Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

5850255691

BIOLOGY **5090/42**

Paper 4 Alternative to Practical **May/June 2023**

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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1 Some students investigated the movement of water by osmosis, using potato tissue.

They were provided with:

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

They used the following method:

- label the test-tubes 0%, 2%, 4%, 6% and 8%
- cut each of the potato cylinders so that each has a mass of 3.0 g
- place one cylinder of potato in each test-tube
- add the matching concentration of salt solution to each test-tube so that the potato cylinder in it is covered as shown in Fig. 1.1
- note the time and leave the potato cylinders in the solutions for 40 minutes
- after 40 minutes remove the potato cylinders from the test-tubes
- dry each potato cylinder using a paper towel
- measure and record the mass of each potato cylinder.

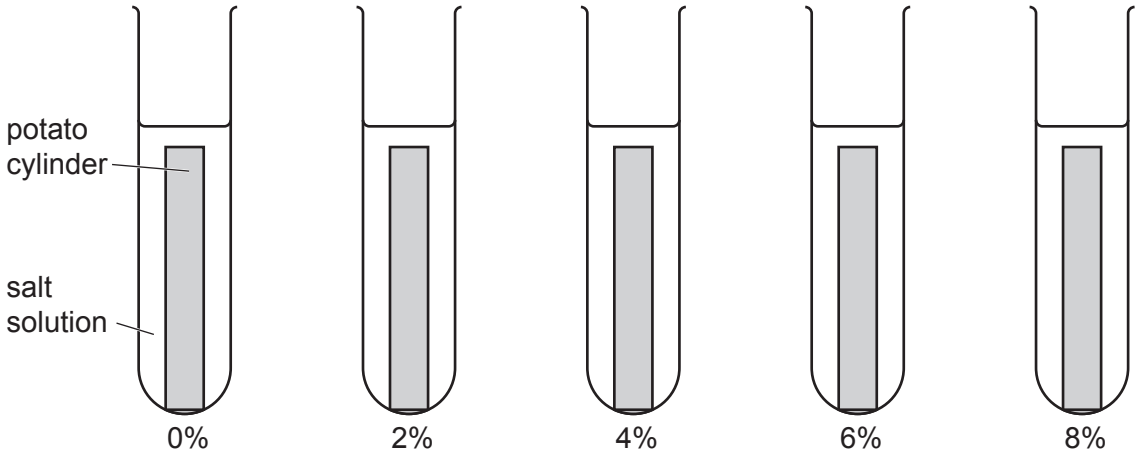
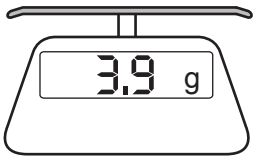


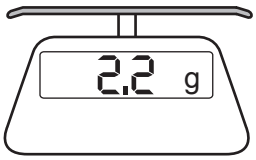
Fig. 1.1

(a) (i) Complete the column headings in Table 1.1. [1]

(ii) Fig. 1.2 shows the balance readings for the potato cylinders taken from the 0% and 8% salt solutions after 40 minutes.



cylinder in 0% solution



cylinder in 8% solution

Fig. 1.2

Record these masses as 'final mass' in Table 1.1. [2]

(iii) Complete Table 1.1 by calculating the change in mass for each of these cylinders of potato. [2]

Table 1.1

percentage concentration of salt solution	**starting mass** /	**final mass** /	**change in mass** / .....
0	3.0		
2	3.0	3.1	+0.1
4	3.0	2.5	–0.5
6	3.0	2.3	–0.7
8	3.0		

(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% salt solution.

.....

.....

..... [2]

(v) Explain why it is important that all the potato cylinders have the same mass at the start of the investigation.

.....

..... [1]

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(b) (i) The concentrations of salt solution were made by using different volumes of a 10% salt solution and distilled water.

Calculate the volumes of 10% salt solution and distilled water needed to make 10 cm^3 of a 4% salt solution.

volume of distilled water .....

volume of 10% salt solution .....

[2]

(ii) Explain why using a 10 cm^3 measuring cylinder is better than using a 50 cm^3 beaker for measuring the volumes of distilled water and salt solution.

..... [1]

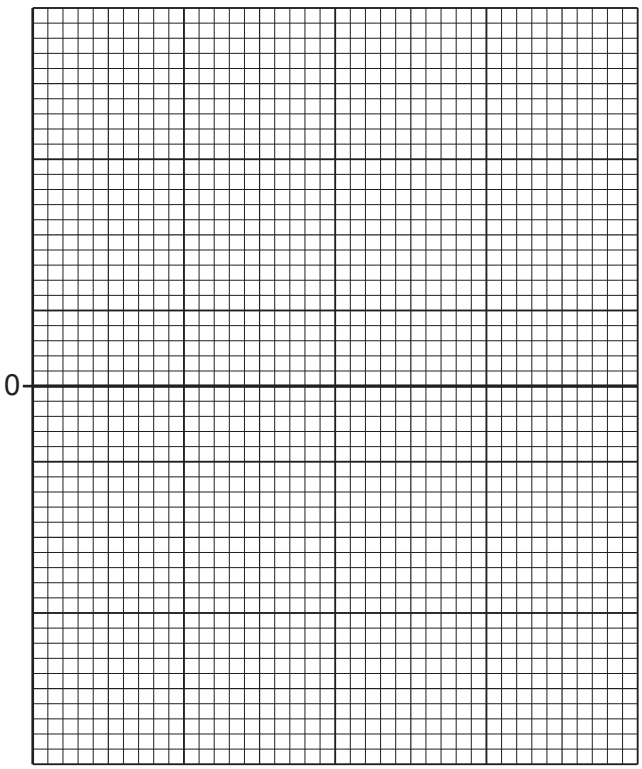
(iii) Explain why it is important that the students dried the potato cylinders before obtaining their final mass.

.....

.....

..... [2]

(c) (i) Construct a graph of percentage concentration of salt solution against **change** in mass. Join your points with ruled lines.



percentage concentration of salt solution

[5]

(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 a 3% salt solution. Show your working on your graph.

final mass ..... g [2]

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

Your investigation should be based on the method described on page 3 but using changes in **length** of the potato tissue and not changes in mass.

Give full experimental details.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [6]

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

..... [1]

(e) (i) Potatoes store starch. Describe a test to confirm the presence of starch. Include the observation for a positive result.

.....

.....

..... [2]

(ii) The starch can be broken down into glucose for the plant to use in respiration. Name the reagent used to test for the presence of glucose.

..... [1]

[Total: 30]

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

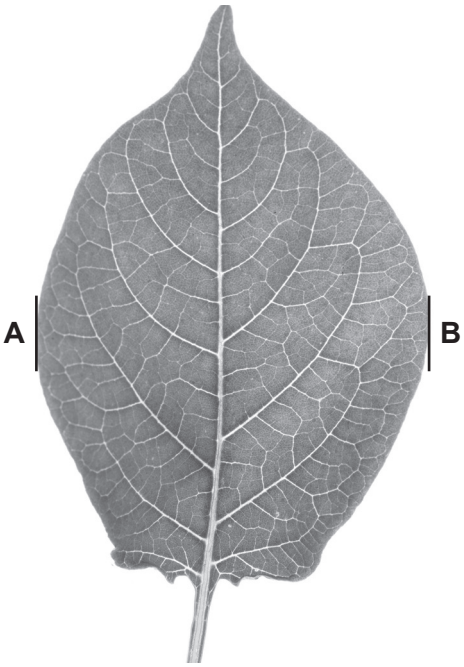


Fig. 2.1

(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 lines **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.

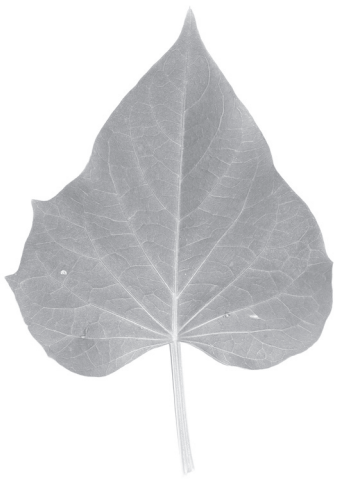


Fig. 2.2

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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