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UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education Ordinary Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

2908196063

CHEMISTRY **5070/03**

Paper 3 Practical Test **October/November 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 working.
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 calculation 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 Solution **P**, which contains hydrogen peroxide, was prepared by adding dilute sulphuric acid to 8.50 g of barium peroxide, filtering off the insoluble barium sulphate and diluting the resulting solution to 1.00 dm^3.

$$BaO_2(s) + H_2SO_4(aq) \rightarrow BaSO_4(s) + H_2O_2(aq)$$

The concentration of hydrogen peroxide in **P** can be determined by adding acidified aqueous potassium iodide and titrating the liberated iodine with aqueous sodium thiosulphate.

You are to determine the concentration of hydrogen peroxide in **P** and use this to determine the relative formula mass of barium peroxide.

Q is 0.100 mol/dm^3 sodium thiosulphate.

(a) Put **Q** into the burette.

Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **P** into a flask and add about a test-tubeful of dilute sulphuric acid followed by about a test-tubeful of aqueous potassium iodide. The solution should turn red-brown. **Do not add the starch indicator at this stage.**

Add **Q** from the burette until the red-brown colour fades to pale yellow, **then** add a few drops of the starch indicator. This will give a dark blue solution. Continue adding **Q** slowly from the burette until one drop of **Q** causes the blue colour to disappear, leaving a colourless solution. 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 **Q** used/cm^3			
best titration results (✔)			

Summary

Tick (✔) the best titration results.

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

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

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

One mole of hydrogen peroxide reacts with potassium iodide to produce iodine. Th
iodine produced reacts with two moles of sodium thiosulphate.

Calculate the concentration, in mol/dm^3, of hydrogen peroxide in **P**.

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

(c) **P** was prepared by adding dilute sulphuric acid to 8.50 g of barium peroxide and diluting the resulting solution to 1.00 dm^3.

Using your answer to **(b)**, calculate the relative formula mass of barium peroxide.

Relative formula mass of barium peroxide is ..... [2]

[Total: 16]

2 You are provided with two solutions **R** and **S** which contain the same transition e... Carry out the following tests and record your observations in the table. You should test ... 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 aqueous barium nitrate and allow the mixture to stand for a few minutes. **(b)** Add dilute nitric acid to the mixture from **(a)**.	
2	**(a)** To a portion of solution **R**, add an equal volume of aqueous silver nitrate and allow the mixture to stand for a few minutes. **(b)** Add dilute nitric acid to the mixture from **(a)**.	
3	**(a)** To a portion of solution **R**, add aqueous sodium hydroxide until a change is seen. **(b)** Add excess aqueous sodium hydroxide to the mixture from **(a)**. **(c)** To a portion of the mixture from **(b)** in a boiling-tube, add an equal volume of aqueous hydrogen peroxide and warm **gently**.	

[11]

Conclusion

The negative ion present in **R** is ..... [1]

Tests on solution S

test no.	test	observations
4	**(a)** To a portion of solution **S**, add aqueous sodium hydroxide until a change is seen. **(b)** To a portion of the mixture from **(a)**, add an equal volume of aqueous barium nitrate and allow the mixture to stand for a few minutes. **(c)** To the mixture from **(b)**, add dilute nitric acid.	
5	To a small portion of solution **S**, add an equal volume of dilute sulphuric acid followed by an equal volume of aqueous hydrogen peroxide.	
6	To a small portion of solution **S**, add an equal volume of dilute sulphuric acid followed by a **few drops** of aqueous potassium iodide.	

[11]

Conclusion

Transition elements form coloured compounds. Suggest another property of transition elements shown by these tests.

property ..... [1]

[Total: 24]

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QUALITATIVE ANALYSIS NOTES

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