Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | CANDIDATE NUMBER

4747092697

PHYSICAL SCIENCE **0652/51**

Paper 5 Practical Test **October/November 2017**

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.
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 8.

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 **7** printed pages and **1** blank page.

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CAMBRIDGE International Examinations

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1 Notes for use in Qualitative Analysis for this question are printed on page 8.

You are going to investigate the temperature changes when metals **L**, **M** and **N** react with acid.

(a) **(i)**
- Place 5 cm^3 hydrochloric acid in a test-tube.
- Measure the initial temperature of the acid in the test-tube and record, in Table 1.1, this value to the nearest 0.5 °C.
- Add the sample of metal **L** to the acid and start the stopclock.
- **Gently** stir the mixture with the thermometer every 30 seconds for three minutes and monitor the temperature.
- Read and record, in Table 1.1, the maximum temperature during the three minutes.
- Record, in Table 1.2, your observations of the reaction. You will use these observations to place the metals in order of reactivity in part **(b)(i)**. [3]

Table 1.1

metal	temperature / °C		
	initial	maximum	change
L			
M			
N			

Table 1.2

metal	observations
L	
M	
N	

(ii) Pour the mixture from **(i)** into the large beaker labelled **used metal**.

Rinse the thermometer and the test-tube with distilled water.

Repeat **(a)(i)** using the sample of metal **M** instead of **L**.

Keep the mixture in the test-tube for use in part **(c)**. [2]

(iii) Using a clean test-tube, repeat **(a)(i)** using one of the samples of metal **N** instead of **L**. [2]

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(iv) Place 5 cm^3 hydrochloric acid in a clean test-tube.

Add the other sample of metal **N** to the acid.

During the reaction, test the gas produced with a lighted splint. Record your observation below and identify the gas.

observation ....

gas ....
[1]

(v) Complete Table 1.1 by calculating the temperature change for the reaction of each metal with acid. [1]

(b) **(i)** Use the results in Tables 1.1 and 1.2 to suggest an order of reactivity for the three metals.

State which observations you used to reach your conclusion.

Explain how you have used these observations to produce an order of reactivity.

most reactive ....

....

least reactive ....

observations used ....

....

explanation ....

....
[3]

(ii) Identify one variable which **should** have been controlled in the experiments used to produce an order of reactivity.

....

....[1]

(c) Suggest a test to identify metal **M** by using the liquid from the mixture in **(a)(ii)**.

Now carry out this test, record your observations below and identify the metal **M**.

test ....

observations ....

metal ....
[2]

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2 You are going to investigate the cooling of two beakers of hot water, **P** and **Q**. Beaker **P** is not insulated (unlagged) and beaker **Q** is insulated (lagged).

(a) Complete the column headings in Table 2.1 with the correct unit symbols. [1]

(b) Use the measuring cylinder provided to pour 200 cm^3 of the hot water supplied into beaker **P**. Place the thermometer in the hot water, as shown in Fig. 2.1.

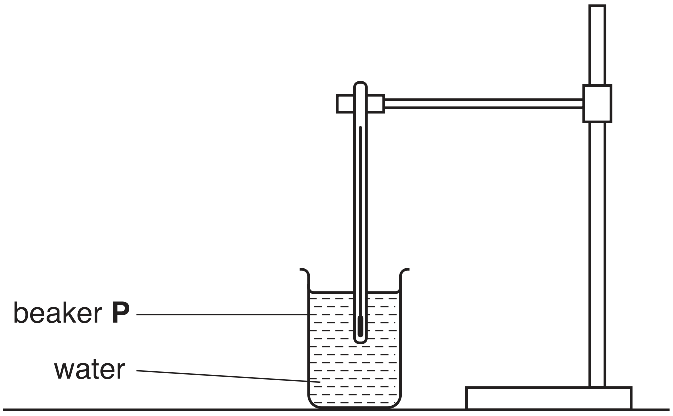

Fig. 2.1

(i) Wait for 1 minute. Start the stopwatch. Record, in Table 2.1, the temperature θ of the hot water at time $t = 0$. [1]

Table 2.1

	beaker **P**	beaker **Q**
time t /	temperature θ/	temperature θ/ ......
0		

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(ii) Measure the temperature θ of the water after 30 seconds. Record, in Table 2.1, the temperature reading and the time.

Continue recording the temperature reading and the time every 30 seconds until you have timed the water cooling for a total of 3 minutes. [3]

(c) Pour 200 cm^3 of the hot water supplied into beaker **Q**. Place the thermometer in the hot water as shown in Fig. 2.2.

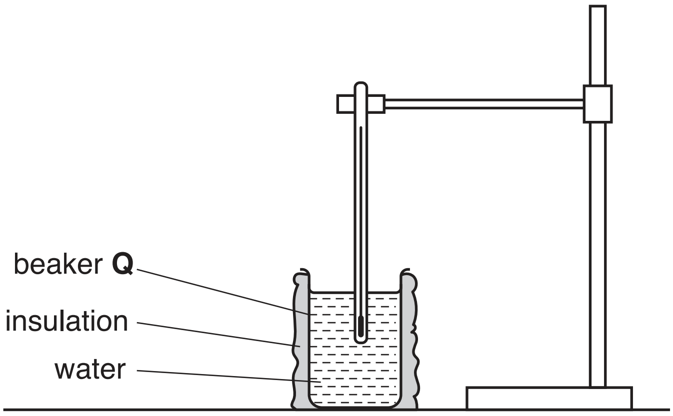

Fig. 2.2

Repeat the procedure described in **(b)(i)** and **(b)(ii)** for beaker **Q**. [4]

(d) Explain why you were asked to wait for 1 minute before measuring and recording the temperature of the hot water at time $t = 0$.

....

....[1]

(e) Examine your results and state whether insulating the beaker **increases**, **decreases** or has **no significant effect** on the rate of cooling of the water. Justify your answer with reference to your results.

effect on the rate of cooling ....

justification ....

....

....

[2]

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(f) **(i)** Another student says that a possible cause of heat loss from the beakers is by evaporation. Suggest how you could reduce the effect of evaporation.

....

....[1]

(ii) This student repeats the experiment with the same apparatus to check the results. Suggest two variables that should be kept constant.

variable 1 ....

....

variable 2 ....

....
[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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