Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

CHEMISTRY **5070/31**

Paper 3 Practical Test **May/June 2016**

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 (KN) 106858/4

1 Sodium percarbonate is often used to remove stains from clothing. It is a white solid with the formula $Na_2CO_3.\mathbf{x}H_2O_2$. When the solid dissolves in water, it produces a solution containing sodium carbonate and hydrogen peroxide.

P is a solution containing 7.85 g of $Na_2CO_3.\mathbf{x}H_2O_2$ in 1.00 dm^3 of solution.
Q is 0.100 mol / dm^3 hydrochloric acid.

You are to determine the value of **x** in the formula $Na_2CO_3.\mathbf{x}H_2O_2$ by titrating the sodium carbonate in **P** with **Q**.

$$Na_2CO_3 + 2HCl \rightarrow 2NaCl + H_2O + CO_2$$

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

Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **P** into a flask and titrate with **Q**, using the indicator provided.

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 hydrochloric acid.
Using your results from **(a)**, calculate the concentration, in mol / dm^3, of sodium carbonate in **P**. Give your answer to **three** significant figures.

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

(c) Using your answer from **(b)**, calculate the concentration, in g / dm^3, of sodium carbonate in **P**.
[The relative formula mass of sodium carbonate is 106.]

concentration of sodium carbonate in **P** .... g / dm^3 [1]

(d) Using your answer from **(c)**, calculate the mass of hydrogen peroxide in 7.85 g of sodium percarbonate.

mass of hydrogen peroxide .... g [1]

(e) Calculate the value of **x** in the formula $Na_2CO_3.\mathbf{x}H_2O_2$.
[The relative formula mass of H_2O_2 is 34.]

The value of **x** is .... [2]

[Total:18]

2 You are provided with solid **R** and solution **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	To 1 cm depth of aqueous iodine in a test-tube, add a small amount of **R** and mix.	
2	Dissolve a small amount of **R** in 3 cm depth of distilled water in a test-tube. Divide this solution into two equal portions for use in tests **3** and **4**.	**no observation required**
3	**(a)** To 1 cm depth of aqueous barium nitrate in a test-tube, add a few drops of the solution of **R** from test **2**. **(b)** To the mixture from **(a)**, add dilute nitric acid.	
4	**(a)** To 1 cm depth of silver nitrate in a test-tube, add the solution of **R** from test **2** until a change occurs. **(b)** To the mixture from **(a)**, add the remainder of the solution of **R**.	
5	**(a)** To 1 cm depth of aqueous iron(III) chloride in a test-tube, add a small amount of **R** and mix well. **(b)** To the mixture from **(a)**, add about the same volume of dilute sulfuric acid and mix well for about 10 seconds. **(c)** Add aqueous sodium hydroxide to the mixture from **(b)** until no further change is seen.	

test no.	test	observations
6	To 1 cm depth of **S** in a test-tube, add about the same volume of dilute sulfuric acid. To the mixture in the test-tube, add a small amount of **R** and mix well.	
7	To 1 cm depth of **S** in a test-tube, add about the same volume of aqueous hydrogen peroxide.	
8	**(a)** To 1 cm depth of aqueous potassium iodide in a test-tube, add about the same volume of dilute sulfuric acid. To the mixture, add a few drops of **S**. **(b)** To the mixture from **(a)**, add a few drops of starch solution. **(c)** To the mixture from **(b)**, add a small amount of **R** and mix well.	
9	To 1 cm depth of **S** in a test-tube, add about the same volume of aqueous sodium hydroxide. To the mixture add a small amount of **R**, mix well and leave to stand.	

[20]

Conclusions

In tests **1** and **5**, **R** is acting as ....

In test **8**, **S** is acting as .... [2]

[Total: 22]

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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