Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME	

CENTRE NUMBER						CANDIDATE NUMBER				

6985481143

BIOLOGY **5090/62**

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 Cells have membranes which can allow molecules to enter and leave the cell.

A student wanted to investigate the movement of glucose and protein molecules through a membrane. He decided to use Visking tubing that acts in a similar way to an actual cell membrane.

He was given two solutions, **A** and **B**.

He wanted to test both solutions **A** and **B** for the presence of glucose and protein.

(a) State which reagents you would use to test for glucose and protein.

glucose .....

protein .....

[2]

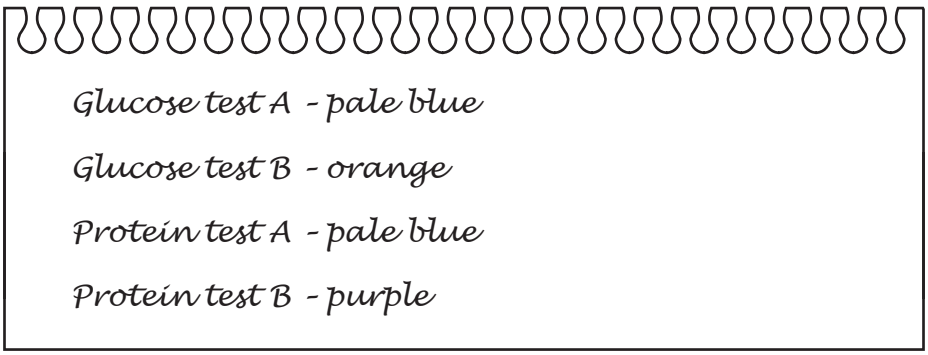
He labelled four glass test-tubes to do these tests.

(b) **(i)** State what you would use to label glass test-tubes.

..... [1]

(ii) Suggest what you would write on each test-tube and record this in the table on page 3. [1]

He completed the tests and recorded the resulting colours of the solutions in his notebook.



(iii) Complete the table using his observations and your conclusions.

solution	test	test-tube label	observation	conclusion
A	glucose			
	protein			
B	glucose			
	protein			

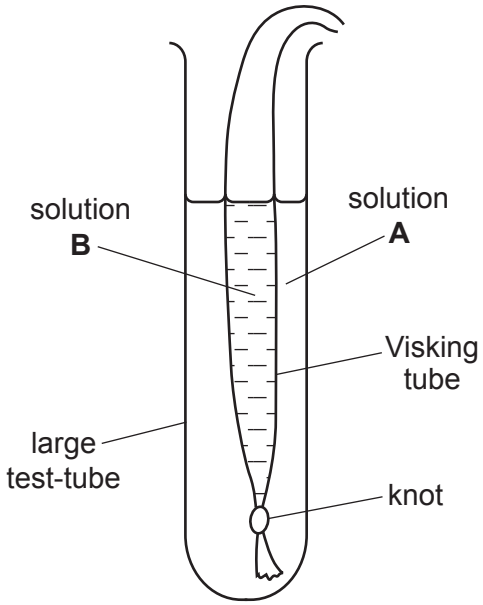
[4]

The Visking tubing that he used was a hollow, flexible tube. He tied a knot in one end of the tube to make it into a test-tube shape.

He carefully added 15 cm^3 of solution **B** to the inside of this tube through the open end.

After checking that no solution was leaking from the knotted end of the tube, he rinsed the outside surface with distilled water.

He placed this tube containing solution **B** into a large glass test-tube that contained solution **A** as shown in the diagram.



(c) **(i)** State what piece of apparatus you would use to add 15 cm^3 of solution **B** to the Visking tube.

..... [1]

(ii) Suggest why it was important to rinse the outside of the Visking tube before placing it in the large test-tube containing solution **A**.

.....

..... [1]

After 30 minutes the student removed the Visking tube from the large test-tube.

(d) He then tested the solution remaining in the large test-tube for glucose and protein.

(i) State **two** variables he should have controlled so that these repeat tests on solution **A** produced results that were comparable with those in the table.

1. .....

2. .....
[2]

From these tests he concluded that the solution in the glass test-tube now contained glucose but not protein.

(ii) Describe and explain what this conclusion and the information in the table show about the permeability of the Visking tube.

.....

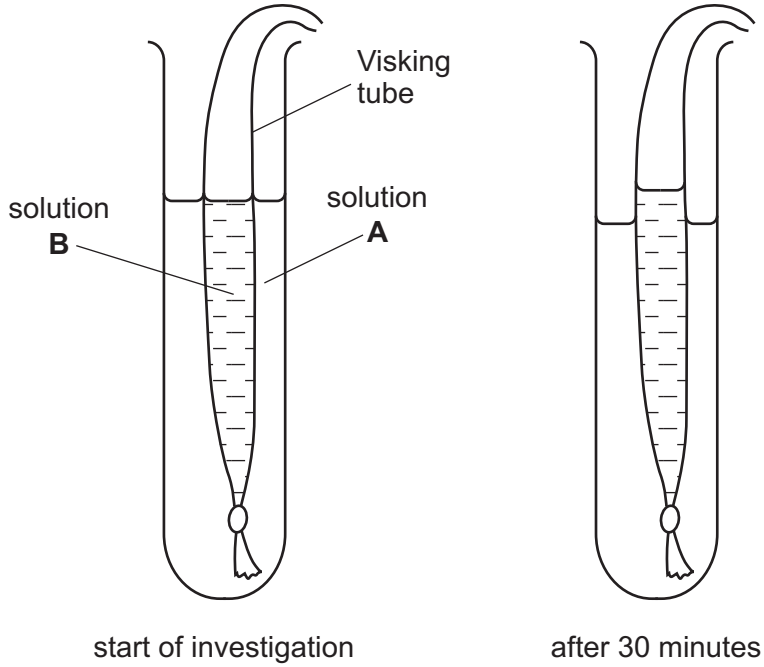
.....

.....

.....

..... [3]

Before the student removed the Visking tube from the large test-tube, he observed that the levels of the solutions **A** and **B** had changed as shown in the diagram.



(e) **(i)** Describe the changes to the levels of solutions **A** and **B** after 30 minutes.

.....

.....

.....

..... [2]

(ii) Suggest which process caused these changes.

..... [1]

[Total: 18]

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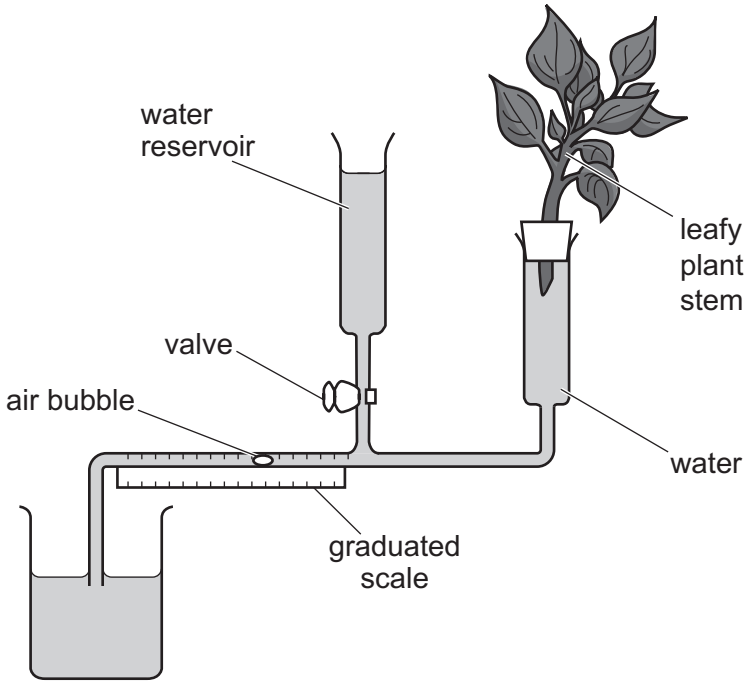
2 Transpiration results in water moving through plant stems. This can be measured using the apparatus shown in the diagram.



The cut end of a leafy plant stem is inserted in the apparatus. As transpiration occurs, water moves up the stem and is absorbed. This causes the air bubble in the apparatus to move along the tube towards the stem. The distance moved by this bubble in a known time is a measure of the rate of transpiration.

A student wanted to investigate the effect of air movement on the rate of transpiration.

She set up the apparatus in a room where there was no movement of air and left it for five minutes before recording any movement of the bubble.

(a) **(i)** Explain why the student left the plant for five minutes before starting recording.

.....

..... [1]

She used the valve to allow water from the reservoir to move the air bubble back to the start of the graduated scale.

She then recorded the position of the bubble every minute for five minutes.

She then set up an electric fan to blow air gently over the plant leaves.

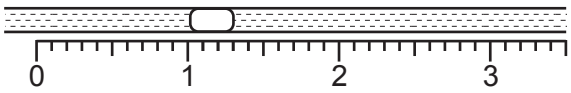
After five minutes she adjusted the air bubble so that it was at the start of the graduated scale and recorded its position every minute for five minutes.

Most of her results are shown in the table.

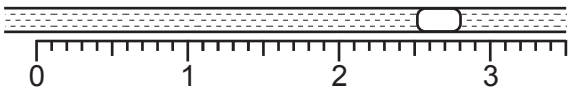
time / minutes	position of air bubble / cm	
	no air movement	moving air
0	0.0	0.0
1	1.0	1.3
2	2.1	
3	3.1	4.4
4	4.0	5.9
5	5.0	7.6

The diagrams show the position of the air bubble at one and two minutes when the plant was in moving air.

position of bubble
at 1 minute

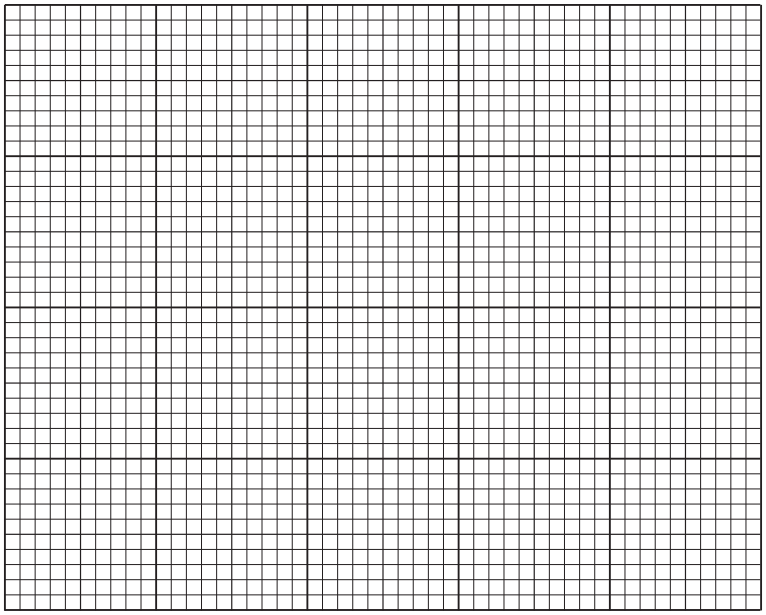


position of bubble
at 2 minutes



(ii) Observe the position of the bubble at 2 minutes and record it in the table. [1]

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



[5]

(iv) Use the data to describe and compare the effect of still air and moving air on the rate of transpiration.

.....

.....

.....

.....

.....

..... [3]

(b) **(i)** Calculate how far the bubble moved between four and five minutes when the plant was in moving air.

..... cm [1]

The area of the cross-section of the hollow glass tube containing the air bubble was $0.785\,mm^2$.

(ii) Use the data to calculate the volume of water that was transpired by the plant between four and five minutes in moving air. Give your answer to 2 decimal places.

Space for working.

..... mm^3 [2]

(c) Another student repeated this investigation a week later, but her results were different.

Suggest **two** reasons why her results were different.

1. .....

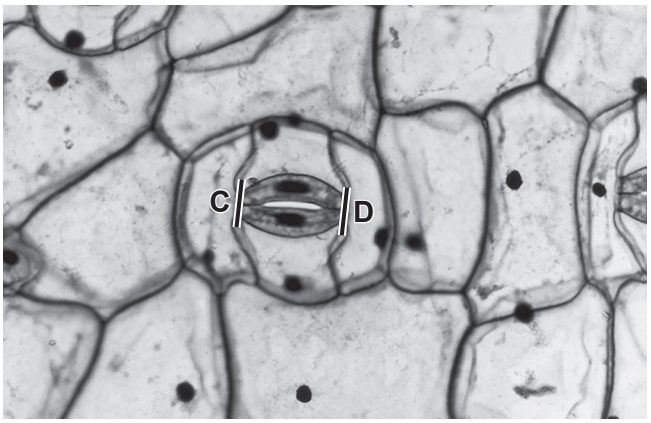
.....

2. .....

.....
[2]

[Total: 15]

3 The photomicrograph shows a surface view of a leaf epidermis.



(a) Make a large drawing of the two guard cells between points **C** and **D** and the epidermal cells touching the guard cells.

[4]

(b) Measure the length of a guard cell in the photomicrograph between points **C** and **D**.

..... mm

The actual length of the guard cell is 0.07 mm. Calculate the magnification of the photomicrograph to the nearest whole number.

Space for working.

magnification × .....
[3]

[Total: 7]

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