Cambridge IGCSE

Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

BIOLOGY **0610/62**

Paper 6 Alternative to Practical **May/June 2017**

1 hour

Candidates answer on the Question Paper.

No Additional Materials are required.

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.

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 **10** printed pages and **2** blank pages.

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CAMBRIDGE International Examinations

1 A student wanted to investigate the effect of different growing conditions on the rate of photosynthesis in plants.

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

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

When small discs are cut from the leaf, the gases in the air spaces in the leaf discs can be removed. This allows the leaf discs to sink when they are placed in a liquid.

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

Step 1 A student selected two plants, **X** and **Y**, which were of the same species but were growing in two different locations.

Step 2 One leaf was removed from plant **X** and five small discs were cut from the leaf. Each leaf disc was 8 mm in diameter.

Step 3 The student placed the five leaf discs from plant **X** into a syringe containing 5 cm^3 of 2% sodium hydrogencarbonate solution.

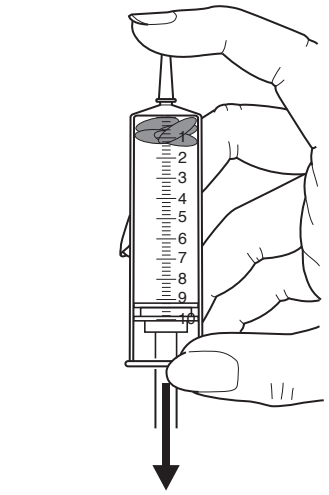

Fig. 1.1a

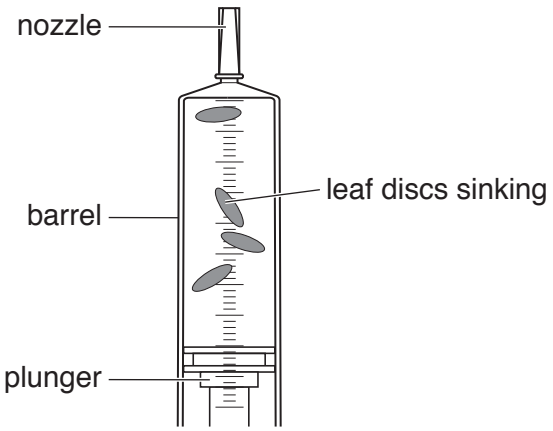

Fig. 1.1b

Step 4 The student removed the air from the air spaces in the leaf discs from plant **X** by pulling and releasing the syringe plunger as shown in Fig. 1.1a. The leaf discs then sank to the bottom of the syringe as shown in Fig. 1.1b.

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Step 5 The five leaf discs from plant **X** were removed from the syringe and each one was placed into a separate test-tube in a test-tube rack.

2% sodium hydrogencarbonate solution was poured into each test-tube to a height of approximately 5 cm from the bottom of the test-tube. This is shown in Fig. 1.2.

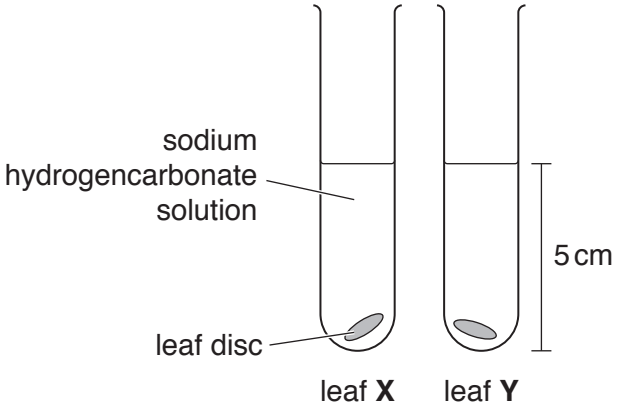

Fig. 1.2

Step 6 A lamp was placed at a distance of 10 cm from the edge of the test-tube rack. This is shown in Fig. 1.3.

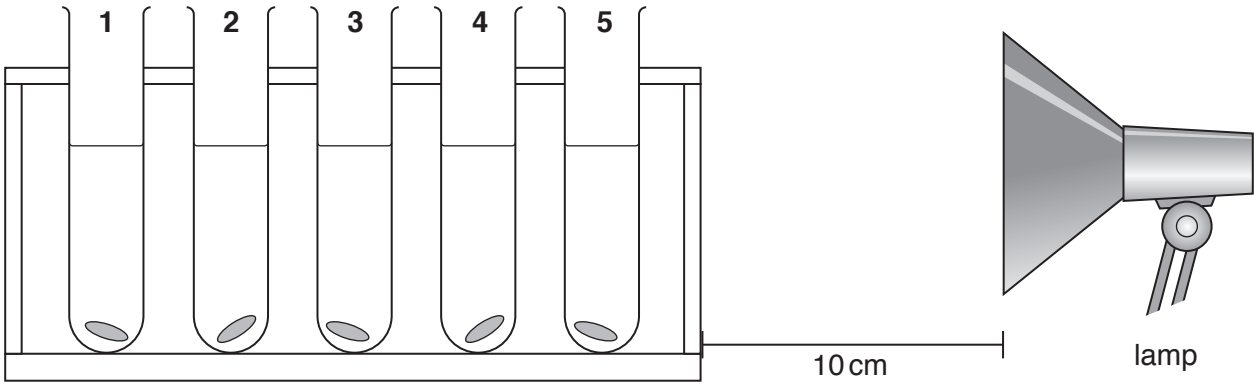

Fig. 1.3

Step 7 The lamp was switched on and a timer was started. The time taken for each of the five leaf discs to **start** to rise to the surface of the liquid in the test-tube was recorded.

Step 8 The student repeated steps **2** to **7** for the five leaf discs from plant **Y**.

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The student's results are shown in Fig. 1.4.

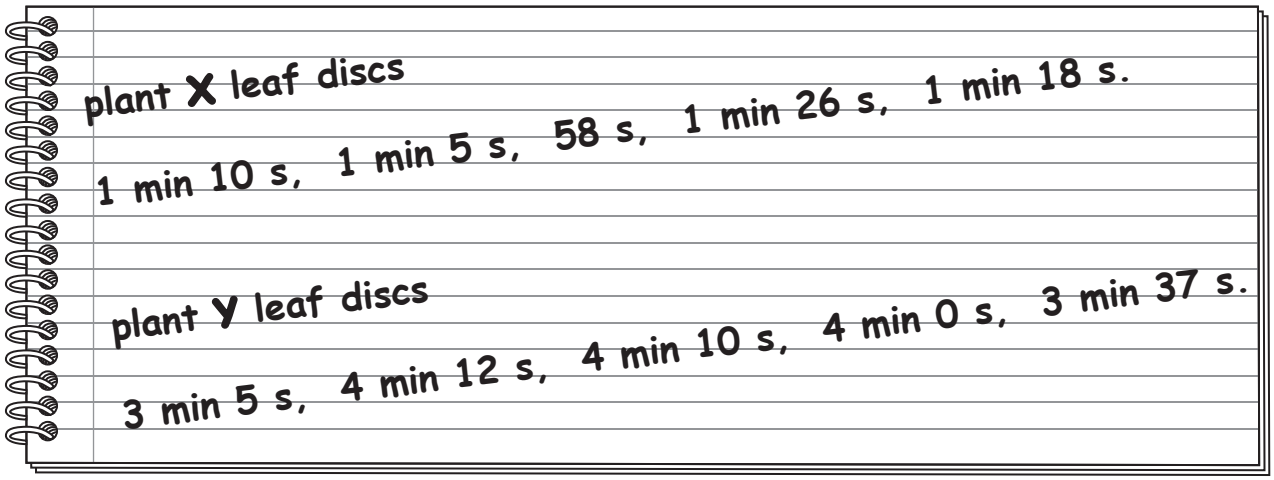

Fig. 1.4

(a) (i) Prepare a table to record the results shown in Fig. 1.4.

View solution

Record the student's results in your table.

[4]

(ii) 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 answer as a whole number.

View solution

Space for working.

X .....

Y.....

[2]

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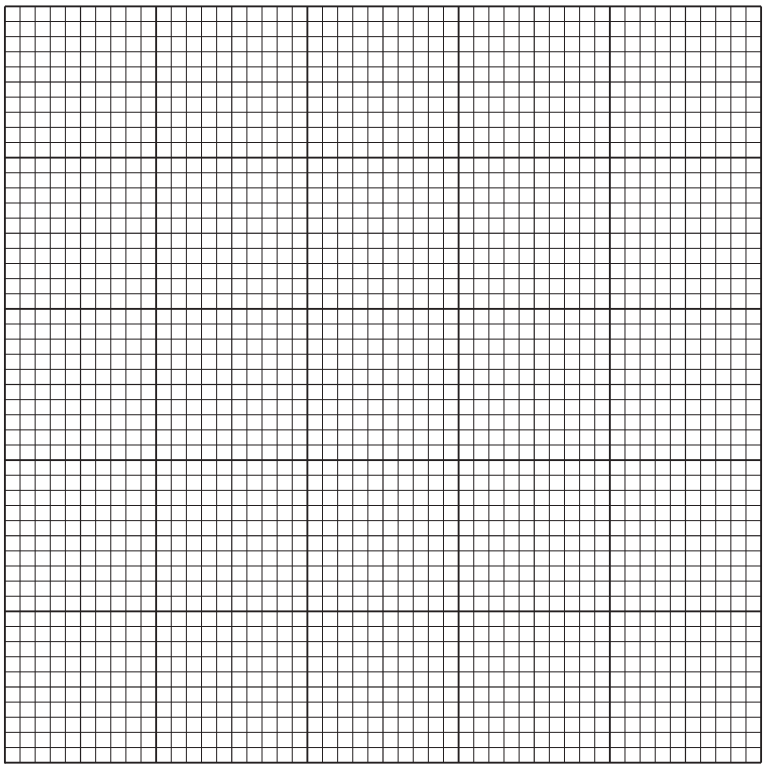
(iii) Plot a bar chart on the grid of the average rising time of the leaf discs for plants **X** and **Y**.

View solution



[3]

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

View solution

.....

.....[1]

(v) Explain why five leaf discs of each leaf type were used.

View solution

.....

.....[1]

(vi) Identify the variable that was:

View solution

measured .....

changed .....

[2]

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

View solution

1 .....

2 .....

[2]

(b) There are potential sources of error in step 5, step 6 and step 7 of the method on page 3.

View solution

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

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

error .....

.....

improvement .....

.....

error .....

.....

improvement .....

.....

[4]

[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 parts 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

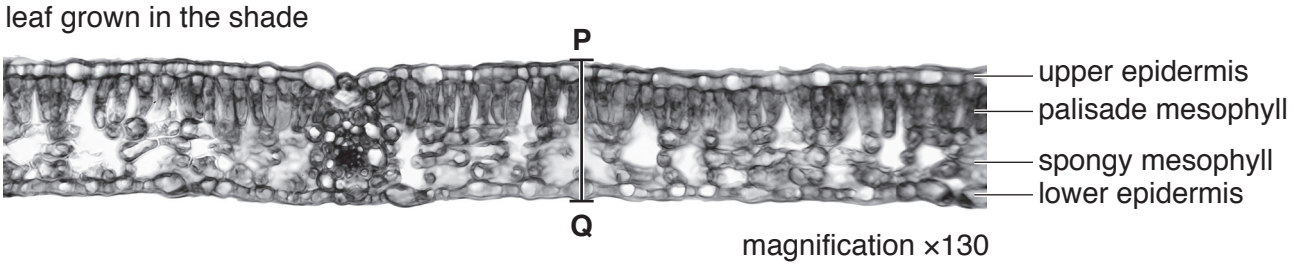


Fig. 2.1

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

1 .....

.....

2 .....

.....

[2]

leaf grown in direct sunlight

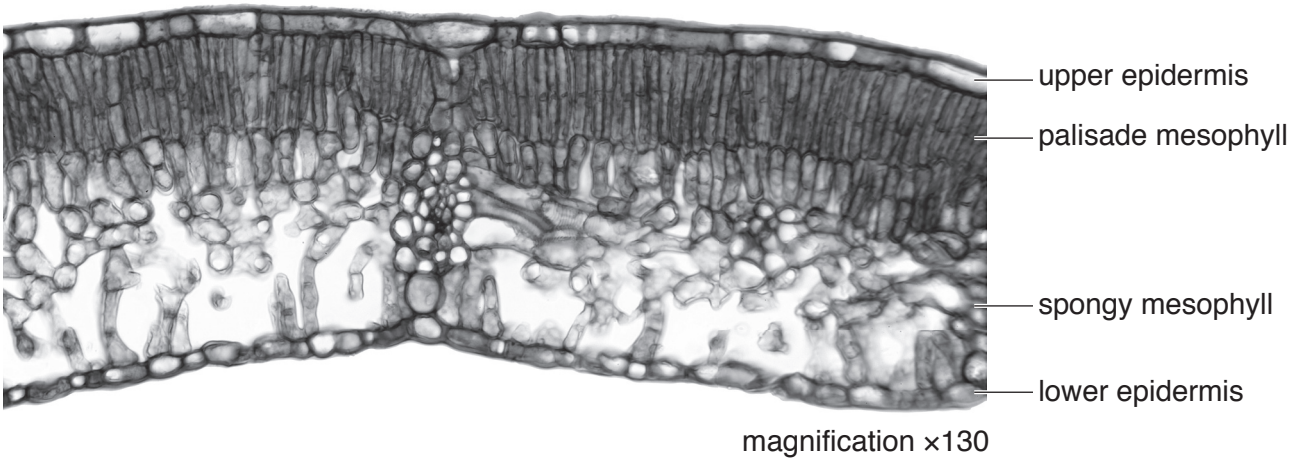


Fig. 2.2

View solution

(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.

[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.

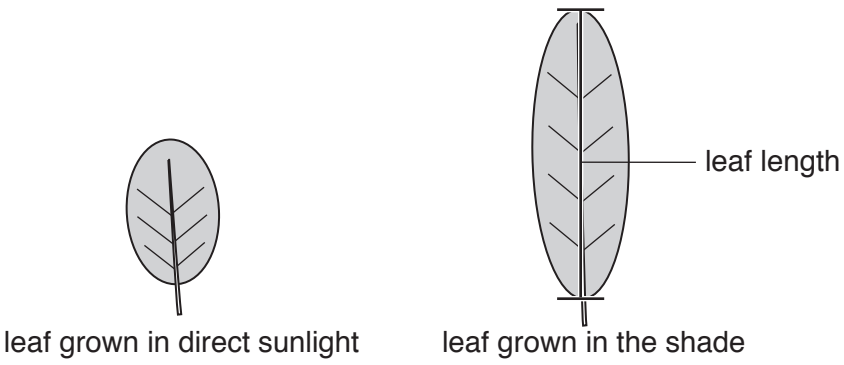


Fig. 2.3

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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	32.60
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.

.....

.....

.....[1]

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

View solution

.....

.....[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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