Centre Number	Candidate Number	Name

CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CHEMISTRY 5070/03

Paper 3 Practical Test

May/June 2003

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.
Do not use staples, paper clips, highlighters, glue or correction fluid.

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 **8** printed pages.

University of Cambridge Local Examinations Syndicate
[Turn over

1 Aqueous hydrogen peroxide has a wide range of reactions. Its concentration can be determined by titrating it with an acidified solution of potassium manganate(VII).

You are to carry out the following tests on a solution of hydrogen peroxide and then determine its concentration.

P is an acidified solution of hydrogen peroxide of unknown concentration.
Q has been prepared by diluting solution **P**.
R is 0.0200 mol/dm^3 potassium manganate(VII).
S is an unknown solid.

(a) Reactions of hydrogen peroxide. You should test and name any gas evolved.

Test no.	Test	Observations
1	To a portion of **P**, add an equal volume of aqueous potassium dichromate(VI).	
2	To a portion of **P**, add an equal volume of aqueous potassium iodide.	
3	**(a)** To a portion of aqueous iron(II) sulphate, add an equal volume of **P**. **(b)** To a portion of the mixture from **(a)** add aqueous sodium hydroxide until a change is seen.	

4	To a portion of **P**, add a small amount of solid **S** and leave the mixture to stand for a few minutes.	

[12]

Conclusions

In **Test 3**, hydrogen peroxide is acting as .....

In **Test 4**, solid **S** is acting as .....[2]

[Turn over

(b) Determination of the concentration of **Q.**

Put solution **R** into the burette. Because the colour of **R** is so intense, you may find it easier to read the top of the meniscus for all measurements.

Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **Q** into a flask and titrate with **R**. At first the purple colour disappears rapidly. As the titration proceeds, this disappearance is less rapid. At the end-point, one drop of **R** produces a pale pink colour that does not disappear on swirling.

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 **R** used / cm^3			
Best titration results (✓)			

Summary

Tick (✓) the best titration results.
Using these results, the average volume of **R** required was ..... cm^3.

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

(c) **R** is 0.0200 mol/dm^3 potassium manganate(VII).
Five moles of hydrogen peroxide react with two moles of potassium manganate(VII).
Using your results from **(b)**, calculate the concentration, in mol/dm^3, of hydrogen peroxide in **Q**.

Concentration of hydrogen peroxide in **Q** is ..... mol/dm^3. [2]

[Turn over

2 You are provided with a solution **T** which contains a simple salt. Carry out the following tests and record your observations in the table.

Test no.	Test	Observations
1	**(a)** To a portion of **T**, 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 **T**, add aqueous ammonia until a change is seen. **(b)** Add excess aqueous ammonia to the mixture from **(a)**.	
3	**(a)** To a portion of **T**, add an equal volume of aqueous silver nitrate. **(b)** Add dilute nitric acid to the mixture from **(a)**.	

4	**(a)** To a portion of **T**, add an equal volume of aqueous barium nitrate. **(b)** Add dilute nitric acid to the mixture from **(a)**.	

[10]

Conclusions

The two ions present in **T** are ..... and ..... [2]

[Turn over

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 (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) green