Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/52**

Paper 5 Practical Test **May/June 2017**

1 hour 15 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.

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	

The syllabus is approved for use in England, Wales and Northern Ireland as a Cambridge International Level 1/Level 2 Certificate.

This document consists of **12** printed pages.

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1 You are going to investigate the rate of photosynthesis in leaf tissue using leaf discs that have been cut from fresh whole leaves.

When photosynthesis takes place in a leaf oxygen gas is produced and this is released into the air spaces in the leaf.

$$\text{carbon dioxide} + \text{water} \longrightarrow \text{glucose} + \text{oxygen}$$

Removing the air from the air spaces allows the leaf discs to sink when they are placed in water.

As photosynthesis takes place the leaf discs start to float. The time taken for the leaf discs to start to float indicates the rate of photosynthesis.

Read all the instructions but DO NOT CARRY THEM OUT until you have drawn a table for your results in the space provided in 1(a)(i).

You should use the gloves and eye protection provided while you carry out the practical work.

Step 1 Label three test-tubes **W1**, **W2** and **W3**. Label the remaining three test-tubes **S1**, **S2** and **S3**. Put all six test-tubes back into the test-tube rack.

Step 2 Remove the plunger from a 10 cm^3 syringe and use forceps to carefully place all 10 leaf discs into the empty syringe barrel.

Step 3 Cover the nozzle of the syringe with your finger and pour approximately 5 cm^3 of distilled water into the barrel of the syringe as shown in Fig. 1.1a.

Step 4 Insert the plunger back into the syringe and hold it upright as shown in Fig. 1.1b. Remove your finger from the nozzle and slowly push the plunger into the barrel to remove all of the air. Do not remove any of the distilled water and take care not to crush the leaf discs.

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Step 5 Hold the syringe barrel in one hand and place your finger over the nozzle of the syringe. Use your other hand to pull on the plunger for five seconds as shown in Fig. 1.1c, taking care not to pull the plunger out of the syringe barrel. After five seconds let go of the plunger. The leaf discs should sink to the bottom of the syringe barrel as shown in Fig. 1.1d.

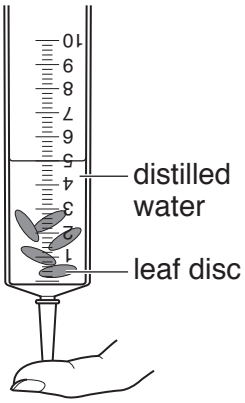
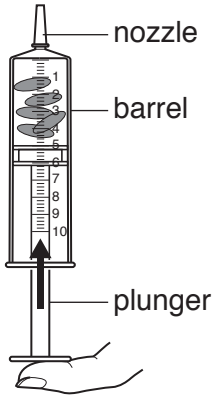
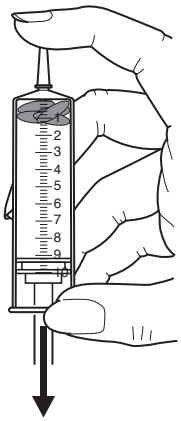


Fig. 1.1a



plunger pushed in to expel air

Fig. 1.1b



pull on plunger of syringe

Fig. 1.1c



Fig. 1.1d

Step 6 If any of the leaf discs do not sink, repeat step 5 until at least six of the leaf discs have sunk. Continue with step 7 if, after three further attempts, the leaf discs have still not sunk.

Step 7 Remove the plunger and pour the contents of the syringe barrel back into the Petri dish base.

Step 8 Use forceps to carefully place one of the leaf discs that sank into each of the six test-tubes you labelled in step 1.

Step 9 Add **distilled water**, to a depth of approximately 5 cm from the bottom of the test-tube, to test-tubes **W1**, **W2** and **W3** as shown in **Fig. 1.2**.

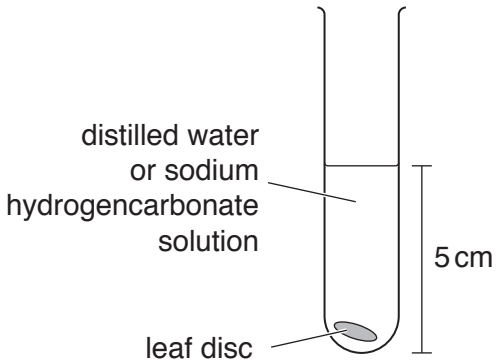


Fig. 1.2

Step 10 Add **sodium hydrogencarbonate solution**, to a depth of approximately 5 cm from the bottom of the test-tube, to test-tubes **S1**, **S2** and **S3** as shown in Fig. 1.2.

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Step 11 Place a lamp at a distance of 10 cm from the test-tube rack containing the six test-tubes you have prepared, as shown in Fig. 1.3.

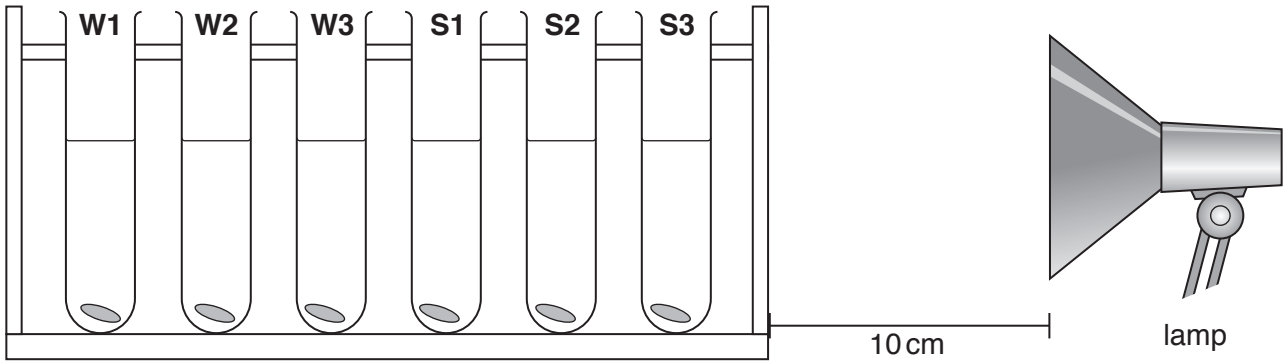

Fig. 1.3

Step 12 Switch on the lamp and time how long it takes for each of the discs to **start** to rise. You should time all six test-tubes at the same time and record your results in your table in **1(a)(i)**.

If a leaf disc has not started to rise after five minutes, stop timing and record the result as **>300** in your table.

(a) (i) Prepare a table to record your results.

View solution

[4]

(ii) State a conclusion for your results.

View solution

.....

.....

.....[1]

(iii) Suggest why the leaf discs rise when photosynthesis takes place.

View solution

.....

.....[1]

(iv) Identify the variable that was:

View solution

measured .....

changed .....

[2]

(v) State **two** variables that were kept constant.

View solution

1 .....

2 .....

[2]

(vi) There are potential sources of error in steps 9 to 12 of the method on pages 3 and 4.

View solution

Identify **two** sources of error in these steps.

For each error suggest **one** possible improvement.

error .....

.....

improvement .....

.....

error .....

.....

improvement .....

.....

[4]

(b) A student used the leaf disc method to investigate photosynthesis in plants grown in different conditions.

The student selected two plants, **X** and **Y** which were of the same species but were grown in different locations. A leaf was taken from each plant and leaf discs were cut out of the leaf from plant **X** and the leaf from plant **Y**.



The results of their investigation are shown in Table 1.1.

Table 1.1

plant	time taken for the leaf discs to rise / s				
	trial 1	trial 2	trial 3	trial 4	trial 5
X	70	65	58	86	78
Y	185	252	250	240	217

(i) Calculate the average time taken for the leaf discs from plant **X** and the leaf discs from plant **Y** to rise. Include the units and give your answers as whole numbers.

Space for working.

X .....

Y .....

[2]

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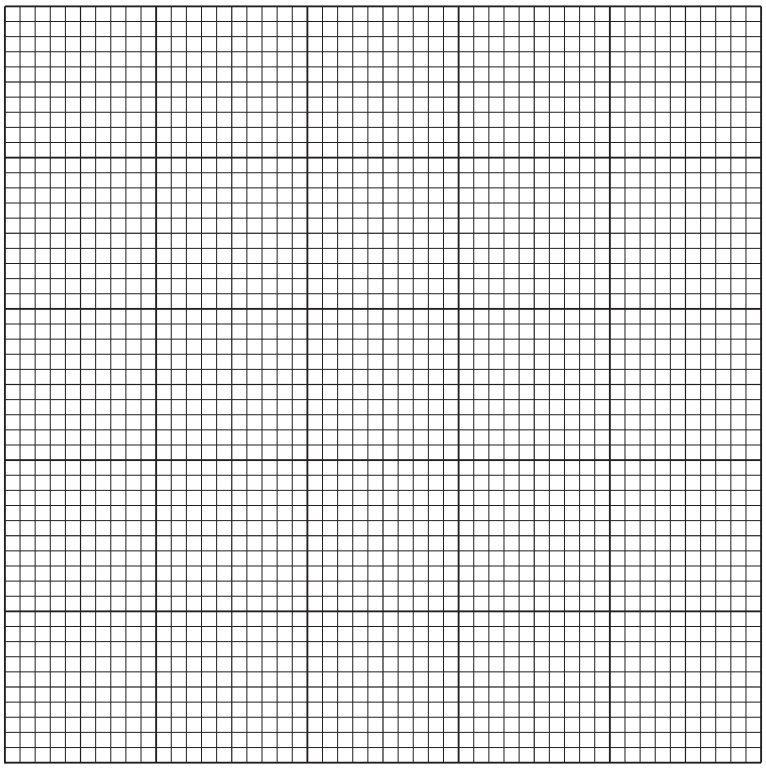
(ii) Plot a bar chart on the grid of the average rising time of the leaf discs for plants **X** and **Y**.

View solution



[3]

[Total: 19]

2 **(a)** Fig. 2.1 and Fig. 2.2 are photomicrographs of cross-sections of leaves taken from different areas of the same tree. Some parts of the tree are shaded from the Sun and some are in direct sunlight.

The cross-section shown in Fig. 2.1 was taken from a leaf grown in the shade and the cross-section shown in Fig. 2.2 was taken from a leaf grown in direct sunlight.

View solution

leaf grown in the shade

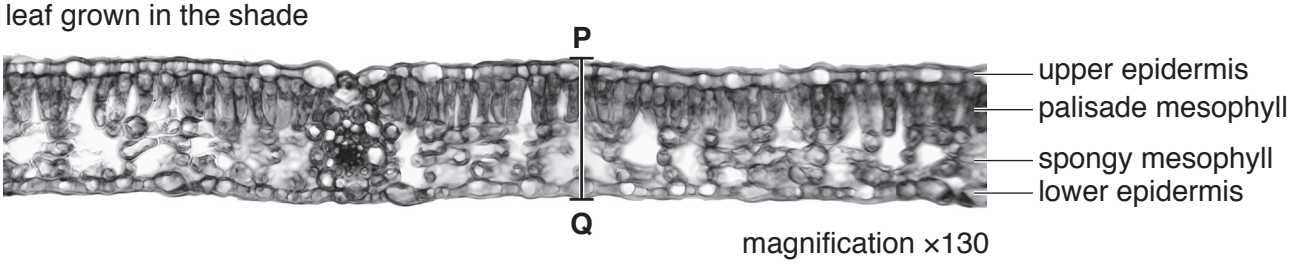


Fig. 2.1

leaf grown in direct sunlight

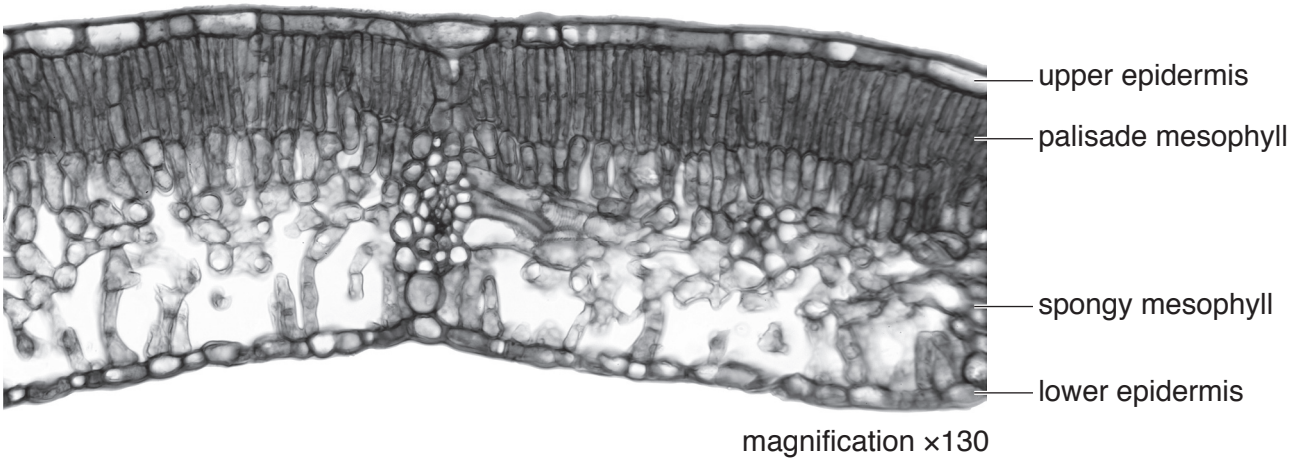


Fig. 2.2

(i) State **two** visible differences between the leaves shown in Fig. 2.1 and Fig. 2.2.

1 .....

.....

2 .....

.....

[2]

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(ii) Make a large drawing of the leaf cross-section shown in **Fig. 2.2**.

Do **not** draw individual cells. Do **not** label your drawing.

View solution

[4]

(iii) Measure the leaf thickness at line **PQ** in Fig. 2.1. Include the unit.

View solution

length of **PQ** .....

Calculate the actual leaf thickness using the equation:

$$\text{actual leaf thickness} = \frac{\text{length of line } \mathbf{PQ}}{\text{magnification}}$$

Show your working and give your answer to **two** decimal places.

.....
[3]

(b) A student measured the length and the thickness of some leaves taken from a different tree.

Some parts of the tree were in direct sunlight and some parts of the tree were shaded from the Sun.

Fig. 2.3 shows a diagram of two of the leaves sampled.

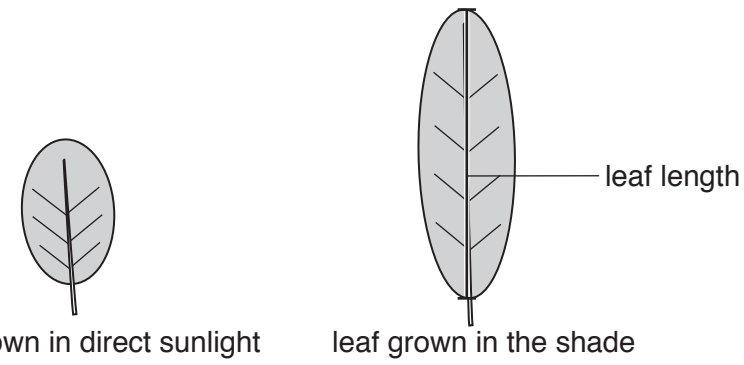

Fig. 2.3

Table 2.1 shows the average leaf thickness and the average leaf length.

Table 2.1

	leaves in direct sunlight	leaves in the shade	difference	percentage difference
average leaf thickness /mm	2.27	1.53	0.74	32.6
average leaf length /mm	70.00	105.00		

(i) Calculate the percentage difference between the average leaf length of the leaves grown in direct sunlight and the average leaf length of the leaves grown in the shade.

View solution

Write your answers in Table 2.1

Space for working.

[2]

(ii) The student was testing a hypothesis that stated

View solution

"leaves grown in the shade will be larger than leaves grown in direct sunlight"

Use Table 2.1 to explain how the data:

supports this hypothesis .....

.....

.....

.....

does **not** support this hypothesis .....

.....

.....

.....

[3]

(c) Before testing leaves for the presence of starch, the green chlorophyll must be removed. The chlorophyll can be removed by boiling the leaf in ethanol.

View solution

(i) Describe how ethanol can be boiled safely.

.....

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.....[1]

(ii) Suggest why the chlorophyll needs to be removed.

View solution

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.....[1]

(iii) A student wanted to find out if starch was present in **both** leaves grown in direct sunlight and leaves grown in the shade.

Plan an investigation to determine if starch is present in both types of leaf.

View solution

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.....[5]

[Total: 21]

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