Cambridge O Level

Cambridge International Examinations
Cambridge Ordinary Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

CHEMISTRY **5070/32**

Paper 3 Practical Test **May/June 2018**

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

1 **P** is a mixture of dilute nitric acid, HNO_3, and dilute sulfuric acid, H_2SO_4. You are to determine the concentration of hydrogen ions in **P** by titrating this solution with aqueous sodium carbonate, **Q**.

Q is 0.225 mol/dm^3 sodium carbonate, Na_2CO_3.

(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 the best titration results, the average volume of **P** required was ..... cm^3.

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

[12]

(b) **Q** is 0.225 mol/dm^3 sodium carbonate.

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

$$CO_3^{2-} + 2H^+ \rightarrow H_2O + CO_2$$

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

P is a mixture of dilute nitric acid, HNO_3, and dilute sulfuric acid, H_2SO_4.

The concentration of nitric acid in **P** is 0.125 mol/dm^3.

(c) Using your answer from **(b)**, calculate the number of moles of hydrogen ions in 1.00 dm^3 of **P** that are due to sulfuric acid.

moles of hydrogen ions in 1.00 dm^3 of **P** due to sulfuric acid ..... [1]

(d) Using your answer from **(c)**, calculate the concentration in mol/dm^3, of sulfuric acid in **P**.

concentration of sulfuric acid in **P** ..... mol/dm^3 [1]

(e) **P** was made by mixing equal volumes of the two dilute acids.

Calculate the concentration, in mol/dm^3, of the dilute nitric acid used to make **P**.

concentration of dilute nitric acid used to make **P** ..... mol/dm^3 [1]

[Total: 17]

[Turn over

2 You are provided with solution **R** and solid **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	Test a sample of **R** with both red and blue litmus paper.	
2	**(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.	
3	To 2 cm depth of **R** in a test-tube, add a piece of magnesium ribbon.	
4	Put 2 cm depth of **R** in a boiling tube and warm the liquid until it just begins to boil. To the hot **R**, add **S**, a small amount at a time, until no further reaction takes place. Filter the final mixture into a clean boiling tube. Retain the filtrate for tests 5 and 6.	
5	To half of the filtrate from test 4 in a test-tube, add aqueous sodium hydroxide until no further change occurs.	

test no.	test	observations
6	To the other half of the filtrate from test 4 in a test-tube, add aqueous ammonia until no further change occurs.	
7	Put a small amount of **S** into a hard glass test-tube and heat the solid. Retain the final solid for test 8.	
8	**(a)** To 1 cm depth of aqueous hydrogen peroxide in a test-tube, add a little of the final solid from test 7. **(b)** To the mixture from **(a)**, add an equal volume of aqueous ammonia.	

[21]

Conclusions

Identify the compound present in **R**. .....

Identify compound **S**. .....

[2]

[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., 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