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Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

0109370997

COMBINED SCIENCE **0653/51**

Paper 5 Practical Test **October/November 2014**

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 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 **9** printed pages and **3** blank pages.

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1 You are going to investigate the relationship between yeast activity and temperature.

You are provided with 50 cm^3 yeast and sugar suspension. You are also provided with two large beakers, ice and a supply of hot and cold water.

- Label one beaker **A** and the other **B**.
- Using a thermometer and the materials provided, create and maintain two water baths. The depth of water in each beaker should be about one third of the depth of the beaker.

  Beaker **A** should be maintained in the range 15 – 20 °C and beaker **B** in the range 35 – 40 °C.

  A syringe or dropping pipette is provided to help with the removal or addition of water.
- Stir the yeast suspension and immediately measure out 20 cm^3 into each of two large test-tubes.
- Place one of the test-tubes containing the yeast suspension into beaker **A** and the other into beaker **B**.
- The water in the beaker should be at about the same height as the yeast and sugar suspension in the test-tube, as shown in Fig. 1.1.

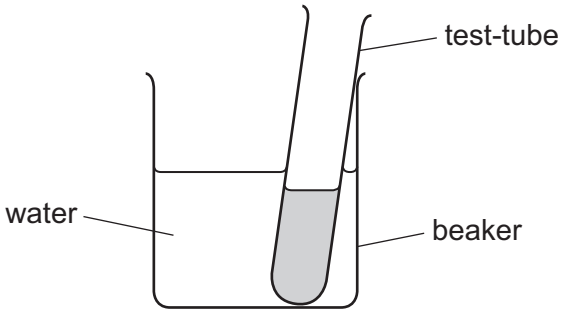

Fig. 1.1

(a) Measure and record, to the nearest °C, the temperature of the water in each beaker.

beaker **A** ..... °C

beaker **B** ..... °C [1]

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(b) Use a ruler to measure the height *h* of the liquid (including any foam) in the test-tubes of beaker **A** and beaker **B** as shown in Fig. 1.2.

Record your measurements in Table 1.1 for time = 0 minutes.

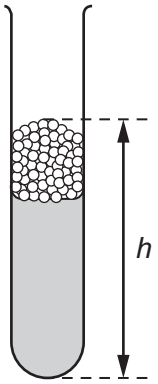

Fig. 1.2

- Start the stopclock.
- Every two minutes for the next ten minutes, measure and record the height *h* (including any foam) in each test-tube. During this time, maintain the temperatures of the beakers within the given ranges.
- Record your measurements in Table 1.1. [3]

Table 1.1

time / minutes	height *h* in beaker **A** / mm	height *h* in beaker **B** / mm
0		
2		
4		
6		
8		
10		

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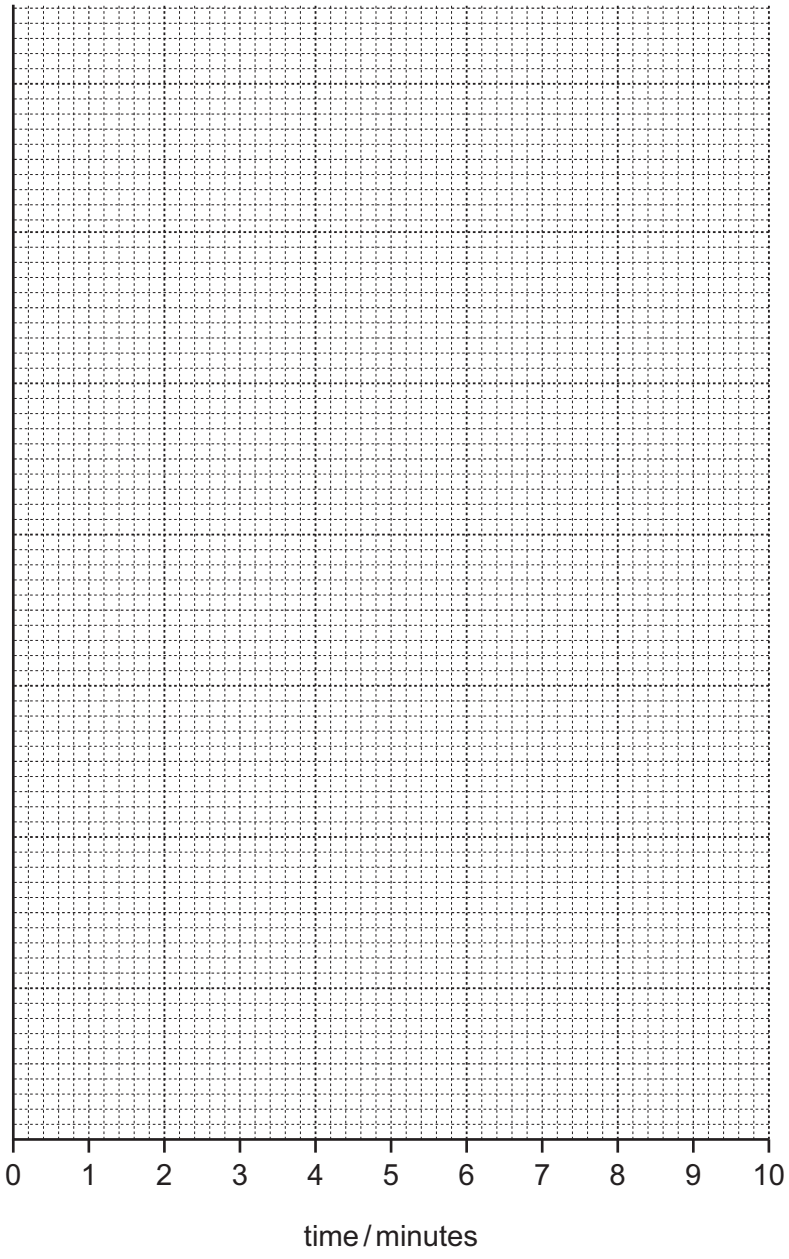
(c) On the grid provided, plot graphs of height *h* against time for each beaker.

Draw best fit lines and label them **A** for beaker **A** and **B** for beaker **B**.



[4]

(d) By using your knowledge of respiration, name the gas which is produced to make the foam.

gas ..... [1]

(e) By referring to your results in Table 1.1 and the graph, suggest a relationship between yeast activity and temperature.

.....

..... [1]

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2 Solid **Q** is a mixture of three compounds. You will separate the compounds and carry out tests to identify two of the cations contained in solid **Q**.

(a) Place the sample of solid **Q** in a small beaker and add about 25 cm^3 distilled water. Stir well for at least one minute, then filter the mixture into a large test-tube.

Keep the filtrate and residue for further testing in **(b)** and **(c)**.

Record the colours of the filtrate and residue.

colour of filtrate .....

colour of residue ..... [2]

(b) (i) Place about 2 cm^3 of the filtrate from **(a)** into a test-tube and slowly add dilute sodium hydroxide until the test-tube is almost full. Now carefully stir the mixture in the test-tube.

Record your observations.

.....

.....

..... [1]

(ii) Place about 2 cm^3 of the filtrate from **(a)** into another test-tube and slowly add ammonia solution until the test-tube is almost full. Now carefully stir the mixture in the test-tube.

Record your observations.

.....

.....

..... [1]

(iii) Use your observations in **(b)(i)** and **(b)(ii)** to identify the cation present in the filtrate from **(a)**.

identity of cation ..... [1]

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(c) (i) Place the residue and filter paper from **(a)** into a clean small beaker and add 25 cm^3 dilute hydrochloric acid. Stir carefully. Gently warm the beaker on a tripod and gauze for two minutes. **Do not boil** the liquid in the beaker. Remove the source of heat.

Record your observations and keep the mixture for **(c)(ii)**.

.....

..... [1]

(ii) When the mixture from **(c)(i)** has cooled a little, filter it into a large test-tube. Keep the filtrate for further testing in **(d)**.

Record the colours of the filtrate and residue.

colour of filtrate .....

colour of residue ..... [2]

(d) Place about 2 cm^3 of the filtrate from **(c)(ii)** into a test-tube and slowly add dilute sodium hydroxide until the test-tube is almost full. Now carefully stir the mixture in the test-tube.

Record your observations and identify the cation present.

observations .....

.....

identity of cation ..... [2]

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3 You are going to find out how the resistance of a wire depends upon its length.

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

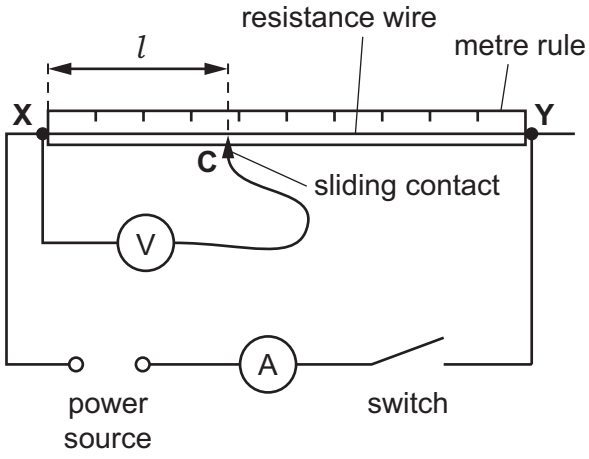

Fig. 3.1

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

Record the current I flowing through the wire and the potential difference (p.d.)V across the wire in Table 3.1. Record also the length l.

Switch off. [1]

Table 3.1

length l / cm	current I / A	p.d. V / V	resistance R / ohms

(ii) Calculate the resistance R of the 10.0 cm length of the wire using the equation.

$$R = V / I$$

Record the value of R in the table. [1]

(iii) Repeat steps **(i)** and **(ii)** for values of l of 40.0 cm, 70.0 cm and 85.0 cm, switching off after each measurement. Record your values of l, I, V and R in Table 3.1. [3]

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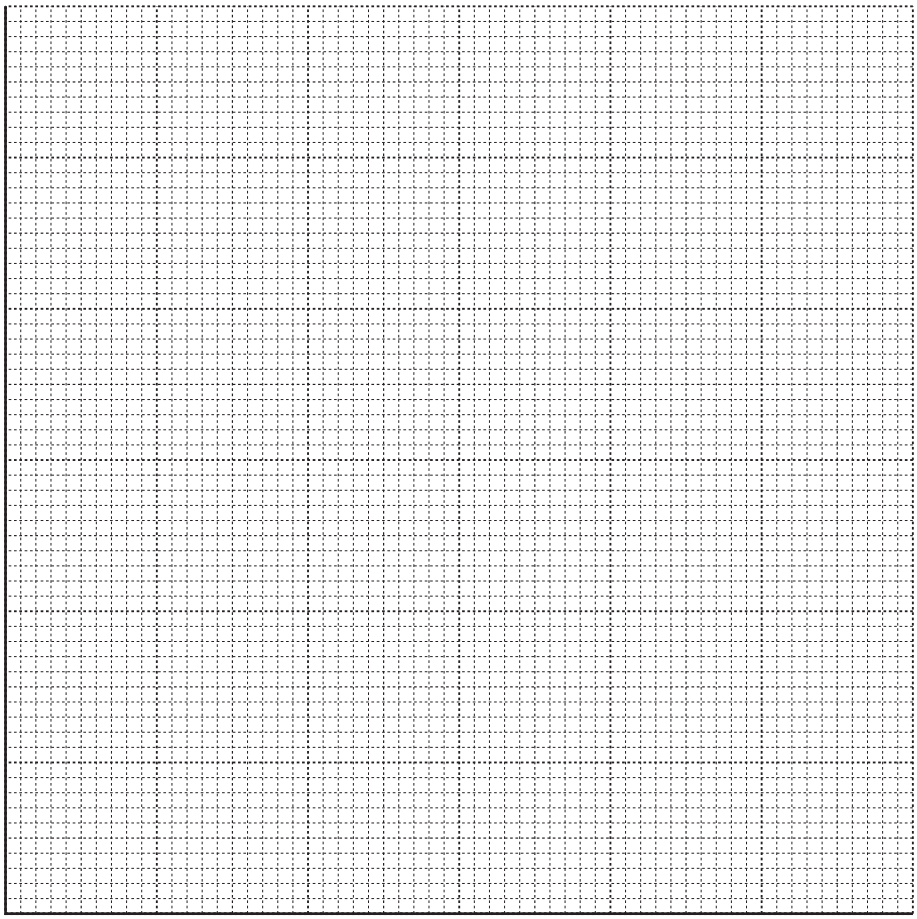
(iv) Suggest why it is important to switch the circuit off between taking readings.

.....

..... [1]

(b) On the grid provided, plot a graph of R (vertical axis) against l (horizontal axis). Start your graph at (0,0). Draw the best fit straight line.

R/Ω



l/cm

[3]

(c) Use your graph to suggest the relationship between the resistance R of the wire and its length l.

relationship .....

.....

[1]

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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 then add aqueous barium chloride *or* 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 results*
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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