Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CHEMISTRY **5070/32**

Paper 3 Practical Test **October/November 2014**

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.

CAMBRIDGE International Examinations

[Turn over

1 The active ingredient in bleaching powder is calcium hypochlorite, $Ca(Cl O)_2$. When bleaching powder is added to an acidified, aqueous solution of iodide ions, iodine is produced.

$$Ca(Cl O)_2 + 4I^- + 4H^+ \rightarrow CaCl_2 + 2H_2O + 2I_2$$

The amount of iodine produced by the above reaction can be determined by titration with 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 reacting bleaching powder with an excess of acidified, aqueous iodide ions.

Q is 0.100 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 0.100 mol / dm^3 sodium thiosulfate.

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

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

concentration of iodine in **P** ..... mol / dm^3 [2]

(c) Using your answer from **(b)**, deduce the number of moles of calcium hypochlorite required to produce the iodine in 1 dm^3 of **P**.

$$Ca(ClO)_2 + 4I^- + 4H^+ \rightarrow CaCl_2 + 2H_2O + 2I_2$$

moles of calcium hypochlorite ..... [1]

(d) Given that the number of moles of calcium hypochlorite in your answer from **(c)** were present in 10.0 g of the bleaching powder, calculate the percentage by mass of calcium hypochlorite in the bleaching powder.
[The relative formula mass of $Ca(ClO)_2$ is 143.]

percentage by mass of calcium hypochlorite in the bleaching powder

.....% [2]

[Total: 17]

2 You are provided with solutions **R** and **S**.
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	Gently warm 2 cm depth of **R** in a test-tube.	
2	**(a)** To 1 cm depth of aqueous sodium chloride in a test-tube, add a few drops of aqueous silver nitrate. **(b)** To the mixture from **(a)**, add **R** until no further change occurs.	
3	To 1 cm depth of aqueous copper(II) sulfate in a test-tube, add **R** until no further change occurs.	
4	To 1 cm depth of **S** in a test-tube, add **R** until no further change occurs. Keep this mixture for use in Test 5.	
5	To 1 cm depth of aqueous hydrogen peroxide in a boiling tube, add the mixture from Test 4.	

test no.	test	observations
6	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous silver nitrate. Leave to settle. **(b)** To the mixture from **(a)**, add dilute nitric acid.	
7	**(a)** To 1 cm depth of **S** in a test-tube, add an equal volume of aqueous sodium thiosulfate and mix well. **(b)** To the mixture from **(a)**, add **R** until no further change occurs.	

[19]

Conclusions

Name the compound present in **R** ..... .

Give the formula of a cation and an anion in **S**.

A cation in **S** is ..... and an anion in **S** is ..... .

In test 7, **S** is acting as ..... . [4]

[Total: 23]

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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.

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