DUNMAN SECONDARY SCHOOL

CANDIDATE NAME			
CLASS		**INDEX NUMBER**	

PRELIMINARY EXAMINATION 2026
SECONDARY 4 EXPRESS

BIOLOGY **6093/03**

Paper 3 Practical Test **20 August 2026**
1 hour 50 minutes

Candidates answer on the Question Paper
Additional Materials: As listed in the Confidential Instructions.

READ THESE INSTRUCTIONS FIRST

Please check that your name, class and index number are correctly written.
Give details of the practical shift and laboratory, where appropriate, in the boxes provided.

Shift
Laboratory

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, correction fluid or highlighters.

Answer **all** questions in the spaces provided on the Question Paper.

The use of an approved scientific calculator is expected, where appropriate.
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	

1 Amylase is an enzyme that catalyses the break-down of starch into reducing sugars.

Amylase is produced by seeds during germination.

You are provided with extract U, which is made from germinating seeds.

You are going to estimate the concentration of amylase in seed extract U by comparing it to known concentrations of amylase.

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)(ii).

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

Step 1 Label four small containers **A**, **B**, **C**, and **D**.

Step 2 Use the syringes to add the volumes of **2% amylase** and **distilled water** shown in Table 1.1 to each labelled beaker.

Table 1.1

container	volume of 2% amylase solution / cm^3	volume of distilled water / cm^3	final percentage concentration of amylase solution / %
A	10.0	0.0	2.0
B	7.5	2.5	1.5
C	5.0	5.0	1.0
D	2.5	7.5	

(a) (i) Complete Table 1.1 by calculating the final percentage concentration of amylase solution for container **D**.

..... % [1]

Step 3 Label five test-tubes **A**, **B**, **C**, **D** and **U**.

Step 4 Use a syringe to add 3 cm^3 of **starch** suspension to each of the labelled test-tubes.

Step 5 Prepare a white tile by using a pipette to put drops of iodine solution in five columns labelled **A**, **B**, **C**, **D** and **U**, as shown in Fig. 1.1. There should be **8** drops of iodine solution in each column.

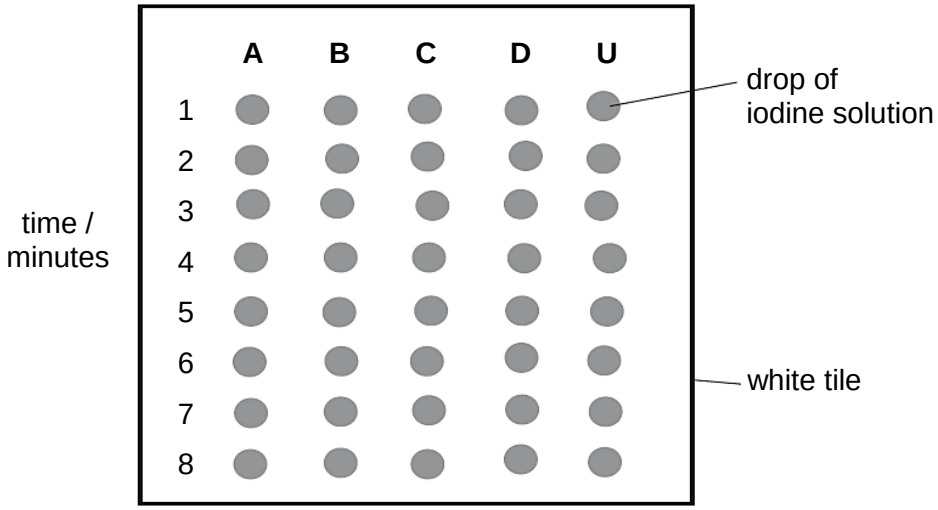

Fig. 1.1

Step 6 Use a clean syringe to add 1 cm^3 of amylase solution from container **A** to test-tube **A** and shake gently to mix.

Step 7 Repeat step 6 using containers **B**, **C**, **D** and **U** and test-tubes **B**, **C**, **D** and **U**.

Step 8 Start the stopwatch.

Step 9 After one minute use a clean pipette to remove one drop of solution from test-tube **A** and add it to the first drop of iodine solution, **A1**, on the white tile. Observe any colour change.

Step 10 Repeat step 9 using:

- the contents of test-tube **B** and iodine solution drop **B1**
- the contents of test-tube **C** and iodine solution drop **C1**
- the contents of test-tube **D** and iodine solution drop **D1**
- the contents of test-tube **U** and iodine solution drop **U1**.

Step 11 Repeat steps 9 and 10 after two minutes using iodine solution drop **A2**, **B2**, **C2**, **D2** and **U2**.

Step 12 Continue to test the contents of the test-tubes at one minute intervals until a drop of the mixtures in the test-tubes has been added to all eight rows of iodine solution drops on the white tile.

Step 13 Observe the colour of each drop of iodine solution on the white tile and determine the time at which the starch in each test-tube was broken down.

In your table in **1(a)(ii)**, record the time taken for the starch to be completely broken down.

If starch was still present in row **8** record the time taken as **>8**.

(ii) Prepare a table to record your results.

[4]

(iii) Explain how you decided when all of the starch had been broken down in step 13.

……...

…….[1]

(iv) Estimate the concentration of amylase in seed extract **U** using your results and record it in your table in **1(a)(ii)**. [1]

(v) Describe how you would test for the presence of reducing sugars.

State the result for a positive test.

method …..……..……

……...

……...

positive test result ……..[3]

(b) Seeds contain starch as a store of energy. Amylase in the seeds catalyses the break-down of the stored starch into reducing sugars. Seeds use the reducing sugars to provide some of the energy required for germination.

Plan an investigation to find out how temperature affects the activity of amylase in germinating seeds.

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……..[6]

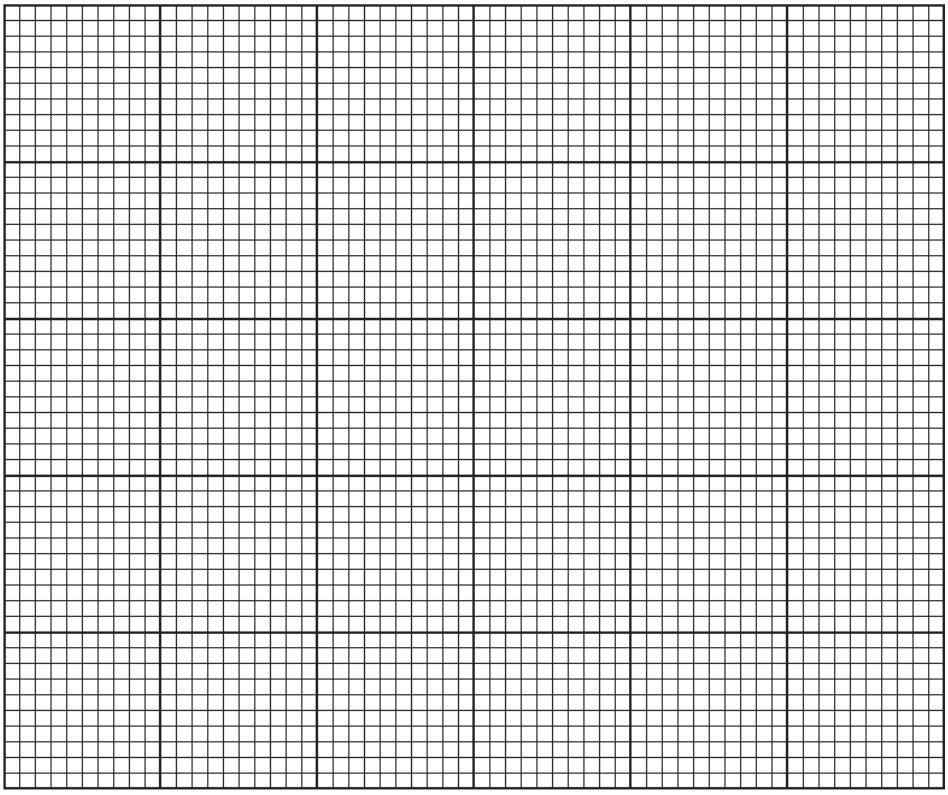
(c) A scientist investigated how the activity of amylase in a seed changed as it germinated. She measured the activity of amylase in a germinating seed over a period of 18 days.

The results are shown in Table 1.2.

Table 1.2

time / days	activity of amylase / arbitrary units
0	0
4	0
8	40
12	240
16	240
20	120
24	65

(i) Plot a line graph of the data in Table 1.2.



[4]

(ii) Describe the pattern shown by the data in your graph.

……...

……...

……...

……[2]

(d) **(i)** The data in Table 1.2 did not enable the scientist to determine precisely when the amylase was most active.

Explain why.

……...

……[1]

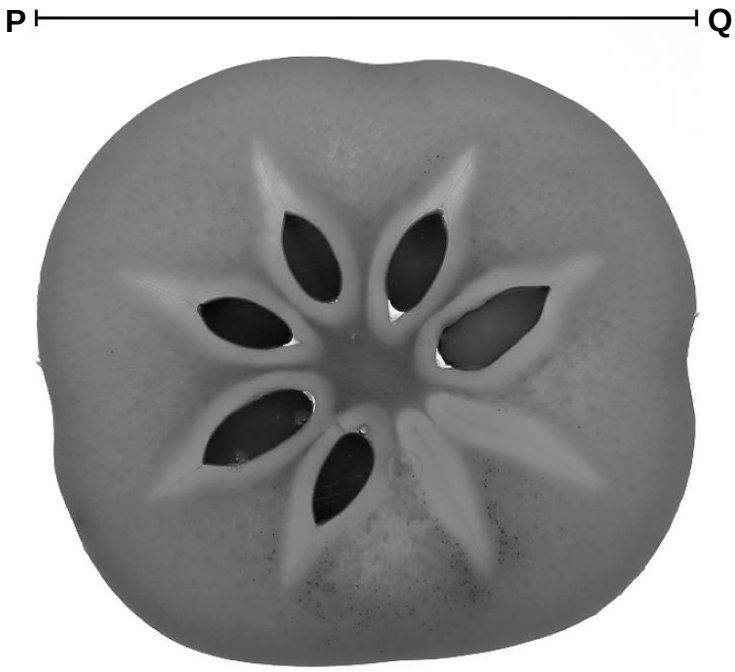
(ii) Suggest what further data is needed to be able to determine exactly when amylase was most active.

……...

……[1]

[Total: 24]

2 **(a)** Fig. 2.1 is a photograph of a cross-section of a persimmon fruit.



magnification ×2.2

Fig. 2.1

(i) Draw a large diagram of the persimmon fruit shown in Fig. 2.1.

[4]

(ii) Line **PQ** on Fig. 2.1 represents the diameter of the persimmon fruit.

Measure the length of line **PQ** on Fig. 2.1.

length of **PQ** ..... mm [1]

(iii) Calculate the actual diameter of the persimmon fruit using the formula and your measurement.

$$\text{magnification} = \frac{\text{length of line } \mathbf{PQ} \text{ in Fig. 2.1}}{\text{actual diameter of the persimmon fruit}}$$

Show your working clearly.

Give your answer to **three** significant figures.

..... mm [2]

(b) Fig. 2.2 is a vertical section through a leaf.

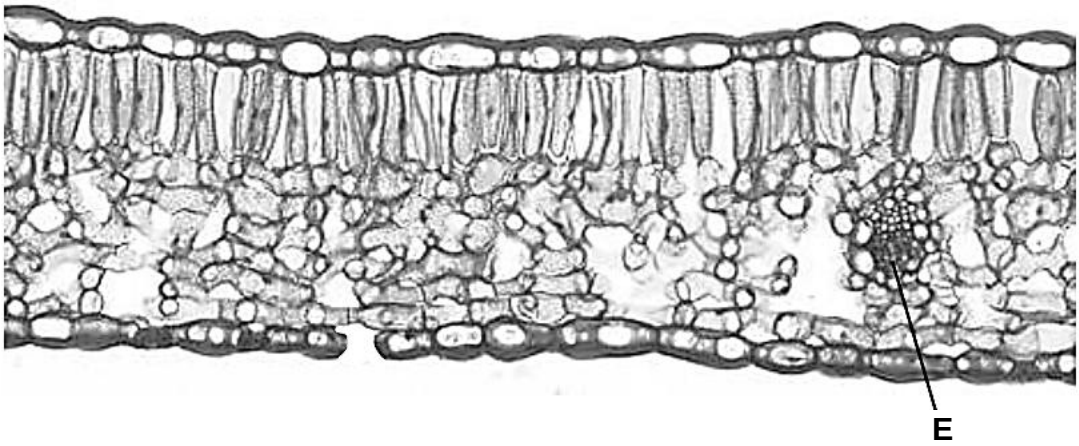


Fig. 2.2

(i) Complete Table 2.1 by naming the part of the leaf that carries out each function.

Table 2.1

structure	part of leaf	function
A		controls diffusion of gases between the atmosphere and air spaces inside the leaf
B		layer that carries out the highest rate of photosynthesis
C		reduces water loss from leaf surface
D	xylem	transports water and ions to leaf cells
E		transports sucrose by translocation

[2]

(ii) On Fig. 2.2, draw a label line with the correct letter to each of the structures you have named in Table 2.1.

Structure **E** has been labelled for you. [2]

(iii) The leaves of lotus plants float on the surface of the water as shown in Fig. 2.3.

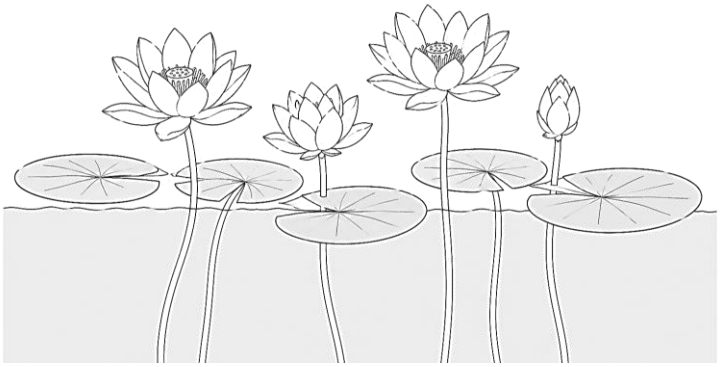


Fig. 2.3

Suggest and explain how the structure of the lotus leaf differs from the leaf shown in Fig 2.2.

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……...

……..[2]

(iv) Guard cells control the opening and closing of stomata.

Explain how the guard cells cause the stomata to open.

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……...

……..[3]

[Total: 16]