



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
International General Certificate of Secondary Education

CANDIDATE NAME

CENTRE NUMBER 

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CANDIDATE NUMBER 

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**CO-ORDINATED SCIENCES**

**0654/53**

Paper 5 Practical Test

**October/November 2011**

**2 hours**

Candidates answer on the Question Paper.

Additional Materials: As listed in Instructions to Supervisors

**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 a pencil for any diagrams, graphs or rough working.  
Do not use staples, paper clips, highlighters, glue or correction fluid.  
**DO NOT WRITE IN ANY BARCODES.**

Answer **all** questions.  
Chemistry practical notes 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	
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>Total</b>	

This document consists of **11** printed pages and **1** blank page.

1 You are going to investigate transport systems in plants.

- Cut a piece of leaf to a size approximately 2 cm x 2 cm using a scalpel or sharp knife. The leaf must have recently been in the light.
- Place the piece of leaf into the syringe, positioned so that the leaf is vertical.
- Insert the plunger without squashing the leaf.
- Fill the syringe with water as shown in Fig. 1.1.
- Eject any excess air by inverting the syringe and pushing out the air.
- Place your thumb over the end of the syringe while it is still inverted, as shown in Fig. 1.2.
- With your thumb still in place, pull the plunger down hard.

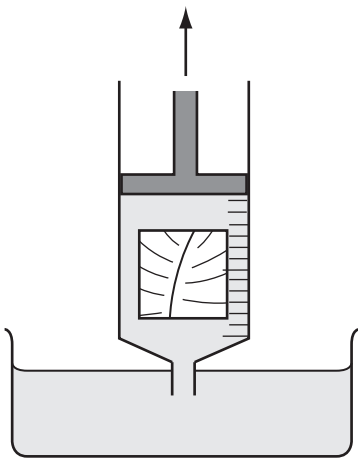


Fig. 1.1

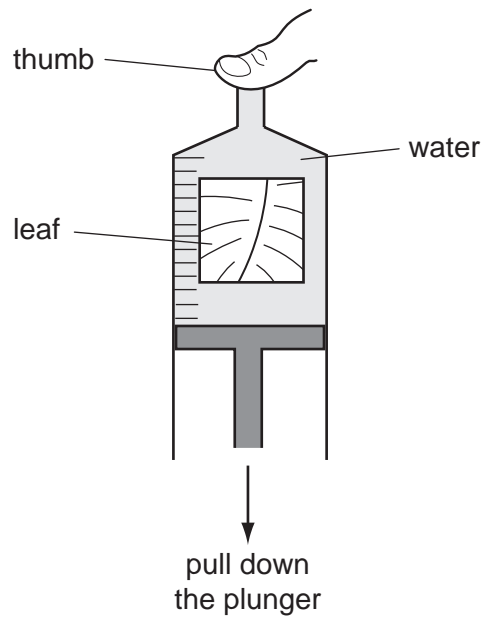


Fig. 1.2

(a) (i) Describe what happens on the lower surface of the leaf. Suggest the reason for this.

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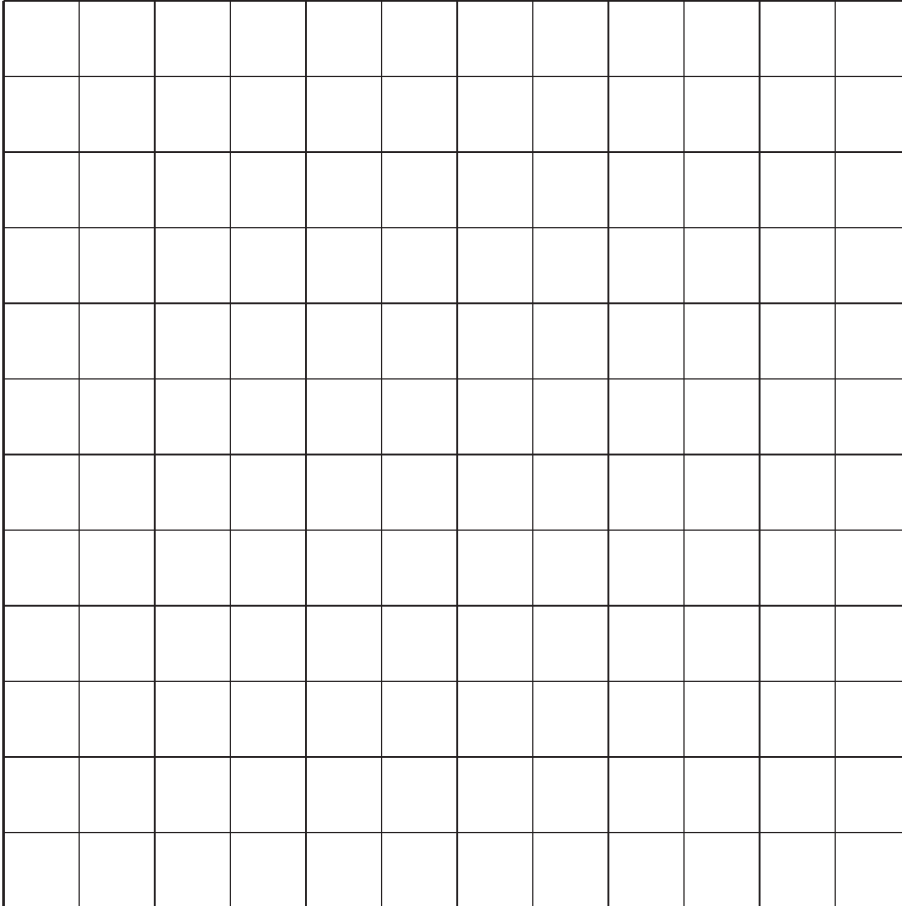
.....

.....

..... [3]

(ii) Use the grid provided to estimate the area of a second leaf. The area of each square is  $1 \text{ cm}^2$ .

- Place the leaf on the grid provided.
- Carefully draw around the leaf then remove it.



- Write the letter **C** in the **complete** squares contained within your outline. Count the number of complete squares.

number of complete (**C**) squares = ..... [1]

- Write the letter **P** in any incomplete squares contained within your outline that have an area of half a square or more.

number of incomplete (**P**) squares = ..... [1]

- Ignore the rest of the squares.
- Add **C** + **P** to estimate the area of the leaf. You will use your answer in (a)(iii).

leaf area = .....  $\text{cm}^2$

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- (iii) There are usually about 100 stomata in every **square millimetre** of the lower surface of a leaf.

Using the surface area you determined in (a)(ii), calculate the total number of stomata found on the lower surface of the leaf.

number of stomata = ..... [2]

- (iv) The number of stomata on the upper surface of a leaf is usually fewer than on the lower surface. Explain why this is of benefit to the plant.

.....  
.....  
.....  
..... [3]

- (b) (i) You have been given a piece of plant stem that has been placed in red dye for 2 hours. Cut a horizontal section through the stem. Draw a cross section of the stem showing clearly the position of the red dye.

Name and label the tissue where the red dye is found on the diagram.

[3]

(ii) Describe an experiment to measure the rate of movement of dye through a piece of celery.

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.....

.....

.....

.....

..... [2]

- 2 In this question you will be investigating some of the properties of carbon dioxide.

Place three marble chips in a test-tube and add dilute hydrochloric acid until the test-tube is half-full. This will generate carbon dioxide gas. If at any time the stream of bubbles slows or stops you can pour away the used acid and add fresh acid.

Use a delivery tube attached to the test-tube, as shown in Fig. 2.1, to carry out the tests below, recording your observations and conclusions.

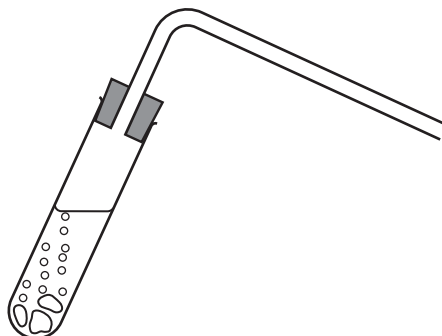


Fig. 2.1

- (a) (i) Pass carbon dioxide gas onto moist blue litmus paper.

observation .....

conclusion ..... [2]

- (ii) Pass carbon dioxide gas into a test-tube containing about 3 cm<sup>3</sup> of water and a few drops of Universal Indicator.

observation .....

conclusion ..... [2]

- (iii) Using your results from (a)(i) and (a)(ii), comment on the acidity or alkalinity of carbon dioxide.

.....

..... [1]

- (b) (i) One-quarter fill a hard glass test-tube with limewater. Pass carbon dioxide gas into the limewater.

observation ..... [1]

- (ii) Continue to pass carbon dioxide gas into the mixture from (b)(i) until another change occurs.

observation ..... [1]

- (iii) Heat the mixture from (b)(ii) until it boils.

observation ..... [1]

- (c) (i) Pass carbon dioxide gas into one-quarter of a test-tube of fresh limewater containing a few drops of Universal Indicator, until there is no further change.

observations .....

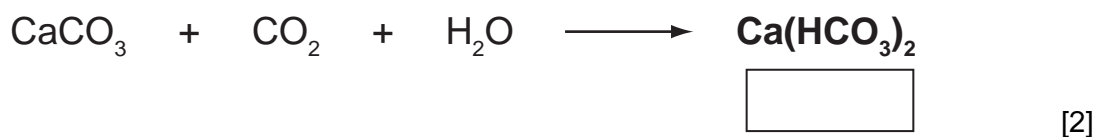
.....

conclusions .....

..... [4]

- (ii) Match the colours you have seen in (c)(i) to the compounds printed in bold in the two reactions shown below.

State the colour of Universal Indicator in the box below each compound.



- (d) Place the end of the delivery tube into the bottom of an empty test-tube and pass carbon dioxide gas downwards into the empty test-tube for 30 seconds. Remove the delivery tube and place a lighted splint into the test-tube of carbon dioxide gas.

observation ..... [1]





- 3 (a) (i) Set up the electrical circuit as in Fig. 3.1 but without the resistance wire. Points **A** and **B** should end with crocodile clips.

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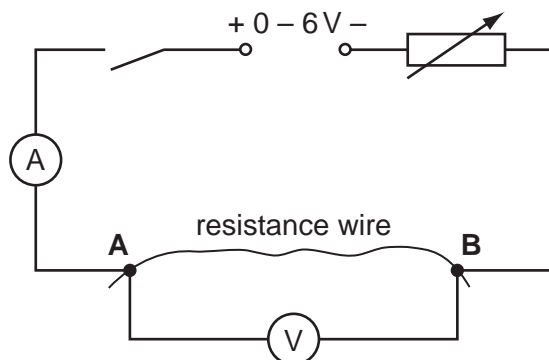


Fig. 3.1

With the switch open, clip a piece of resistance wire between points **A** and **B** so that 25 cm of wire is in the circuit between the crocodile clips.

Close the switch and, using the variable resistor, adjust the voltage shown on the voltmeter to around 2 V. Record the readings on the voltmeter and the ammeter in row 1 of Table 3.1. Open the switch. [1]

**Warning:** the resistance wire may get hot.

Table 3.1

readings for 1 wire			
reading	voltage / V	current / A	resistance / $\Omega$
1			
2			
3			
4			
5			

- (ii) Close the switch again. Adjust the variable resistor to reduce the voltage shown on the voltmeter. (You will have to do this three more times.)

Record the readings on the voltmeter and the ammeter in row 2 of Table 3.1. Open the switch.

- (iii) Repeat (ii) three more times, recording your readings in rows 3, 4 and 5 of Table 3.1. Open the switch. [2]

- (iv) For each reading, calculate the value of the resistance of the wire using

$$\text{resistance} = \text{voltage} / \text{current}$$

Enter the resistance values in Table 3.1. [1]

- (v) Calculate the average of the five resistance values in Table 3.1 and enter your average value in Table 3.2 as the resistance for 1 wire. [1]

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Table 3.2

number of 25 cm wires	voltage/V	current/A	resistance/ $\Omega$
1			
2			
3			
4			

- (b) (i) Open the switch. Now attach a second piece of resistance wire so that there is 25 cm between points A and B. This second piece is in parallel with the original piece as shown in Fig. 3.2.

It is essential that no wires curl around to touch themselves between the points A and B.

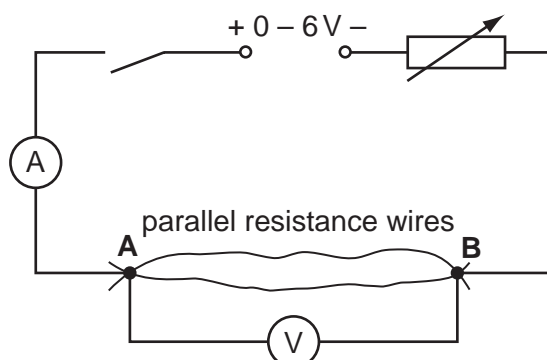


Fig. 3.2

- (ii) Close the switch. Adjust the variable resistor so that the voltage on the voltmeter is similar to the reading in (a)(i).

Record the readings on the voltmeter and the ammeter in the row for 2 wires in Table 3.2. Open the switch. [1]

- (iii) Now repeat (b)(ii) for three and four parallel 25 cm pieces of resistance wire, entering the readings on the voltmeter and the ammeter for each in Table 3.2. [2]

Make sure that the switch is open when you have finished recording your readings.

- (iv) Calculate the resistance of the parallel wires by using

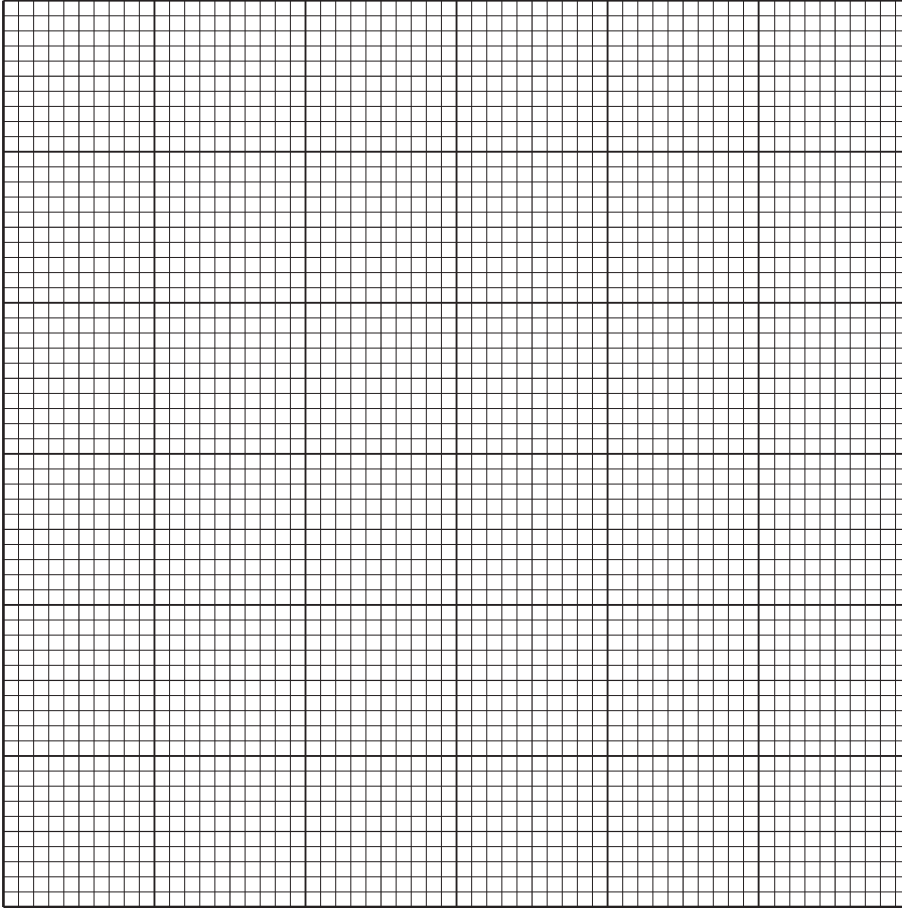
$$\text{resistance} = \text{voltage} / \text{current}$$

Enter the values of resistance in Table 3.2. [1]

- (c) (i) Plot a graph of resistance (vertical axis) against the number of wires in parallel on the grid provided using your data from Table 3.2. You will need to extend the graph to include 5 parallel wires.

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Draw a smooth curve through your points.



[4]

- (ii) Extend the graph to enable you to read off the resistance of 5 parallel wires.

resistance of 5 parallel wires = .....  $\Omega$  [1]

- (d) Using your results for the resistance of 1 wire from Table 3.1, comment on whether or not all of the experiments for the parallel wires should have been repeated five times.

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

## CHEMISTRY PRACTICAL NOTES

## Test for anions

<i>anion</i>	<i>test</i>	<i>test result</i>
carbonate ( $\text{CO}_3^{2-}$ )	add dilute acid	effervescence, carbon dioxide produced
chloride ( $\text{Cl}^-$ ) [in solution]	acidify with dilute nitric acid, then add aqueous silver nitrate	white ppt.
nitrate ( $\text{NO}_3^-$ ) [in solution]	add aqueous sodium hydroxide then aluminium foil; warm carefully	ammonia produced
sulfate ( $\text{SO}_4^{2-}$ ) [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 ( $\text{NH}_4^+$ )	ammonia produced on warming	-
copper(II) ( $\text{Cu}^{2+}$ )	light blue ppt., insoluble in excess	light blue ppt., soluble in excess giving a dark blue solution
iron(II) ( $\text{Fe}^{2+}$ )	green ppt., insoluble in excess	green ppt., insoluble in excess
iron(III) ( $\text{Fe}^{3+}$ )	red-brown ppt., insoluble in excess	red-brown ppt., insoluble in excess
zinc ( $\text{Zn}^{2+}$ )	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 ( $\text{NH}_3$ )	turns damp red litmus paper blue
carbon dioxide ( $\text{CO}_2$ )	turns limewater milky
chlorine ( $\text{Cl}_2$ )	bleaches damp litmus paper
hydrogen ( $\text{H}_2$ )	"pops" with a lighted splint
oxygen ( $\text{O}_2$ )	relights a glowing splint

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