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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

3733489680

CHEMISTRY **5070/03**

Paper 3 Practical Test **October/November 2007**

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.
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.
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 hydrochloric acid, HC*l*. You are to determine the concentration of HC*l* in **P** by titrating it against solution **Q**, which is 0.100 mol / dm^3 sodium hydroxide, NaOH. You are then to use **P** to identify solid **R**.

(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. Repeat 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]

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

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

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

(c) Identification of solid **R**

Carry out the following test on solid **R** and record your observations in the table.

test	observations
Place your sample of **R** into a boiling-tube and add solution **P** until the boiling-tube is approximately one third full. You should test and name any gas evolved.	

[4]

(d) Several possible formulae for **R** are given below. Using your results from **(c)**, identify **R** and draw a circle around the correct formula.

$ZnCO_3$ **$ZnCl_2$** **$Zn(NO_3)_2$** **$ZnSO_3$** **$ZnSO_4$** [1]

[Total: 19]

2 Carry out the following tests on solution **S** and record your observations in the ta
should test and name any gas evolved.

test no.	test	observations
1	Put a portion of **S** into a boiling-tube and heat **gently** until the mixture boils.	
2	**(a)** To a portion of **S**, slowly add hydrochloric acid until a change is seen. **(b)** Add excess hydrochloric acid to the mixture from **(a)**.	
3	**(a)** To a portion of **S**, add an equal volume of aqueous barium nitrate and allow the mixture to stand for a few minutes. **(b)** Add nitric acid to the mixture from **(a)**.	

test no.	test	observations
4	**(a)** To a portion of **S**, add an equal volume of aqueous potassium iodide. **(b)** Pour a portion of the mixture from **(a)** into a boiling-tube and add an equal volume of dilute hydrochloric acid and allow the mixture to stand for a few minutes. **(c)** Slowly add aqueous sodium thiosulphate to the mixture from **(b)** until there is no further change.	

[19]

Conclusions

Give the formulae of two ions present in **S**.

The ions present in **S** are ..... and ..... [2]

[Total: 21]

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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