Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER		CANDIDATE NUMBER	

4502826303

CO-ORDINATED SCIENCES **0654/52**

Paper 5 Practical Test **October/November 2018**

2 hours

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.
You may lose marks if you do not show your working or if you do not use appropriate units.
Notes for Use in Qualitative Analysis for this paper are printed on page 12.

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	
3	
Total	

This document consists of **11** printed pages and **1** blank page.

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CAMBRIDGE International Examinations

[Turn over

1 You are going to investigate the nutrient content of three solutions **A**, **B** and **C**.

You are provided with Benedict's solution, biuret solution and iodine solution.

(a) Procedure

- Add about 1 cm depth of solution **A** to each of three test-tubes.
- Add about 1 cm depth of Benedict's solution to one of these test-tubes containing solution **A** and place this test-tube in a hot water-bath for at least 3 minutes. You should continue with the rest of this procedure during this time.
- Add the same depth of biuret solution to the second test-tube containing solution **A**.
- Add a few drops of iodine solution to the third test-tube containing solution **A**.

(i) Record, in Table 1.1, your observations of the final colours for each of the three test-tubes. [3]

Table 1.1

solution	observation with Benedict's solution	observation with biuret solution	observation with iodine solution
A			
B			
C			

(ii) Using clean test-tubes, repeat the procedure in **(a)** with solution **B** instead of solution **A**.

Record your observations in Table 1.1. [2]

(iii) Using clean test-tubes, repeat the procedure in **(a)** with solution **C** instead of solution **A**.

Record your observations in Table 1.1. [2]

(b) Use your observations in Table 1.1 to state the nutrients present in each solution.

solution **A** contains ....

solution **B** contains ....

solution **C** contains ....
[3]

(c) State **and** explain **one** safety precaution you used when carrying out the tests.

safety precaution ....

explanation ....
[1]

(d) Describe the method used to test a liquid for the presence of fat.

Include the observation for a positive result.

method ....

....

observation for a positive result ....

....
[2]

(e) A student investigates the nutrient concentration in some food samples using Benedict's solution.

Benedict's solution will give a range of colours depending on the concentration of the nutrient for which it is testing.

State **two** variables which need to be controlled in this investigation.

variable 1 ....

variable 2 ....
[2]

2 Notes for Use in Qualitative Analysis for this question are printed on page 12.

You are going to investigate the thermal decomposition of metal carbonates and identify the metal ion in metal carbonate **L**.

(a) (i) Procedure

- Add about 3 cm depth of limewater to a test-tube.
- Connect the bung of a delivery tube to a hard-glass test-tube containing copper carbonate.
- Place the delivery tube into the limewater as shown in Fig. 2.1.

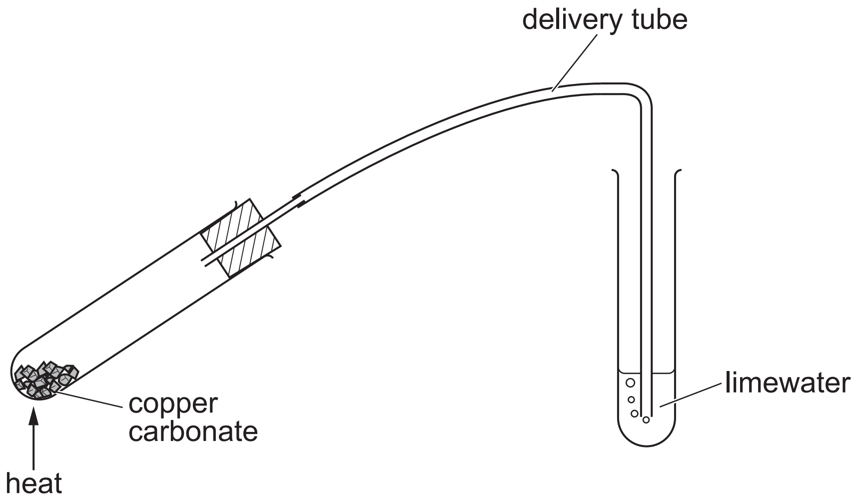

Fig. 2.1

- Heat the test-tube containing the copper carbonate with a hot flame and start the stopclock.
- When the limewater becomes milky, stop the stopclock, **remove the delivery tube from the limewater** and stop heating to avoid suck-back.
- Record, in Table 2.1, the time **to the nearest second** as well as any colour change in the solid. [1]

Table 2.1

name of metal carbonate	time / s	colour change
copper carbonate		
magnesium carbonate		
L		

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(ii) Repeat the procedure in **(a)(i)** with the magnesium carbonate instead of copper carbonate.

Use fresh limewater.

Stop the stopclock when the limewater has become the same milky colour as in **(a)(i)**. [1]

(iii) Repeat **(a)(ii)** with **L** instead of magnesium carbonate.

Keep the test-tube containing the result of heating L for the procedure in (c). [1]

(iv) Place the three metal carbonates in order of **rate** of turning limewater milky (speed of thermal decomposition).

1 .... fastest

2 ....

3 .... slowest [1]

(v) Name the gas that is produced by the thermal decomposition of a metal carbonate.

....[1]

(b) (i) Suggest **two** reasons why the results in this experiment may be inaccurate.

1 ....

....

2 ....

....
[2]

(ii) This experiment may be improved by carrying out the process for each metal carbonate three times.

Explain how this will improve the experiment.

....

....

....[1]

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[Turn over

(iii) The rate of gas production when metal carbonates are heated can be measured without the use of limewater.

Suggest an alternative method of measuring the rate of gas production.

Include a diagram to show what replaces the test-tube of limewater and state what should be measured.

....

....

....[3]

(c) Procedure

- Empty into a beaker the solid contents of the hard-glass test-tube in which **L** was heated.
- Add about 20 cm^3 of dilute sulfuric acid into the beaker and use the stirring rod to stir well.
- If any solid remains, filter the resulting mixture into a clean test-tube.
- Add about 1 cm depth of the resulting solution to a large test-tube for use in **(c)(i)**.

(i) **Slowly** add ammonia solution to the resulting solution from **(c)** until there is no further change.

Record your observations.

....

....[2]

(ii) Use your observations in Table 2.1 and **(c)(i)** to identify the metal ion in **L**.

metal ion in **L** is ....[1]

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(d) The order of reactivity of the three **metals** in the metal carbonates is shown.

magnesium		most reactive
L	↓	
copper		least reactive

Describe the relationship between the reactivity of the metals and the rate of thermal decomposition of their metal carbonates.

You may wish to use **(a)(iv)** or Table 2.1.

....

....

....[1]

3 You are going to investigate how the power produced in a resistance wire **XY** depends upon its length.

The circuit shown in Fig. 3.1 has been set up for you.

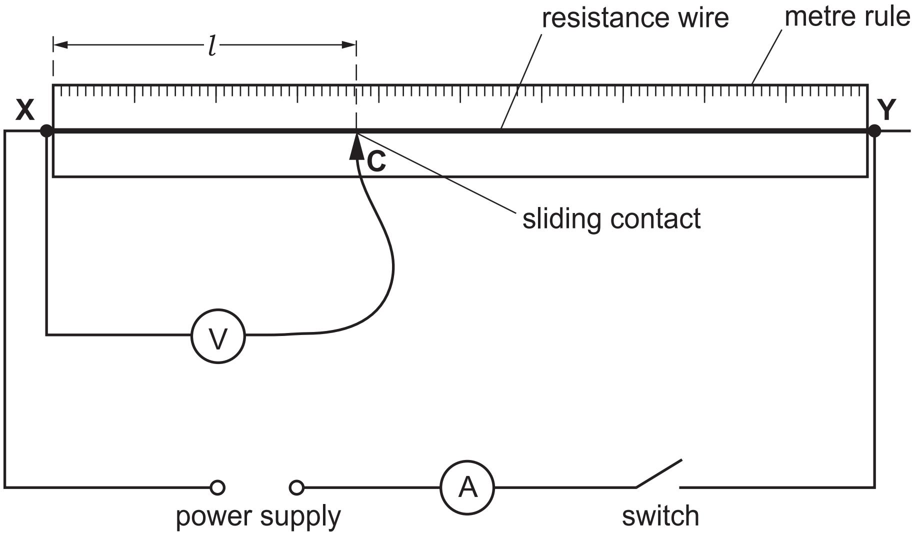

Fig. 3.1

(a) (i) Procedure

- Close the switch.
- Place the sliding contact **C** on the resistance wire **XY** at a length l = 10.0 cm from end **X**.
- Record, in Table 3.1, the current I flowing through the wire.
- Record, in Table 3.1, the potential difference V across the wire.
- Open the switch.

[2]

Table 3.1

length l / cm	current I / A	potential difference V / V	power P / ....
10.0			
20.0			
40.0			
60.0			
80.0			

(ii) Calculate and record in Table 3.1 the power P produced in the 10.0 cm length of the wire using the equation shown.

$$P = I \times V$$

[1]

(iii) Complete Table 3.1 by adding the correct unit for power at the top of the column. [1]

(iv) Repeat the procedure in **(a)(i)** and the calculation in **(a)(ii)** for values of l = 20.0 cm, 40.0 cm, 60.0 cm and 80.0 cm.

Record, in Table 3.1, your values of I, V and P.

[4]

(v) State why it is important to open the switch between taking readings.

....

....[1]

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(b) (i) On the grid provided, plot a graph of *P* (vertical axis) against *l*. Start your axes at (0,0).

[3]

(ii) Draw the best-fit line. [1]

(c) Use your graph to suggest the relationship between the power *P* produced in the wire and its length *l*.

Explain your answer.

relationship ....

....

explanation ....

....
[2]

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NOTES FOR USE IN QUALITATIVE ANALYSIS

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.
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*
ammonium (NH_4^+)	ammonia produced on warming	–
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

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