UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
International General Certificate of Secondary Education

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

7828333977

COMBINED SCIENCE **0653/51**

Paper 5 Practical Test **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 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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UNIVERSITY *of* CAMBRIDGE
International Examinations

For Examiner's Use

1 Some plants show differences in the structure of a leaf growing in a sunny area (sun leaf), and a leaf growing in a shaded area (shade leaf).

(a) (i) You are supplied with two leaves, labelled **sun leaf** and another leaf labelled **shade leaf.**

Make drawings of the two leaves in the spaces provided to show the difference in size.

sun leaf **shade leaf**

[2]

length of sun leaf = ... mm length of shaded leaf = ... mm [2]

(ii) Measure and record the maximum length of each leaf on your drawing, excluding the petiole (stalk). Write your measurements below each diagram.

(b) One leaf has a larger surface area than the other.

Suggest an advantage to the leaf with the larger surface.

....

....

.... [1]

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(c) Fig. 1.1 shows cross sections of a sun leaf and a shade leaf as viewed using a microscope.

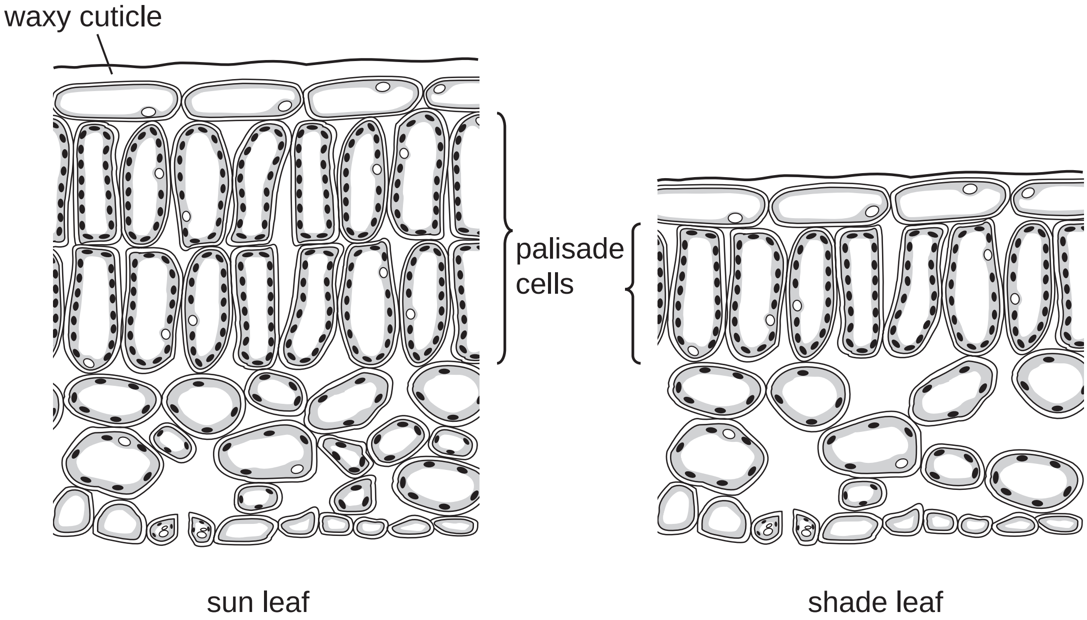

Fig. 1.1

(i) Construct a table to compare the two diagrams shown in Fig. 1.1. Include the following features**; thickness of leaf, number of palisade cells, size of air spaces**.

[4]

(ii) The sun leaf usually has a thicker cuticle than the shade leaf. The cuticle is a waxy layer covering the leaf.

Suggest an advantage that this thicker cuticle gives to the sun leaf.

....

.... [1]

For Examiner's Use

2 You are going to make some measurements on a test-tube before using it to determine the density of **liquid P**.

(a) Measure and record the length, l, and the internal diameter, **D**, of the test-tube.

l = ... mm   **D** = ... mm

Using these measurements, calculate the volume of the tube using the formula

$$\pi \times \left(\frac{\mathbf{D}}{2}\right)^2 \times l$$

volume of test-tube = ... mm^3 [3]

(b) (i) Hold the test-tube in the glass beaker labelled **water** and add dry sand to the tube until it floats with its open end about 10 mm above the surface. Place a rule in the water beside the tube and measure the depth, $\mathbf{d_1}$ from the water surface to the bottom of the test-tube. See Fig. 2.1. You may need to hold the tube upright to do this.

Record this value, $\mathbf{d_1}$ in Table 2.2 on page 5.

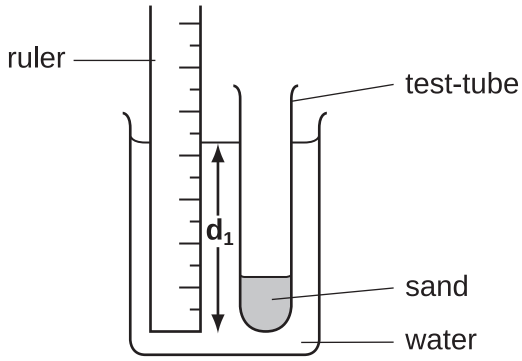

Fig. 2.1

(ii) Remove the test-tube from the water and wipe the outside, taking care not to lose any sand. Do not let water splash into the test-tube. Place the test-tube in the beaker labelled **liquid P** and as before, measure the depth, $\mathbf{d_2}$.

Record this value, $\mathbf{d_2}$ in the first line of Table 2.2.

(iii) Remove the test-tube and wipe the outside. Empty out a small amount of sand so that it floats in the water with the open end about 12 or 13 mm above the surface.

Measure and record $\mathbf{d_1}$, the new depth in Table 2.2.

As before, wipe the outside of the test-tube and transfer it to the **liquid P**.

Measure and record the new depth $\mathbf{d_2}$ in Table 2.2.

(iv) Repeat the process with the tube floating about 2 or 3 mm higher in water each time, until you have five sets of readings of $\mathbf{d_1}$ and $\mathbf{d_2}$.

Record all your values in Table 2.2.

Table 2.2

$\mathbf{d_1}$ **in water / mm**	$\mathbf{d_2}$ **in liquid P / mm**

[3]

(c) On the grid provided on page 6 (Fig. 2.2), plot a graph of $\mathbf{d_1}$ (vertical axis) against $\mathbf{d_2}$.

Draw the best straight line through your points.

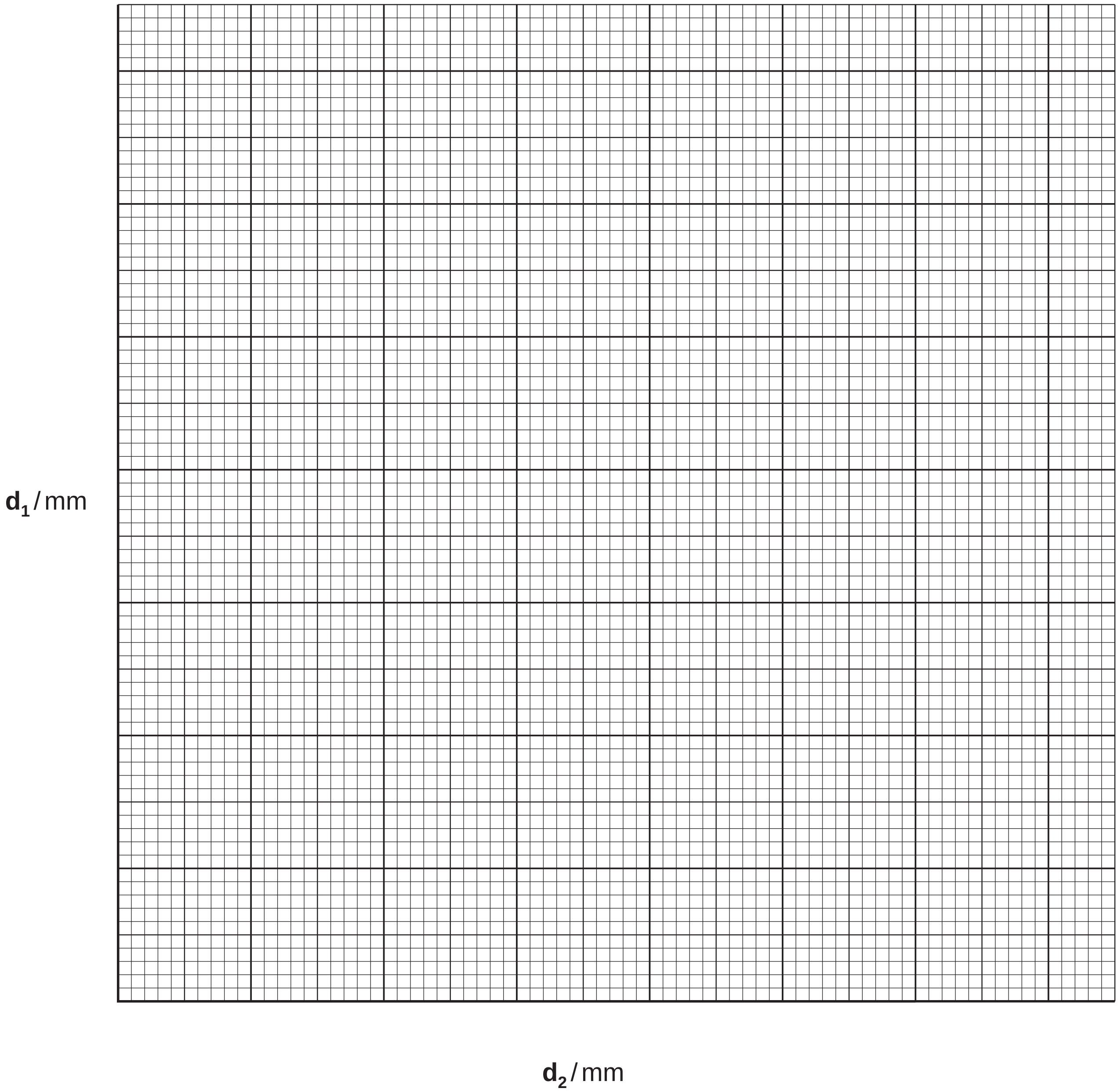

Fig. 2.2

[3]

(d) Calculate the gradient of the line, indicating on your graph the values chosen to enable you to do this. The gradient is numerically equal to the density of **liquid P** in grams per centimetre.

gradient of line = ... [1]

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Please turn over for Question 3.

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3 **X**, **Y** and **Z** are solutions of the same acid but different concentrations. You will use alkali, solution **A**, to find which of the acid solutions is the most concentrated. You will also carry out tests to identify the acid.

(a) Using the dropping pipette provided, and no other apparatus, estimate the volume of a single drop of liquid.

volume of 1 drop = ... cm^3 [1]

(b) **(i)** Using the small measuring cylinder, place 5 cm^3 of solution **X** in a test-tube. Add 2 drops of the indicator. Use the dropping pipette to add the alkali, solution **A**, a drop at a time, counting the drops. Shake the tube after each addition until a pink colour is produced.

Record the number of drops in Table 3.1.

(ii) Repeat the procedure using solution, **Y**, and then **Z**.

Record the number of drops in Table 3.1.

Table 3.1

solution	number of drops
X	
Y	
Z	

[3]

(c) Which of the solutions is the most concentrated? Explain your answer.

....

.... [1]

(d) Place about 2 cm^3 of solution **X** in a test-tube. Add a piece of magnesium. Test any gas given off with a glowing splint and a lighted splint.

Record your observation and name the gas given off.

glowing splint ....

lighted splint ....

name of the gas .... [3]

For Examiner's Use

(e) Place about 2 cm^3 of solution **X** in a test-tube and add a few drops of aqueous silver nitrate.

Record your observation and name the acid in solution **X**.

observation ....

name of the acid .... [2]

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CHEMISTRY PRACTICAL NOTES

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