



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE
NAME

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NUMBER

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CO-ORDINATED SCIENCES

0654/52

Paper 5 Practical Test

May/June 2014

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.

- 1 You will be investigating the rate at which acid moves from an aqueous solution into a block of agar. The agar contains the indicator phenolphthalein. This indicator is purple in a pH of greater than 8 and colourless in a pH of less than 8.

You are provided with a dish containing two agar blocks of dimensions $2\text{ cm} \times 2\text{ cm} \times 2\text{ cm}$.

- Use the forceps to place one, uncut, agar block into a beaker. Label this beaker **A**.
- Cut the other block as shown in Fig. 1.1 to make a cube of $1\text{ cm} \times 1\text{ cm} \times 1\text{ cm}$.

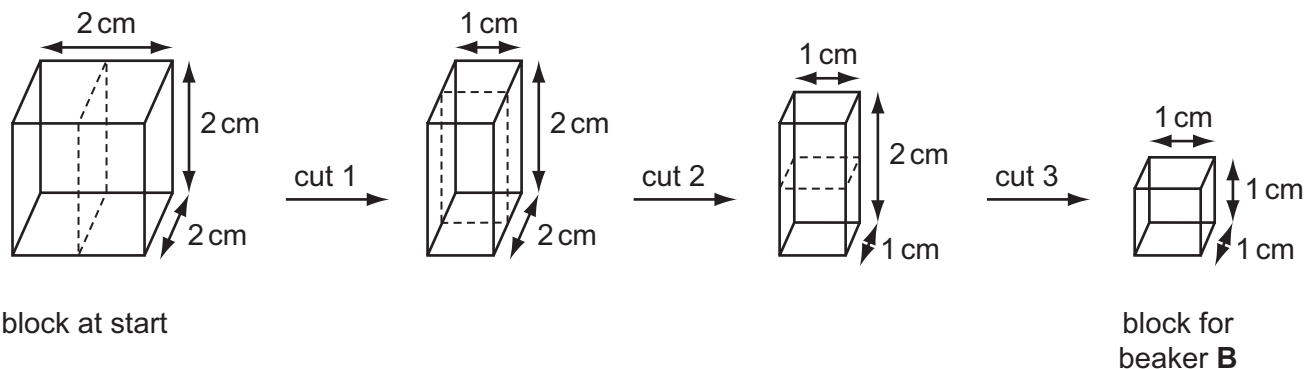


Fig. 1.1

- Return the excess agar to the dish.
- Use the forceps to place the $1\text{ cm} \times 1\text{ cm} \times 1\text{ cm}$ block of agar into a beaker. Label this beaker **B**.

(a) State the colour of the agar and what this tells you about its pH.

..... [1]

(b) (i) Read part **(b)(ii)** on page 3.

Draw a table of results to record the observations you will make in the space below.

[2]

- (ii) • To beaker **A** add sufficient hydrochloric acid to cover the block of agar and immediately start the stopclock.
- Record the time taken (in seconds), in your table, for the block to go colourless.
- Repeat the procedure for beaker **B** containing the smaller block of agar.

[2]

(c) Explain why the agar changes colour.

.....
.....
..... [2]

(d) Identify **two** inaccuracies of this experimental method and suggest an improvement to reduce each inaccuracy.

inaccuracy 1
.....
improvement 1
.....
inaccuracy 2
.....
improvement 2
..... [4]

(e) (i) Explain the difference between the time taken for each block to go colourless in beakers **A** and **B**.

.....
..... [1]

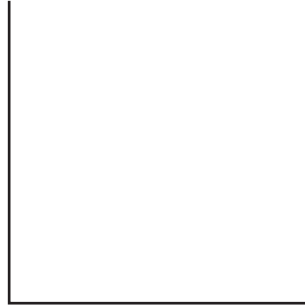
(ii) Explain the significance of this for gaseous exchange in the lungs.

.....
..... [1]

(f) (i) Suggest how you could extend this experiment to be more confident about your explanation in (e)(i).

.....
..... [1]

(ii) Label the axes to show how you would represent your results graphically.



[1]

Please turn over for Question 2.

- 2 Solid **X** is a mixture of two salts which have the same anion. You are going to carry out a series of tests to identify the two salts.

(a) Identification of the anion

- (i) Dissolve one spatula load of solid **X** in a test-tube which is three-quarters full of distilled water. Divide the resulting solution into three test-tubes in equal portions.

Record the colour of the solution.

colour of solution [1]

- (ii) To one portion of the solution add an equal volume of dilute nitric acid.

Record your observations and state what you can conclude about the anion in **X**.

observations

conclusion about the anion [2]

- (iii) To the second portion of the solution add a few drops of silver nitrate solution.

Record your observations and state what you can conclude about the anion in **X**.

observations

conclusion about the anion [2]

- (iv) To the third portion of the solution add barium chloride solution.

Record your observations and state what you can conclude about the anion in **X**.

observations

conclusion about the anion [2]

(b) Separation of the salts and identification of the two cations

Fill a test-tube with distilled water and then empty it into a small beaker. Add one spatula load of solid **X** to the water in the beaker and stir well to dissolve the solid. Do not shake.

- (i) Slowly add approximately 50 cm³ of ammonia solution to the solution in the beaker.

Record your observations. Keep the mixture for **(b)(ii)**.

observations

..... [1]

- (ii) Filter the mixture from (b)(i) into a large test-tube. When you have collected about 5 cm³ of the filtrate remove the test-tube. You do not need to filter any more of the mixture.

Wash the residue with a small amount of distilled water and discard the liquid into the beaker labelled **washings**.

Describe the colours of the filtrate and of the residue.

colour of filtrate

colour of residue [2]

- (iii) Use your results from (b)(i) and (b)(ii) to identify the cations in the filtrate and in the residue.

cation in filtrate

cation in residue [2]

- (c) Name the **two** salts in solid **X**. Remember that the salts have the same anion.

salt 1

salt 2 [1]

- (d) **Gently** heat the remainder of solid **X** in a hard-glass test-tube by holding the test-tube well above the flame.

Record your observations.

observations

.....

..... [2]

- 3 You are going to find out how the potential difference (p.d.) across a lamp and the power of the lamp vary with the length of resistance wire in series with the lamp.

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

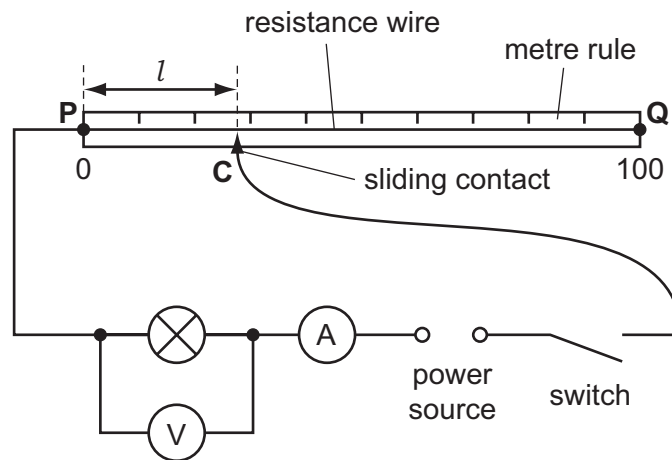


Fig. 3.1

- (a) (i) Close the switch and place the sliding contact **C** on the resistance wire at a distance of 10.0 cm from end **P**.

Record this length l of resistance wire used, in Table 3.1.

Record, in Table 3.1, the current I flowing through the lamp and the potential difference V across it.

Switch off the circuit.

[2]

- (ii) Insert the unit for the current I in Table 3.1.

[1]

Table 3.1

length l /cm	current I /	p.d. V /V	power P /W

- (iii) Repeat step (i) for values of l of 20.0 cm, 40.0 cm, 60.0 cm and 80.0 cm.

Record your values of l , I and V in Table 3.1. Remember to switch off the circuit between readings.

[4]

- (b) (i) Calculate the power, P of the lamp for each length of wire, using the equation

$$P = V \times I$$

Record your values of P in Table 3.1 to an appropriate number of significant figures. [2]

- (ii) What have you observed, when carrying out this experiment, which shows that the power of the lamp decreases as the length of resistance wire increases?

.....
 [1]

- (c) (i) Transfer into Table 3.2, your recorded values of V (from column 3 in Table 3.1), corresponding to each value of l . The values of l have been filled in for you in Table 3.2.

Table 3.2

length l /cm	p.d. V/V	$\frac{V}{l}$ in V/cm
10.0		
20.0		
40.0		
60.0		
80.0		

For each pair of readings of l and V , calculate the ratio $\frac{V}{l}$. Record your values of $\frac{V}{l}$ in Table 3.2 to an appropriate number of significant figures. [3]

(ii) A student makes the following suggestion.

“The potential difference across the lamp is directly proportional to the length of resistance wire in the circuit.”

Use your values of $\frac{V}{l}$ from Table 3.2 to comment on this suggestion. In your answer, justify your comment by referring to the values you have calculated.

comment

.....

justification

.....

.....

[2]

NOTES FOR USE IN QUALITATIVE ANALYSIS

Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
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 then add aqueous barium chloride <i>or</i> aqueous barium nitrate	white ppt.

Test for aqueous cations

<i>cation</i>	<i>effect of aqueous sodium hydroxide</i>	<i>effect of aqueous ammonia</i>
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

<i>gas</i>	<i>test and test results</i>
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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