Cambridge O Level

Cambridge Assessment International Education
Cambridge Ordinary Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

5663923782

CHEMISTRY **5070/31**

Paper 3 Practical Test **May/June 2019**

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 The concentration of aqueous sodium sulfite can be determined by titrating acidified portions of the solution with aqueous potassium manganate(VII).

No indicator is needed for this titration as the products of the reaction are almost colourless and one drop of aqueous potassium manganate(VII) in excess produces a permanent pale pink colour.

P is aqueous sodium sulfite.
Q is 0.0192 mol/dm^3 potassium manganate(VII).

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

The colour of **Q** makes it difficult to see the bottom of the meniscus so you should take all your readings using the top of the meniscus.

Pipette a 25.0 cm^3 portion of **P** into a flask. To the solution in the flask also add about 25 cm^3 of dilute sulfuric acid using a measuring cylinder.

Add **Q** from the burette. At first the purple colour disappears quickly but as more **Q** is added the colour disappears less quickly. At the end-point, one drop of **Q** produces a pale pink colour that does not disappear on swirling.

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 best titration results, the average volume of **Q** required was .... cm^3.
[12]

(b) **Q** is 0.0192 mol/dm^3 potassium manganate(VII).

Calculate the number of moles of potassium manganate(VII) present in the average volume of **Q** required.

number of moles of potassium manganate(VII) .... [1]

(c) In the titration reaction, five moles of sodium sulfite react with two moles of potassium manganate(VII).

Use your answer from **(b)** to calculate the number of moles of sodium sulfite present in $25.0\,cm^3$ of **P**.

number of moles of sodium sulfite in $25.0\,cm^3$ of **P** .... [1]

(d) Use your answer from **(c)** to calculate the number of moles of sodium sulfite in $1.00\,dm^3$ of **P**.

number of moles of sodium sulfite in $1.00\,dm^3$ of **P** .... [1]

(e) Use your answer from **(d)** to calculate the mass of sodium sulfite in $1.00\,dm^3$ of **P**.
[M_r: Na_2SO_3, 126]

mass of sodium sulfite in $1.00\,dm^3$ of **P** .... g [1]

(f) Explain why the volume of dilute sulfuric acid added to **P** in each titration does not need to be measured accurately.

....

.... [1]

[Total: 17]

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 with solution **R**	observations with solution **S**
1	**(a)** To 2 cm depth of the solution in a test-tube, add aqueous ammonia until a change is seen. **(b)** To the mixture from **(a)**, add excess aqueous ammonia.		
2	**(a)** To 2 cm depth of the solution in a test-tube, add aqueous sodium hydroxide until a change is seen. **(b)** To the mixture from **(a)**, add excess aqueous sodium hydroxide. Keep this mixture for use in **(c)**. **(c)** To 1 cm depth of aqueous hydrogen peroxide in a boiling tube, add an equal volume of the mixture from **(b)**.		

test no.	test	observations with solution **R**	observations with solution **S**
3	**(a)** To 1 cm depth of the solution in a test-tube, add an equal volume of dilute nitric acid. **(b)** Pour half of the mixture from **(a)** into a test-tube and add an equal volume of aqueous barium nitrate. **(c)** To the other half of the mixture from **(a)**, add an equal volume of aqueous silver nitrate.		

[21]

(b) Conclusions

Identify the compound in solution **R**.

The compound in solution **R** is ....

Identify the anion in solution **S**.

The anion in solution **S** is ....

[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