Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

2804765217

BIOLOGY **5090/61**

Paper 6 Alternative to Practical **October/November 2021**

1 hour

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 40.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Any blank pages are indicated.

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Answer **all** questions in the spaces provided.

1 The tissue of a peeled potato tuber is composed of many similar cells. A student investigated the effect of varying concentrations of sucrose solution on some potato tissue.

She was provided with:

- a potato tuber with the outer peel removed
- distilled water labelled **A**
- three sucrose solutions of different concentrations labelled **B**, **C** and **D**.

She cut four strips of tissue from the potato, each measuring 5 mm × 5 mm in cross-section and 80 mm long. This was their length at the start of the investigation.

(a) **(i)** Describe in detail how you would cut strips of potato to this size.

.....

.....

.....

.....

.....

..... [3]

The student then labelled four test-tubes **A**, **B**, **C** and **D**. She placed one potato strip in each and then added distilled water to test-tube **A**, and the sucrose solutions **B**, **C** and **D** to test-tubes **B**, **C** and **D**. She made sure that each potato strip was fully covered by solution.

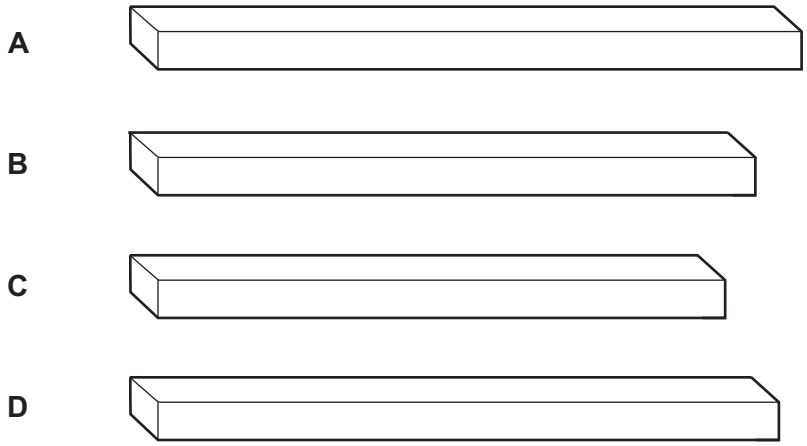
After 30 minutes, she poured away the solutions and prepared to remove the potato strips from the test-tubes to measure them.

(ii) Describe what she could do to ensure that, after they had been removed from the test-tubes, she knew which potato strip had been in which solution.

.....

..... [1]

The diagram shows the four potato strips after 30 minutes in the solutions.



(iii) Measure the lengths of strips **A**, **B**, **C** and **D**. Record the lengths of each strip at the **start** and **end** of the investigation and calculate the changes in length. Enter your results in the table.

solution	start length / mm	end length / mm	change in length / mm	flexibility of strip
A				
B				
C				
D				

[3]

She also assessed the flexibility of each strip by gently bending them. The more easily the strip bent, the more flexible it was. She recorded her results in her notebook:

strip C most flexible

strip A least flexible

strip D more flexible than A but less flexible than C

strip B more flexible than D but less flexible than C

(iv) Arrange the strips in order of decreasing flexibility and use the scale below to record this in the table. Record the most flexible strip as ++++ and the least flexible as +.

most flexible/bendable	++++
	+++
	++
least flexible/bendable	+

[2]

(v) Describe and explain the changes in length and flexibility in the potato strip that had been **in solution A**.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(vi) Identify **two** problems with the method used in this investigation that might have led to unreliable conclusions. Suggest a way in which each could have been improved to make the results more reliable.

problem 1 .....

improvement 1 .....

.....

problem 2 .....

improvement 2 .....

.....

[4]

(b) Another student investigated the effect of varying concentrations of sucrose solution on some potato tissue by measuring changes in the **mass** of the tissue.

He placed five pieces of potato tissue, each with a mass of 5 g, in five separate test-tubes.

The test-tubes contained either distilled water or one of four different concentrations of sucrose solution.

Later he poured away the solutions.

(i) State **two** factors, apart from the mass of tissue, that should have been kept constant when using this method.

1 .....

2 .....
[2]

When he removed the pieces of tissue from the test-tubes, he carefully dried them on a paper towel.

(ii) Explain why it was important to dry them.

.....

.....

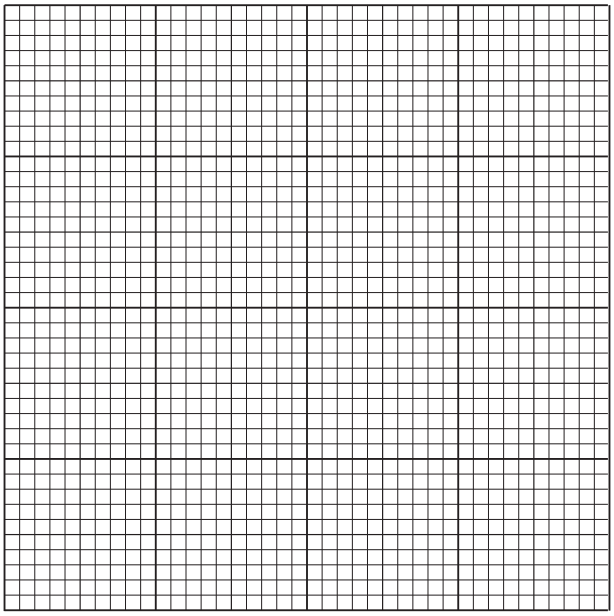
.....

..... [2]

The table shows the measurements at the end of the investigation.

sucrose concentration / mol per dm^3	mass at end of investigation / g
0.0	5.7
0.2	5.2
0.4	4.6
0.5	4.3
0.8	3.3

(iii) Construct a line graph of the data in the table on the grid below. Join your points with ruled, straight lines.



[4]

(iv) Use your graph to determine the concentration of sucrose which will produce no change in mass.

concentration ..... [2]

(v) Describe the method you used to determine this concentration of sucrose.

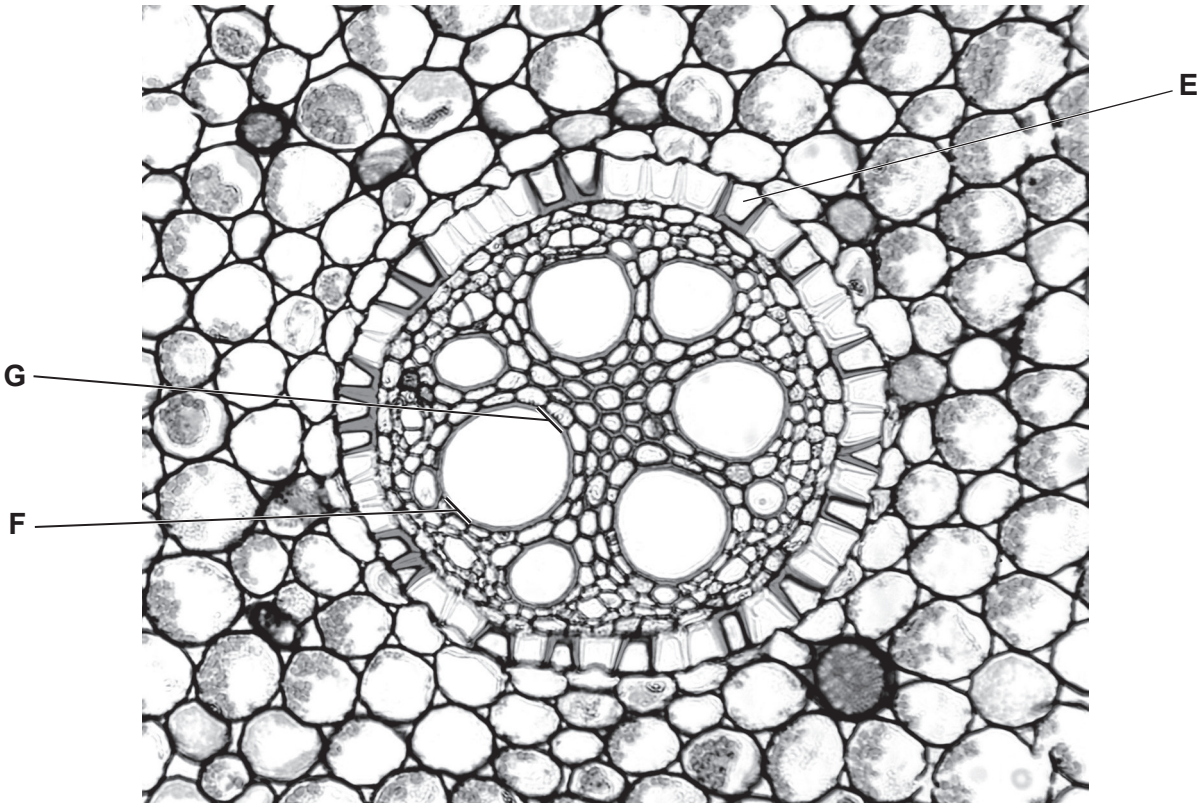
.....

.....

..... [1]

[Total: 28]

2 The photomicrograph shows the central part of a plant root as seen under a light microscope.



magnification ×200

(a) **(i)** The xylem and phloem are surrounded by a layer of tissue that is one cell thick. The cell labelled **E** is in this layer.

Make a large drawing of cell **E** and the cells that touch it on the outside and inside of the layer.

[4]

(ii) Measure the diameter of the xylem vessel between **F** and **G**.

..... mm [1]

(iii) Calculate the actual diameter of the xylem vessel.

Space for working.

diameter ..... mm [2]

(b) Some of the outer cells in the photomicrograph contain small particles.

Describe in detail how you would prepare a section of the root for observation under the microscope to see whether these cells contain starch.

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..... [5]

[Total: 12]

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