution **R** and allow the mixture to stand for a few minutes.	
3	To a portion of aqueous silver nitrate, add an equal volume of solution **R** and leave to stand until no further change is seen.	
4	**(a)** To a portion of solution **R**, add an equal volume of aqueous lead(II) nitrate. **(b)** Add dilute nitric acid to the mixture from **(a).**	

[15]

Tests on Solution S

Test no.	Test	Observations
5	**(a)** To a portion of acidified potassium manganate(VII), add an equal volume of solution **S.** **(b)** To a portion of the mixture from **(a)**, add an equal volume of solution **R** and allow the mixture to stand for a few minutes.	
6	To a portion of aqueous silver nitrate, add an equal volume of solution **S**.	
7	**(a)** To a portion of solution **S**, add an equal volume of aqueous lead(II) nitrate. **(b)** Add dilute nitric acid to the mixture from **(a).** **(c)** Transfer a portion of the mixture from **(b)** to a boiling tube, add an equal volume of water and heat carefully until the mixture just boils. Allow to cool.	

[9]

Conclusion

Give the formula of the anion (negative ion) present in **S** …….

In Test 5, **S** is acting as a …….. and **R** is acting as

a …….. [2]

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NOTES FOR USE IN QUALITATIVE ANALYSIS

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
zinc (Zn^{2+})	white ppt., soluble in excess giving a colourless solution	white ppt., soluble in excess giving a colourless solution

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