Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

2863270442

BIOLOGY **5090/31**

Paper 3 Practical Test **May/June 2023**

1 hour 30 minutes

You must answer on the question paper.

You will need: The materials and apparatus listed in the confidential instructions

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 [ ].

For Examiner's Use	
1	
2	
Total	

This document has **8** pages. Any blank pages are indicated.

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[Turn over

In order to plan the best use of your time, read through all the questions on this paper carefully before starting work.

1 You are going to investigate the movement of water by osmosis using potato tissue. You are provided with:

- four cylinders of potato tissue with equal diameters
- four different concentrations of sodium chloride (salt) solution at room temperature
- four test-tubes
- sharp knife
- white tile
- marker pen/pencil
- paper towels
- stop-watch/timer
- ruler.

Use the following method:

- label the test-tubes 0.0%, 2.0%, 4.0% and 6.0%
- on the white tile, cut each of the four cylinders of potato to exactly 40 mm in length
- place one potato cylinder in each test-tube
- pour the concentration of salt solution matching the label into each test-tube so that the potato cylinders are covered as shown in Fig. 1.1

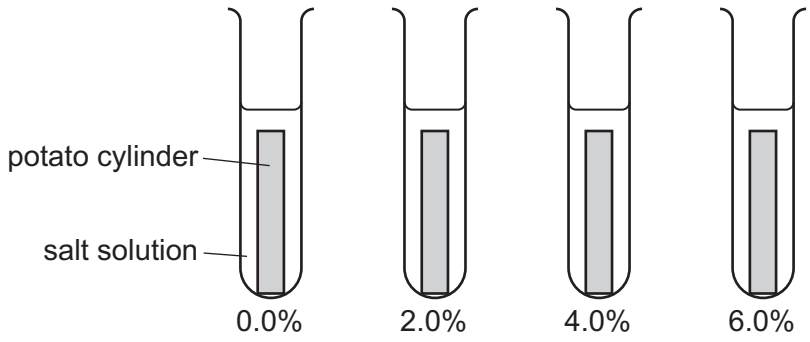


Fig. 1.1

- start the timer and leave the potato cylinders in the solutions for 40 minutes

After 40 minutes you are going to remove the potato cylinders from the test-tubes, measure their final lengths and calculate any change in length.

While waiting you may continue with Question 1(b) and Question 2.

- after 40 minutes pour off the salt solution from each test-tube into the container labelled **waste** but leave each potato cylinder in its test-tube.

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(a) (i) Complete the column headings in Table 1.1. [3]

Table 1.1

percentage concentration of salt solution	starting length /	..... /	..... / .....
0.0	40		
2.0	40		
4.0	40		
6.0	40		

(ii) For each potato cylinder:

- remove the potato cylinder from its test-tube
- measure its length
- record this final length in Table 1.1. [4]

(iii) Calculate the change in length of each potato cylinder and record it in Table 1.1. [2]

(iv) Water can move into and out of potato cells by osmosis. Salt cannot move into and out of potato cells.

Use this information to explain the results in the test-tube containing 6.0% salt solution.

.....

.....

.....

..... [2]

(v) Explain why it is important that all the potato cylinders were cut to the same length at the start of the investigation.

.....

..... [1]

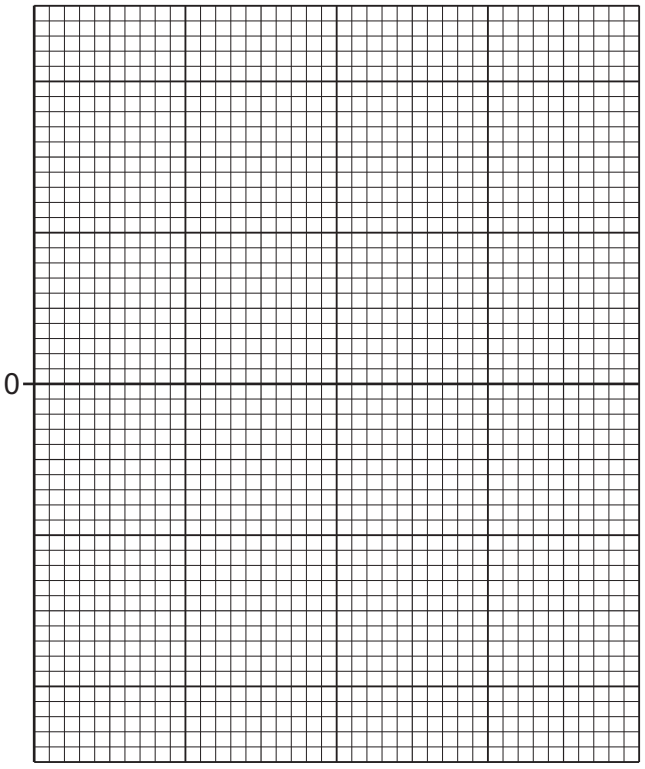
(b) A student used a similar method to investigate the movement of water by osmosis in potato cylinders. Instead of length, changes in **mass** were measured for each potato cylinder. The cylinders each had the same mass when first placed in the salt solutions.

Fig. 1.2 shows the results in the student's notebook:

percentage concentration of salt solution	change in mass / g
0.0	+ 0.9
2.0	+ 0.1
4.0	– 0.5
6.0	– 0.7
8.0	– 0.8

Fig. 1.2

(i) Use the data in Fig. 1.2 to construct a graph of percentage concentration of salt solution used against change in mass. Join your points with ruled lines. [5]



percentage concentration of salt solution

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(ii) Each potato cylinder had a starting mass of 3.0 g.

Use your graph to determine the **final mass** of a potato cylinder placed in 3.0% salt solution. Show your working on your graph.

final mass ..... g [2]

(c) (i) The concentrations of salt solution were made by using different volumes of a 10.0% salt solution and distilled water.

Calculate the volumes of 10.0% salt solution and distilled water needed to make 10 cm^3 of a 4.0% salt solution.

volume of distilled water .....

volume of 10.0% salt solution .....
[2]

(ii) The student dried the potato cylinders before obtaining their final mass. Explain why this was important.

.....

.....

..... [2]

(d) (i) Design an investigation to determine the concentration of salt solution in which movement of water into and out of potato tissue is equal.

Your investigation should be based on the method described on page 2 but using changes in **mass** of the potato tissue and not changes in length.

Give full experimental details.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

(ii) Identify the dependent variable in the investigation you have designed.

..... [1]

[Total: 30]

2 Fig. 2.1 is a photograph of a leaf from a potato plant.

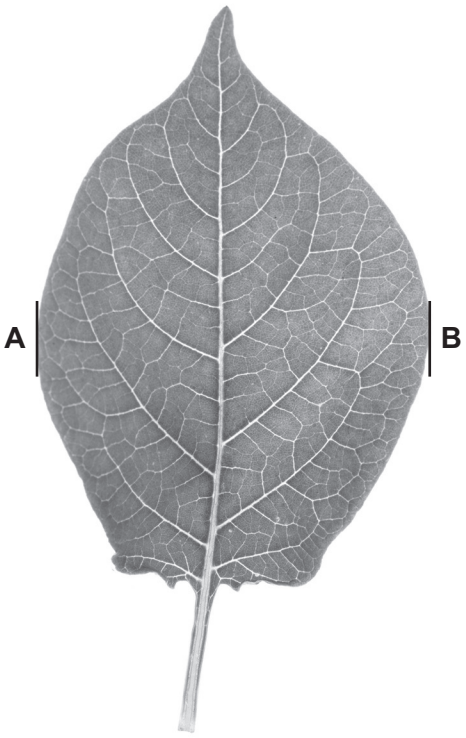


Fig. 2.1

(a) In the space below make a large drawing of the leaf as it appears in Fig. 2.1.

[3]

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(b) (i) Draw a straight line on the photograph to join **A** and **B**.

Measure and record the length of this line.

length of line **A**–**B** ..... mm [1]

(ii) On your drawing, draw a line at the same location as the line **A**–**B**.

Measure and record the length of this line.

length of line on drawing ..... [2]

(iii) Use your measurements in **(b)(i)** and **(ii)** to calculate the magnification of your drawing compared to the photograph. Give your answer to 1 decimal place.

Space for working.

magnification × ..... [2]

(c) Fig. 2.2 is a photograph of a leaf from a sweet potato plant.

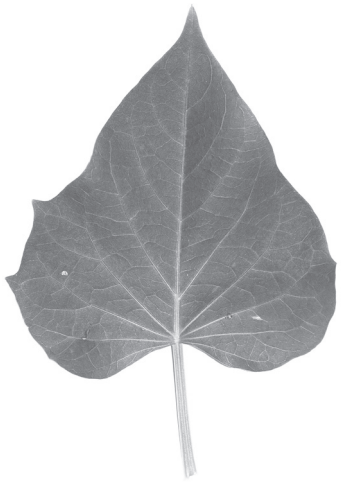


Fig. 2.2

Describe **one visible** difference and **one visible** similarity in the structure of the potato leaf in Fig. 2.1 and the sweet potato leaf in Fig. 2.2.

difference .....

similarity .....
[2]

[Total: 10]

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