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Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2753230154

CHEMISTRY **5070/31**

Paper 3 Practical Test **October/November 2015**

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.

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1 Calcium carbonate tablets are often taken by people who have stomach pain caused by indigestion. They work by neutralising acid in the stomach and are called antacid tablets.

P is an aqueous solution prepared by reacting **two** of the antacid tablets with an excess of hydrochloric acid, HC*l*. In preparing **P**, all the calcium carbonate in the two tablets reacted when they were added to 250 cm^3 of 0.500 mol/dm^3 hydrochloric acid, an excess.

$$CaCO_3 + 2HCl \rightarrow CaCl_2 + H_2O + CO_2$$

You are to determine by titration the amount of acid remaining in **P**.

Q is 0.336 mol/dm^3 sodium hydroxide, NaOH.

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

Pipette a 25.0 cm^3 (or 20.0 cm^3) portion of **Q** into a flask and titrate with **P**, 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 **P** used / cm^3			
best titration results (✓)			

Summary

Tick (✓) the best titration results.

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

Volume of **Q** used was ..... cm^3.

[12]

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(b) **Q** is 0.336 mol / dm^3 sodium hydroxide, NaOH.

Calculate the number of moles of sodium hydroxide in the volume of **Q** used.

moles of sodium hydroxide in the volume of **Q** used .....[1]

(c) Using the equation shown and your answer to **(b)**, deduce the number of moles of hydrochloric acid that reacted with the volume of **Q** used.

$$NaOH + HCl \longrightarrow NaCl + H_2O$$

moles of hydrochloric acid that reacted with the volume of **Q** used .....[1]

(d) Using your answer to **(c)** and the average volume of **P** from the titration results, calculate the number of moles of hydrochloric acid in 250 cm^3 of **P**.

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

(e) Calculate the number of moles of hydrochloric acid in 250 cm^3 of 0.500 mol / dm^3 hydrochloric acid.

moles of hydrochloric acid in 250 cm^3 of 0.500 mol / dm^3 hydrochloric acid .....[1]

(f) Using your answers from **(d)** and **(e)**, calculate the number of moles of hydrochloric acid that reacted with the calcium carbonate in the tablets.

moles of hydrochloric acid that reacted with calcium carbonate .....[1]

(g) Using your answer to **(f)**, calculate the mass of calcium carbonate in **one** tablet of the antacid. The relative formula mass of calcium carbonate is 100.

mass of calcium carbonate in one tablet of the antacid ..... g [2]

[Total: 19]

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[Turn over

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2 You are provided with solution **R** and solid **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	To 2 cm depth of **R** in a test-tube, add a few drops of aqueous silver nitrate. Keep this mixture for use in tests **2** and **3**.	
2	Transfer about half of the mixture from test **1** to a test-tube and add dilute nitric acid.	
3	To the rest of the mixture from test **1**, add aqueous ammonia until no further change occurs.	
4	**(a)** To 1 cm depth of **R** in a boiling tube, add a small amount of zinc carbonate. **(b)** To the mixture from **(a)** when the reaction has finished, add aqueous sodium hydroxide until no further change occurs.	
5	**(a)** To 1 cm depth of aqueous barium nitrate in a test-tube, add a few drops of aqueous sodium carbonate. **(b)** To the mixture from **(a)**, add **R** until no further change occurs.	

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6	To 1 cm depth of aqueous hydrogen peroxide in a test-tube, add a small amount of **S**.	
7	**(a)** To 1 cm depth of aqueous potassium iodide in a test-tube, add an equal volume of dilute sulfuric acid. To the mixture, add a small amount of **S**. Mix well then filter off some of the liquid into another test-tube. **(b)** To the filtrate from **(a)**, add a few drops of starch solution.	
8	To 1 cm depth of **R** in a boiling tube add a small amount of **S**. Warm the mixture and hold a piece of damp blue litmus paper at the end of the boiling tube.	

[19]

(b) Conclusions

Identify the compound in solution **R**.

Solution **R** contains .....

In both tests **7** and **8**, **S** is acting as ..... [2]

[Total: 21]

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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 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
sulfur dioxide (SO_2)	turns aqueous acidified potassium manganate(VII) from purple to colourless

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