



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS International General Certificate of Secondary Education

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		

COMBINED SCIENCE
Paper 5 Practical Test

0653/52

May/June 2010

1 hour 30 minutes

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 16.

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 5 blank pages.

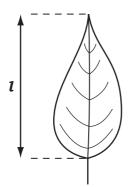


1 This question is about variation in leaves.

For Examiner's Use

(a) You are provided with 20 leaves of the same species. Measure the length *I* of each leaf in millimetres as shown in Fig. 1.1a. If the lamina does not meet the petiole evenly on either side of the leaf use the longer measurement. See Fig. 1.1b.

Enter your measurements in Table 1.1.





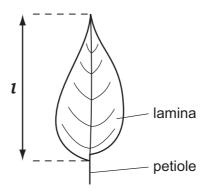


Fig. 1.1b

Table 1.1

length of leaf // mm							
1	11						
2	12						
3	13						
4	14						
5	15						
6	16						
7	17						
8	18						
9	19						
10	20						

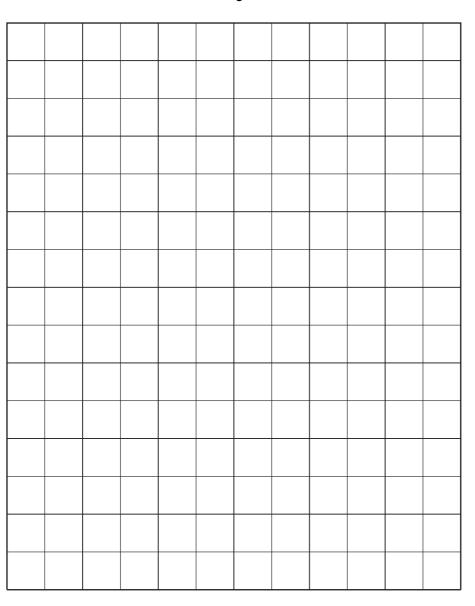
[2]

(b) Calculate the average (mean) length of the 20 leaves. Show your working.

[2]

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(c)	The difference between the greatest length and the smallest length is the range.									
	Complete the following.									
	the	greatest length =			mm					
	the	smallest length =			mm					
	the	range =			mm		[1]			
(d)	Use the grid provided on page 5 to estimate the area of one of the leaves. The area of each square is 1 cm ² .									
	•	Place the leaf on	the grid provided.							
	•	Carefully draw rou	und the leaf then re	emove it.						
	•	Write the letter squares.	C in the comple	te squares.	Count the number	of compl	ete			
		nun	nber of complete (C) squares =		•				
	•	Write the letter P more.	in any incomplete	squares tha	nt have an area of ha	alf a square	or			
		numb	er of incomplete (F	P) squares =						
	•	Ignore the rest of	the squares.							
	•	Add C + P to estin	nate the area of the	e leaf.						
				leaf area =		cm ²	[3]			



For Examiner's Use

(e)	The leaves in the sample were all of the same species yet they showed variation in
	length.

Suggest and explain a reason for this.

	[2]
explanation	
reason	

For Examiner's Use

2

You are going to find the specific heat capacity of the material of a can. The specific heat capacity of a material is the heat energy required to raise 1 g of the material by 1 °C.	
(a) Find the mass of the can to the nearest gram.	
Record its mass below.	
mass of can, \mathbf{m}_1 , =g [1]	
(b) Place the lagging around the can. Place the thermometer inside the can and leave for two minutes. Read the temperature, t ₁ , to the nearest 0.5 °C and record it below.	
temperature of can, $\mathbf{t_1} = \underline{}^{\circ} \mathbb{C}$ [1]	
(c) (i) Heat enough water in a beaker to about one-third fill the can. When the temperature is just above 70 °C, remove the Bunsen. As soon as the temperature of the water has cooled to exactly 70.0 °C pour the water into the can. Read the temperature, t ₂ , to the nearest 0.5 °C of the water after exactly two minutes. Record this temperature.	
temperature of water, t ₂ =°C [1]	
(ii) Remove the lagging and pour the water into a measuring cylinder. Record the volume.	
volume of water =cm ³ [1]	
(iii) 1 cm³ of water has a mass of 1 g. Calculate the mass, m₂, of the volume of water you recorded in (c)(ii).	
mass of water, $\mathbf{m_2} = \underline{\qquad} g$ [1]	
(d) Calculate	
(i) \mathbf{t}_3 , the fall in temperature of the hot water, $\mathbf{t}_3 = (70.0 - \mathbf{t}_2)$.	
$t_3 = \underline{\hspace{1cm}}^{\circ} C$ (ii) t_4 , the rise in temperature of the can, $t_4 = (t_2 - t_1)$.	
t ₄ =°C [2]	

(e) Use the equation to calculate the specific heat capacity, **shc**, of the material of the can.

$$shc = \frac{\mathbf{m_2} \times \mathbf{t_3} \times 4.2}{\mathbf{t_4} \times \mathbf{m_1}}$$

specific heat capacity of the material of the can =
$$_{\text{material}} J g^{-1} \circ C^{-1}$$
 [3]

3 You are going to investigate the rate of reaction between magnesium and hydrochloric acid.

For Examiner's Use

(a) (i) Set up the apparatus as shown in Fig. 3.1.

Read through the procedure before starting the experiment.

• Fill the 100 cm³ measuring cylinder and trough with water.

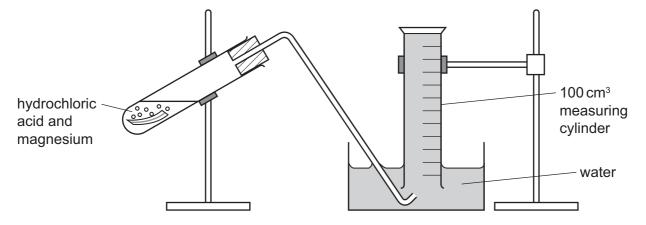


Fig. 3.1

- (ii) Place 20 cm³ of the hydrochloric acid in the large test-tube.
 - Cut 6 cm of magnesium ribbon from the length provided.
 - Loosely fold the piece of magnesium ribbon and place it in the acid contained in the test-tube. Immediately replace the stopper and delivery tube and start the timer.
 - Read the volume of gas in the measuring cylinder after 20, 40, 60 and 80 seconds.
 - Record the volumes in Table 3.1. [2]
- **(b) (i)** You will now repeat the procedure using the same length of magnesium but different volumes of acid and water.
 - Wash out the contents of the test-tube.
 - Refill the measuring cylinder with water.
 - Place 16 cm³ of hydrochloric acid in the test-tube and 4 cm³ of water.
 - Cut 6 cm of magnesium ribbon and place it in the acid. Replace the stopper and delivery tube.
 - Immediately start the timer.
 - Read the volume of gas in the measuring cylinder after 20, 40, 60 and 80 seconds.
 - Record the volumes in Table 3.1.

(ii) Repeat the experiment **two** more times using volumes of acid and water as shown in Table 3.1. Record the results in Table 3.1. [2]

For Examiner's Use

Table 3.1

volume of 2 mol/dm³	volume of water/cm ³	concentration of acid in the	volun		collected ter	d/cm³
hydrochloric acid/cm ³		mixture/mol/ dm ³	20 s	40 s	60 s	80 s
20	0	2.0				
16	4	1.6				
12	8	1.2				
4	16	0.4				

(c) Draw a graph of volume of gas collected **after 40 s** (vertical axes) against concentration of hydrochloric acid. Include the origin in your plots and draw a smooth curve.

For Examiner's Use

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gas collected after 40 s / cm³

volume of

concentration of acid/moldm⁻³

[3]

(d)	How is the rate of reaction affected by concentration of acid? Explain how your results enable you to decide this.	For Examiner's Use
	[2]	
	[2]	
(e)	Had any of the reactions finished by the time 80 s had been reached? Explain your answer.	
	[1]	

CHEMISTRY PRACTICAL NOTES

Test for anions

anion	test	test result					
carbonate (CO ₃ ²⁻)	add dilute acid	effervescence, carbon dioxide produced					
chloride (C <i>l</i> ·) [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

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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