



Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

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PHYSICAL SCIENCE

0652/51

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 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 **8** printed pages.

- 1 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**.

At the end you will show how to confirm the identity of the third cation.

- (a) Place the sample of solid **Q** in a small beaker and add about 25 cm³ 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 cm³ 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.

.....

.....

..... [2]

- (ii) Place about 2 cm³ 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.

.....

.....

..... [2]

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

identity of cation [1]

- (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 and residue for further testing in (d).

Record the colours of the filtrate and residue.

colour of filtrate

colour of residue [2]

- (d) (i) 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.

.....
 [1]

- (ii) Place about 2 cm^3 of the filtrate from (c)(ii) into another a 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.

.....

 [2]

- (iii) Use your observations in (d)(i) and (d)(ii) to identify the cation present in the filtrate from (c)(ii).

identity of cation [1]

- (e) The third cation is in the residue from (c)(ii). A student who carried out this experiment thinks that this residue might be a compound containing the iron(III) ion. He dissolves the residue in dilute nitric acid.

Describe how he can show that the resulting solution contains the iron(III) ion.

Do NOT attempt to carry out this experiment.

.....

.....

..... [1]

Please turn over for Question 2.

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

The circuit shown in Fig. 2.1 has been set up for you.

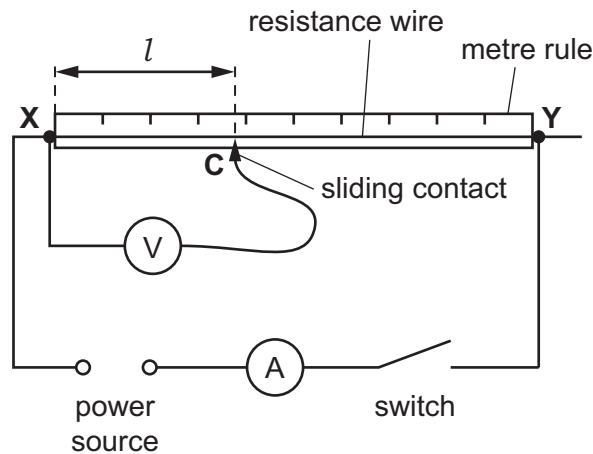


Fig. 2.1

- (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 2.1. Record also the length l .

Switch off.

[1]

Table 2.1

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

- (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) Insert appropriate units for each quantity at the top of each column. The first column has been done for you.

[1]

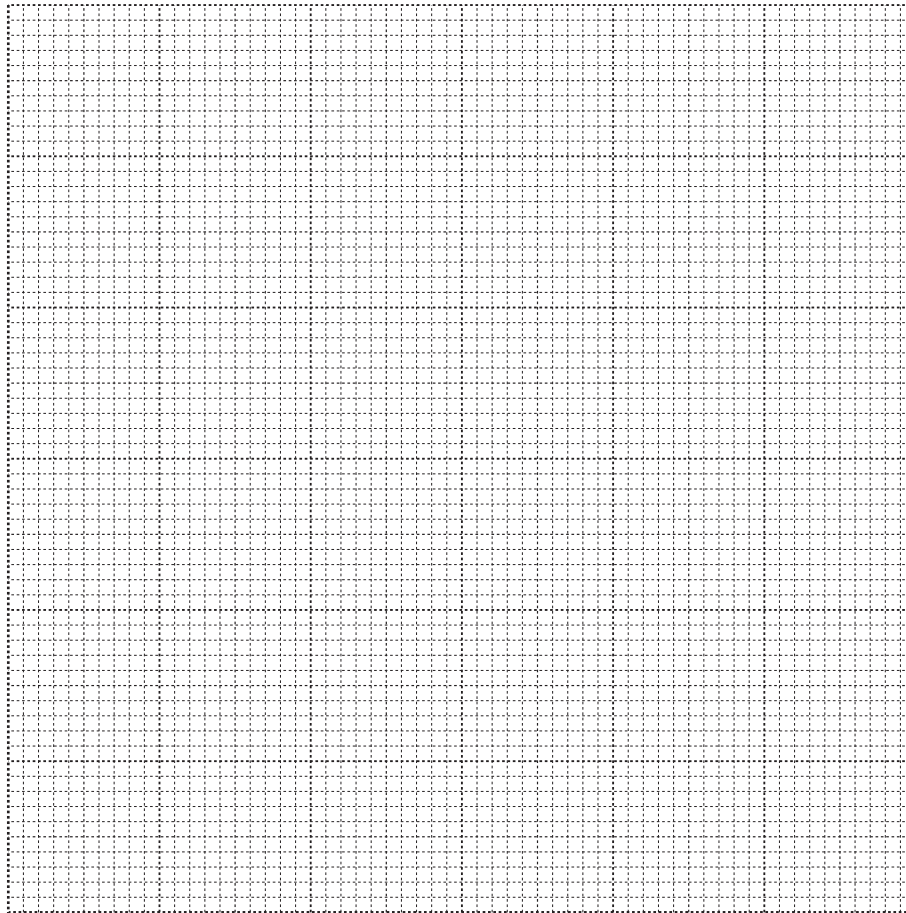
- (iv) Repeat steps (i) and (ii) for values of l of 25.0 cm, 40.0 cm, 70.0 cm and 85.0 cm, switching off after each measurement. Record your values of l , I , V and R in Table 2.1.

[5]

(v) 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.



[4]

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

relationship

.....

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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