Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

CO-ORDINATED SCIENCES **0654/52**

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

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.

CAMBRIDGE International Examinations

1 You are provided with a seedling from a seed that has germinated and started to grow.

(a) In the box, make a large pencil drawing of the seedling.

Label the root and the stem.

[3]

(b) **(i)** Measure the length of the seed provided, excluding the root and the stem.

Record this length in millimetres.

length of seed .....mm [1]

(ii) Use a straight line to show this length on your drawing.

Record the length of this line in millimetres.

length of line on drawing .....mm [1]

(iii) Use your measurements from **(b)(i)** and **(b)(ii)** to calculate the magnification of your drawing.

magnification .....[1]

(c) A student wants to carry out an experiment on some germinated seeds.

Describe how the student can germinate the seeds.

.....

.....

.....[2]

(d) You are provided with some seeds that have been liquidised into a paste. You are going to use the tests shown in Table 1.1 to find out the nutrient content of these seeds.

(i) State which test in Table 1.1 requires heat.

.....[1]

(ii) Complete the second row of Table 1.1 to show which nutrient each test is used to identify. [1]

(iii) Carry out the tests using the three solutions supplied **and** complete Table 1.1 to show your observations.

- Use 1 cm depth of seed paste in each of the tests.
- Add 2 cm depth of test solution for the Benedict's test and the biuret test.
- Add a few drops of iodine solution for the iodine test.

Table 1.1

	Benedict's test	biuret test	iodine test
nutrient tested for			
observation with seed paste			

[3]

(iv) State the nutrients present in the seeds.

.....[2]

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

A good reagent in qualitative analysis gives positive results and different results with different ions.

H is a sodium compound. You are going to investigate the reactions of **H** and assess whether **H** could be used as a reagent to identify cations. You have been given a solution of **H** for the reactions and a sample of solid **H** for **(c)**.

(a) You are provided with the following solutions.

ammonium sulfate
copper sulfate
iron(III) sulfate
zinc sulfate

(i)
- For each of these solutions, place about 1 cm^3 of the solution into a clean test-tube.
- Add solution **H** to each test-tube until there is no further change.
- If no change is observed in a test-tube, keep it for use in **(a)(ii)**.

Construct a suitable table with labelled columns in the space provided and record your observations in it.

[5]

(ii) If no change is observed in a test-tube in **(a)(i)**, stir the mixture. If necessary, pour away some of the mixture to leave a half-filled test-tube. Then heat the test-tube gently and carefully bring to the boil.

Test for the presence of ammonia gas.

Record your observations.

test .....

observations .....

[1]

(b) (i) Use your observations in **(a)** to explain whether **H** could be used as a reagent to identify the cations in the four solutions.

You should make comparisons with the usual reagents for the analysis of cations.

.....

.....

.....

.....[3]

(ii) Using the Notes for use in Qualitative Analysis, suggest another reaction to test the effectiveness of **H** for identifying cations.

.....

.....[1]

(c) A student adds barium nitrate solution to solution **H** and a white precipitate (ppt.) is produced.

The student concludes that **H** is sodium sulfate.

You are going to check the student's conclusion.

(i) Remove the bung from the test-tube containing **solid H** and add dilute hydrochloric acid.

Use a delivery tube to bubble the gas produced through 2 cm depth of limewater in another test-tube.

Record your observations.

.....

.....[1]

(ii) Use your observations in **(c)(i)** to explain why **H** is not sodium sulfate **and** identify **H**.

.....

.....

.....

H is .....
[2]

(iii) Identify the white ppt. formed when **H** reacts with barium nitrate solution.

white ppt. is .....[1]

(iv) State the mistake made by the student when testing **H** with barium nitrate solution, which led the student to conclude that sulfate ions are present.

.....

.....[1]

Please turn over for Question 3.

3 You are going to investigate the cooling rates of different volumes of water. A supply of hot water, a beaker and a thermometer have been provided for you.

- Pour hot water into the beaker up to the 200 cm^3 mark.
- Place the thermometer into the beaker.
- Wait approximately 60 s.

(a) (i) Start the stopclock. Record, in Table 3.1, the temperature θ of the hot water at time $t = 0$. [1]

(ii) Record, in Table 3.1, the temperature θ of the water and the time t at 30 s intervals for 3 minutes. [3]

Table 3.1

	cooling of 200 cm^3 of hot water	cooling of 100 cm^3 of hot water
time t / s	temperature θ / °C	temperature θ / °C
0		

(b) Empty the beaker.

- Pour hot water into the beaker up to the 100 cm^3 mark.
- Place the thermometer into the beaker.
- Wait approximately 60 s.

Repeat **(a)(i)** and **(a)(ii)**. [1]

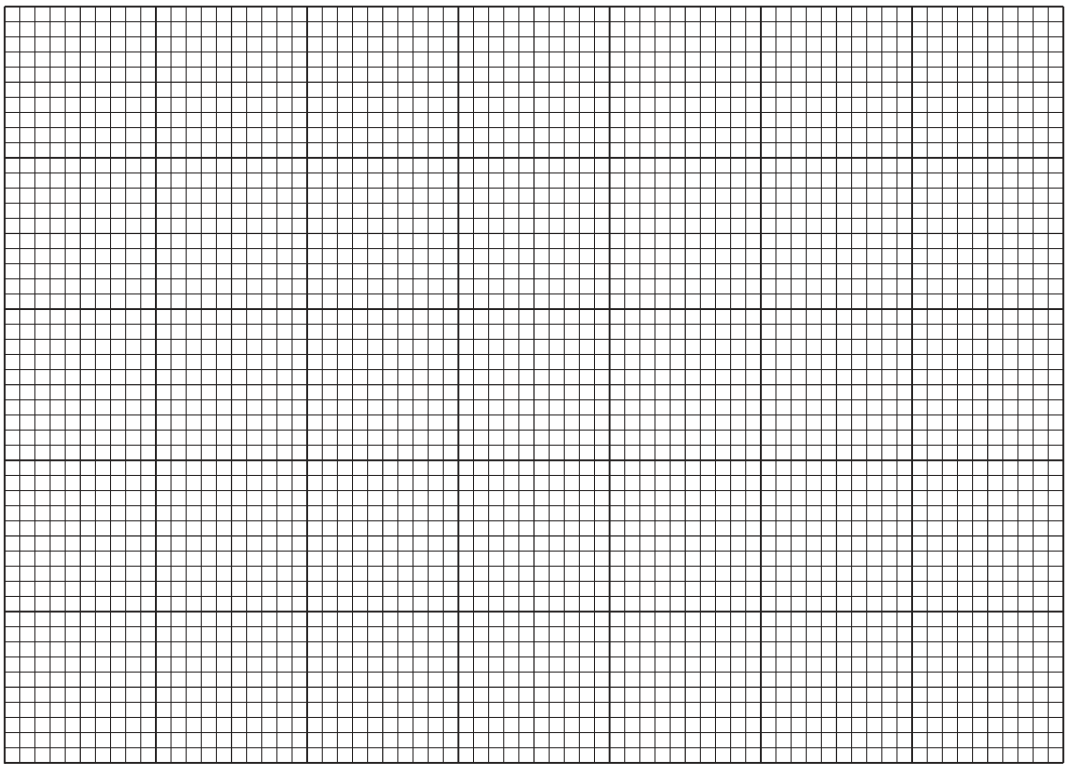
(c) Suggest why it is important to wait 60 s before measuring the initial temperature of the hot water.

.....

.....[1]

(d) On the grid provided, plot a graph of θ (vertical axis) against t for **only** the 100 cm^3 volume of water. You do **not** need to start both axes from (0,0).

Draw the best-fit line.



[4]

(e) Explain how your **graph** shows that the rate of cooling of the water is greater at the start of the experiment than at the end of the experiment.

.....

.....[1]

[Turn over

(f) A student suggests that the rate of cooling is slower for the larger volume of water than for the smaller volume of water.

State whether your **results** support this suggestion.

Justify your answer by referring to your **results** in Table 3.1.

statement .....

justification .....

.....

[2]

(g) The experiment is repeated 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

Test 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.

Test 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

Test 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