Cambridge International Examinations
Cambridge International General Certificate of Secondary Education

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER					

BIOLOGY **0610/62**

Paper 6 Alternative to Practical **October/November 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.

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

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

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CAMBRIDGE International Examinations

1 Starch is an important food source that is digested by the enzyme amylase to form the reducing sugar maltose.

$$\text{starch + water} \xrightarrow{\text{amylase}} \text{maltose}$$

Some students investigated the effect of enzyme concentration on the rate of digestion of starch.

Step 1 Three test-tubes were labelled **A**, **B** and **C**.

Step 2 5 cm^3 of starch solution was put into each of test-tubes **A**, **B** and **C**.

Step 3 Another three test-tubes were labelled **A1**, **B1** and **C1**.

Step 4 1 cm^3 of 3% amylase solution was put into test-tube **A1**.
1 cm^3 of 2% amylase solution was put into test-tube **B1**.
1 cm^3 of 1% amylase solution was put into test-tube **C1**.

Step 5 All six test-tubes were placed into a water-bath at 60 °C for three minutes.

Step 6 A white tile was divided into three sections and labelled **A**, **B** and **C** as shown in Fig. 1.1.

Step 7 Iodine solution was dropped onto the tile to form two rows of 10 drops approximately the same distance apart, in each of the sections **A**, **B** and **C** as shown in Fig. 1.1.

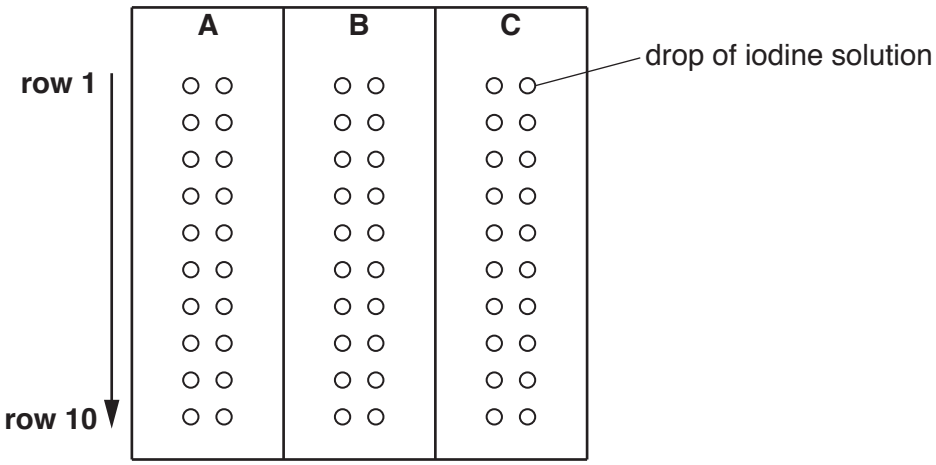

Fig. 1.1

Step 8 A glass rod was dipped into the starch solution in test-tube **A** to remove some of the solution. The glass rod was then touched onto the surface of the first drop and then the second drop of iodine solution in row **1** on the section of the tile labelled **A**. The glass rod was rinsed and dried.

Step 9 Step **8** was repeated using the amylase solution in test-tube **A1** and the drops of iodine solution in row **2** on the section of the tile labelled **A**.

Step 10 A timer was started and the amylase solution in test-tube **A1** was poured into test-tube **A**.

The mixture of starch and amylase in test-tube **A** was stirred with a glass rod and then some of the mixture was **immediately** removed using the glass rod.

The glass rod was then touched onto the surface of the first drop and then the second drop of iodine solution in row **3** on the section of the tile labelled **A**. The glass rod was rinsed and dried.

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Step 11 After **one** minute the glass rod was used to remove some of the mixture from test-tube **A** and touched onto the first drop and then the second drop of the iodine solution in row **4** on the section of the tile labelled **A**. The glass rod was rinsed and dried.

Step 12 Step 11 was repeated for **six more** minutes.

Step 13 Steps 8 to 12 were repeated for test-tubes **B** and **B1**.

Step 14 Steps 8 to 12 were repeated for test-tubes **C** and **C1**.

Fig. 1.2 shows the students' results.

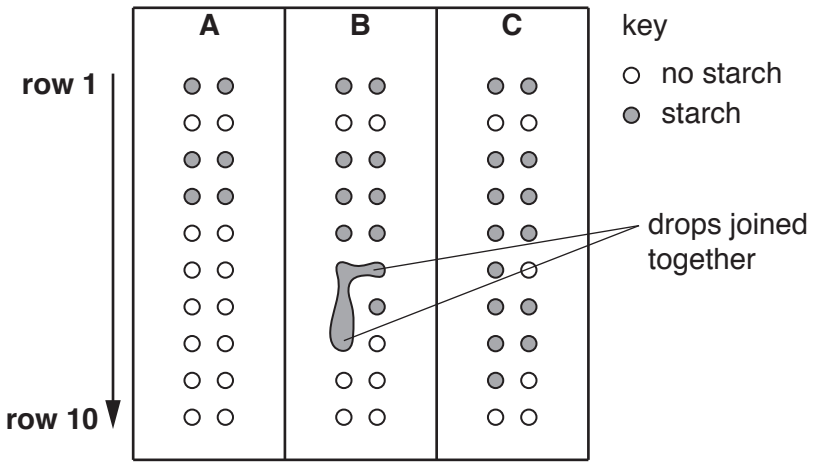

Fig. 1.2

(a) (i) Prepare a table to record the students' results.

The table should include:
- the concentration of the amylase solution
- the time taken for all the starch to be digested for each amylase concentration.

[5]

(ii) Explain why the students' results are not reliable.

.....

.....

.....[1]

(iii) The starch was digested into simple (reducing) sugars. Describe how you could test the liquid in the test-tubes to show they contain reducing sugars.

.....

.....

.....

.....[2]

(b) **(i)** State **one** variable that was kept constant in this investigation.

Describe how this variable was kept constant.

variable .....

how it was kept constant .....

.....
[2]

(ii) Explain why all the test-tubes were left in the water-bath for three minutes before the amylase was added to the starch.

.....

.....

.....[1]

(iii) Explain why step 9 was carried out before mixing the amylase and starch together.

.....

.....

.....[1]

(c) **(i)** Identify **two** sources of error in steps 10, 11 and 12.

1 .....

.....

2 .....

.....
[2]

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(ii) For **one** of the errors you identified in **(c)(i)**, describe how the method could be improved to reduce the error.

.....

.....

.....[1]

(d) In another experiment some students made starch agar that contained 100 mg per cm^3 of starch.

The starch agar was stained using iodine and was then cut into blocks that measured 2 cm × 3 cm × 0.5 cm.

(i) Calculate the total mass of starch in each of the blocks of starch agar.

Show your working.

.....mg
[3]

Six small beakers containing 20 cm^3 of 5% amylase solution were placed in water-baths at different temperatures. One of the blocks containing starch from **(d)(i)** was placed into each of the beakers.

The time taken for all the starch to disappear was measured.

The results of the experiment are shown in Table 1.1.

Table 1.1

temperature / °C	time taken for starch to disappear / s	rate of reaction / mg per s
20	1500	0.2
30	375	0.8
40	200	1.5
50	125	2.4
60	65	4.6
70	88	

(ii) Complete Table 1.1 by writing in the rate of reaction at 70 °C. [1]

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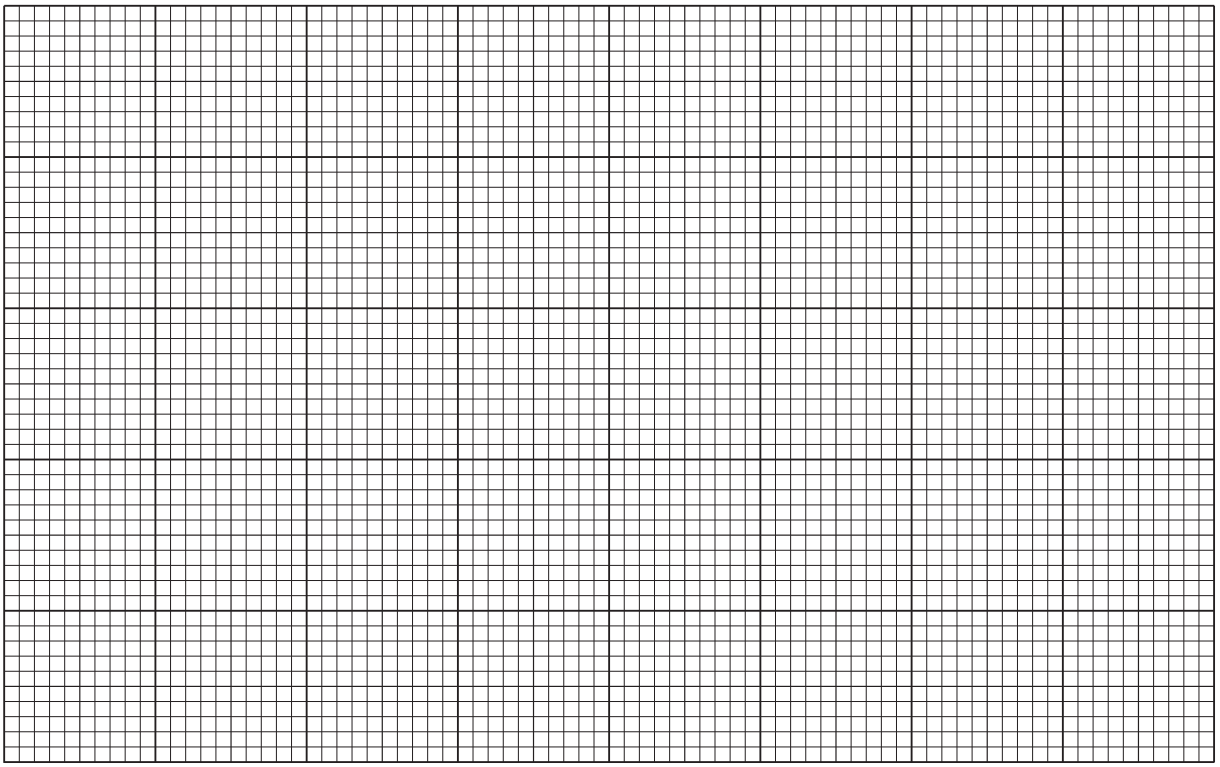
(iii) Plot a graph on the grid to show the effect of temperature on the rate of reaction.



[4]

[Total: 23]

2 Fig. 2.1 is a photomicrograph of the epidermis of a leaf. It shows epidermal cells, guard cells and stomata.

Each stoma is surrounded by two guard cells containing chloroplasts.

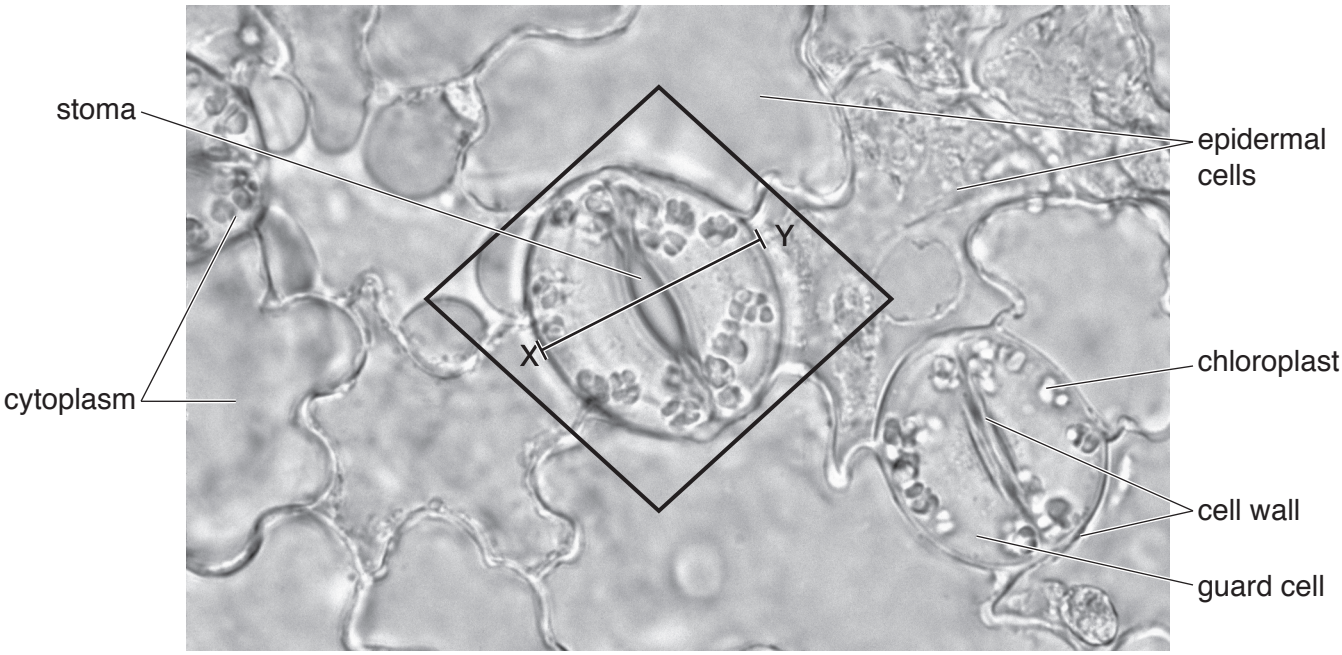


Fig. 2.1

(a) **(i)** Complete table 2.1 to show **two** visible differences between epidermal cells and guard cells.

feature	epidermal cell	guard cell

[2]

(ii) Make a large drawing of the two guard cells and the stoma shown inside the box on Fig. 2.1.

[4]

(b) Measure the total width of the guard cells and stoma along the line **XY** on Fig. 2.1. Include the units.

Total width of the guard cells and stoma on Fig. 2.1 .....

Draw a line **on your drawing** in the same position as the line XY.

Measure the width of the guard cells and stoma on your drawing. Include the units.

Total width of the guard cells and stoma on your drawing .....

Calculate the magnification of your drawing using the formula:

$$\text{magnification} = \frac{\text{width on your drawing}}{\text{width on Fig. 2.1}}$$

Show your working and give your answer to the nearest whole number.

.....

[3]

(c) Fig. 2.2 shows the rate of water gain by absorption and the rate of water loss by transpiration in a plant during a 24-hour period on a hot sunny day.

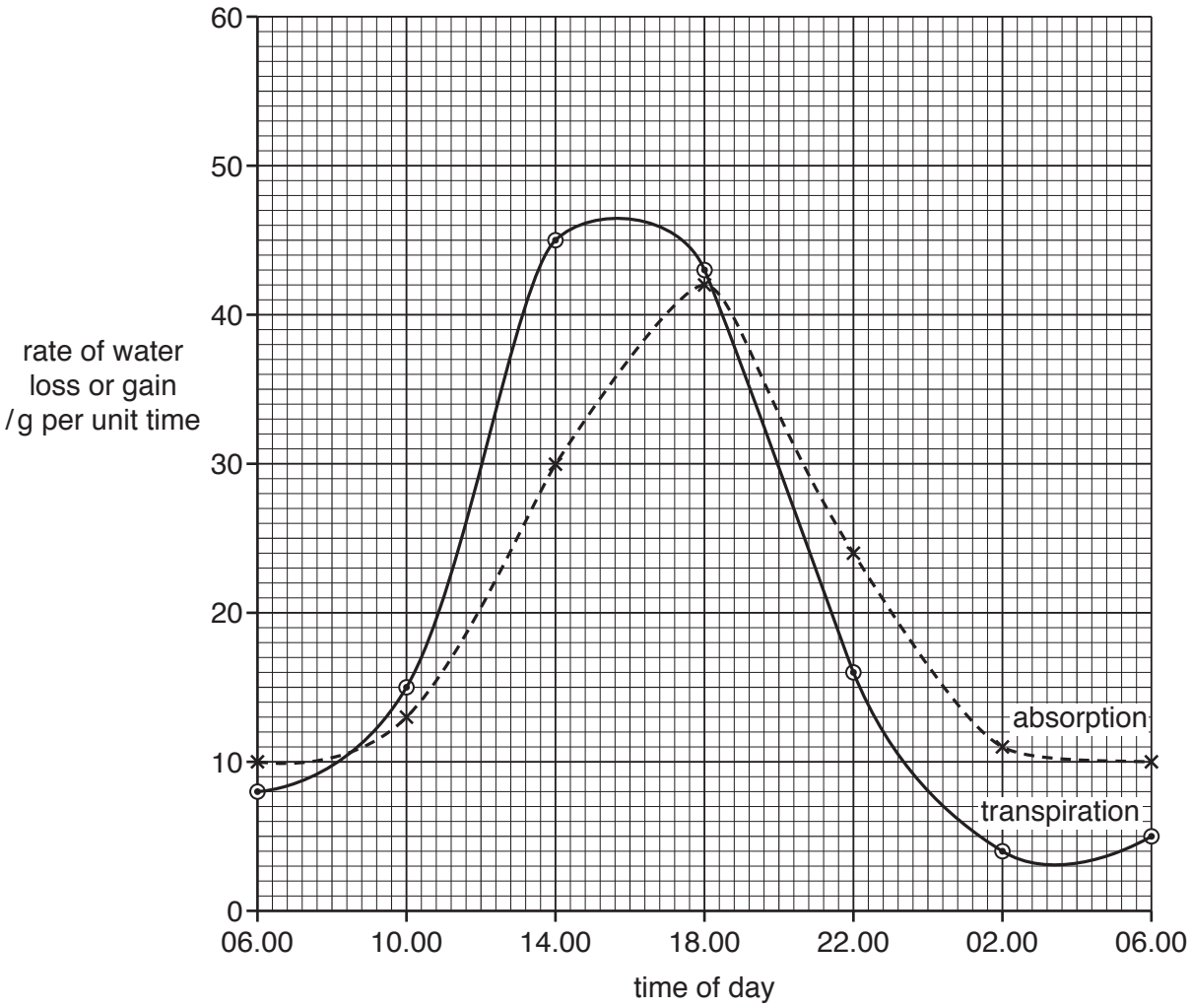


Fig. 2.2

Compare the trends shown in Fig. 2.2 for the absorption and transpiration of water during the 24-hour period.

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.....

.....

.....[2]

(d) Fig. 2.3 shows the apparatus used to measure water uptake by a leafy shoot. The leafy shoot is sealed tightly into a glass tube which is connected to a capillary tube containing water.

As the leafy shoot loses water through its leaves it absorbs water from the apparatus. Air is pulled into the open end of the capillary tube as the water moves towards the leafy shoot.

The distance moved by the air in the capillary tube can be measured on the scale and used to calculate the volume of water absorbed by the leafy shoot.

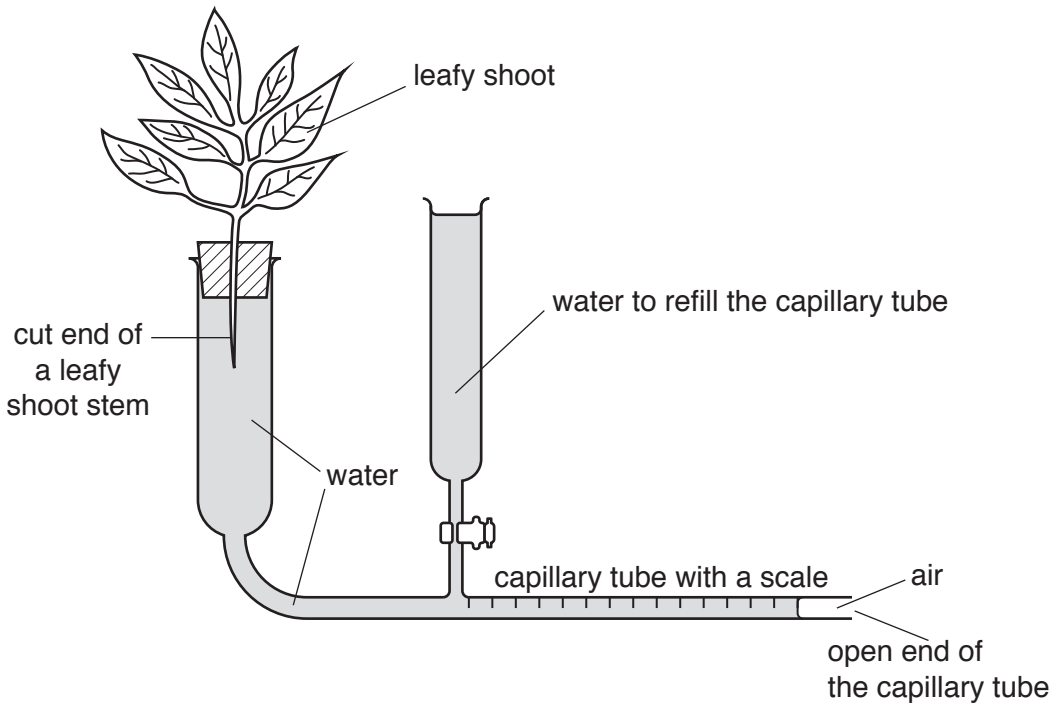

Fig. 2.3

Describe how you would use the apparatus in Fig. 2.3 to investigate the effect of temperature **OR** humidity on the rate of water absorption by a leafy shoot.

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.....[6]

[Total: 17]

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