Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

4589718447

CHEMISTRY **5070/32**

Paper 3 Practical Test **May/June 2017**

1 hour 30 minutes

Candidates answer on the Question Paper.

Additional Materials: As listed in the Confidential Instructions

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 an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Electronic calculators may be used.
Qualitative Analysis Notes are printed on page 8.
You should show the essential steps in any calculations 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.

DC (NH) 129380/2

CAMBRIDGE
International Examinations

[Turn over

1 Chlorine water is an aqueous solution of chlorine made by bubbling the gas through water. The amount of chlorine present in the solution can be estimated by reacting the chlorine with aqueous potassium iodide.

$$Cl_2 + 2KI \rightarrow 2KCl + I_2$$

The amount of iodine produced by the above reaction can then be determined by titration with aqueous sodium thiosulfate, $Na_2S_2O_3$, using starch as an indicator.

$$2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$$

P is an aqueous solution of iodine produced by mixing 50 cm^3 of chlorine water with 200 cm^3 of aqueous potassium iodide, an excess.

Q is 0.0230 mol / dm^3 sodium thiosulfate.

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

Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **P** into a flask.

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 **P** used was .... cm^3. [12]

(b) **Q** is 0.0230 mol/dm^3 sodium thiosulfate.

Calculate the number of moles of sodium thiosulfate in the average volume of **Q** used in the titration.

moles of sodium thiosulfate ....[1]

(c) Using your answer from **(b)**, deduce the number of moles of iodine in the volume of **P** used in the titration.

$$2Na_2S_2O_3 + I_2 \rightarrow Na_2S_4O_6 + 2NaI$$

moles of iodine ....[1]

(d) Using your answer from **(c)**, calculate the number of moles of iodine in 250 cm^3 of **P**.

moles of iodine in 250 cm^3 of **P** ....[1]

(e) Using your answer from **(d)**, deduce the number of moles of chlorine in 50 cm^3 of the chlorine water.

$$Cl_2 + 2KI \rightarrow 2KCl + I_2$$

moles of chlorine in 50 cm^3 of the chlorine water ....[1]

(f) Using your answer from **(e)**, calculate the mass, in g, of chlorine in 1 dm^3 of the chlorine water.
[A_r: Cl, 35.5]

mass of chlorine in 1 dm^3 of the chlorine water .... g [2]

[Total: 18]

2 You are provided with two solutions, **R** and **S**.

(a) Carry out the following tests and record your observations in the table.

You should test and name any gas evolved.

test no.	test	observations
1	**(a)** To 1 cm depth of **R** in a test-tube, add an equal volume of aqueous barium nitrate. **(b)** To the mixture from **(a)**, add dilute nitric acid.	
2	To 1 cm depth of **R** in a test-tube, add aqueous ammonia until no further change occurs.	
3	**(a)** To 1 cm depth of **R** in a boiling tube, add aqueous sodium hydroxide until no further change occurs. **(b)** Warm the final mixture from **(a)** in the boiling tube.	
4	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous silver nitrate. **(b)** To the mixture from **(a)**, add dilute nitric acid.	

test no.	test	observations
5	To 1 cm depth of **S** in a test-tube, add aqueous sodium hydroxide until no further change occurs.	
6	**(a)** To 1 cm depth of **S** in a test-tube, add a small amount of ascorbic acid and mix well. **(b)** To the mixture from **(a)**, add aqueous sodium hydroxide until no further change occurs.	
7	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous potassium iodide. **(b)** To the mixture from **(a)**, add 1 or 2 drops of starch indicator.	

[18]

(b) Conclusions

Identify the ions in solution **R**.

Solution **R** contains ....

Identify the ion in solution **S** which acts as an oxidising agent in test **7**.

The ion which acts as an oxidising agent is ....

[4]

[Total: 22]

BLANK PAGE

BLANK PAGE

QUALITATIVE ANALYSIS 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 silver nitrate	yellow ppt.
nitrate (NO_3^-) [in solution]	add aqueous sodium hydroxide, then add aluminium foil; warm carefully	ammonia produced
sulfate (SO_4^{2-}) [in solution]	acidify with dilute nitric acid, then add aqueous barium nitrate	white ppt., insoluble in excess dilute nitric acid

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.
chromium(III) (Cr^{3+})	green ppt., soluble in excess, giving a green solution	green ppt., insoluble in excess
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