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Cambridge Assessment International Education

Cambridge O Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

2511995349

BIOLOGY **5090/42**

Paper 4 Alternative to Practical **October/November 2024**

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.

[Turn over

1 Carbohydrates are found in different plant organs in the form of starch and sugars (such as glucose and maltose).

A student decided to test two different plant organs (a potato and an apple) for the presence of starch and sugar.

(a) (i) Suggest a suitable reagent for the test for **starch** and describe how it should be used. Details of possible results are **not** required.

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.....

.....

..... [2]

The student carried out the test for starch on pieces of the potato and the apple. Fig. 1.1 shows the appearance of the plant pieces before the test and after the test.

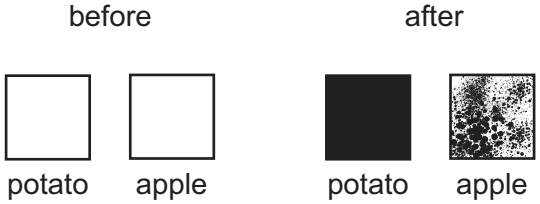

Fig. 1.1

(ii) Record in Table 1.1 what you observe in Fig. 1.1 after the test and what you can conclude.

Table 1.1

plant organ	observation	conclusion
apple		
potato		

[4]

(b) The student then carried out a test for sugar on the potato and the apple, using Benedict's solution and following these instructions:

- Cut a 1 cm × 1 cm × 1 cm cube of potato.
- On a white tile, use a cutting device to cut the cube into small pieces, and place these in a large test-tube.
- Add 4 cm^3 of distilled water, and use a stirring rod to gently crush the pieces and mix them with the water.
- Clean your tile, cutting device and stirring rod.

Repeat this procedure with the apple.

- Add 8 cm^3 of Benedict's solution to both test-tubes. The contents of both test-tubes will be blue.
- Heat the two test-tubes for ten minutes at a temperature between 75 °C and 85 °C.

(i) Describe how you would keep the test-tubes at the required temperature for ten minutes.

.....

.....

.....

..... [2]

(ii) After ten minutes, the student observed the test-tubes. The colour of the apple mixture was red, and the colour of the potato mixture was blue.

State what conclusions can be made from these results.

apple .....

potato .....

[1]

(iii) Suggest why it was important to:

- use a 1 cm × 1 cm × 1 cm cube for each plant organ

  .....

  .....

- cut each cube up into small pieces

  .....

  .....

- crush the small pieces and mix them with water.

  .....

  .....

[3]

(iv) Explain why the tile, cutting device and stirring rod were cleaned after using them on the potato.

.....

..... [1]

(c) Describe how you would test the apple for protein, and state what you would observe if protein was present and not present.

test .....

.....

.....

protein present .....

protein not present .....

[4]

[Total: 17]

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2 Photosynthesis in green plants can be summarised by the equation:

$$\text{carbon dioxide + water} \xrightarrow{\text{light and chlorophyll}} \text{carbohydrate + oxygen}$$

A student used the apparatus shown in Fig. 2.1 to investigate the rate of photosynthesis in an aquatic plant.

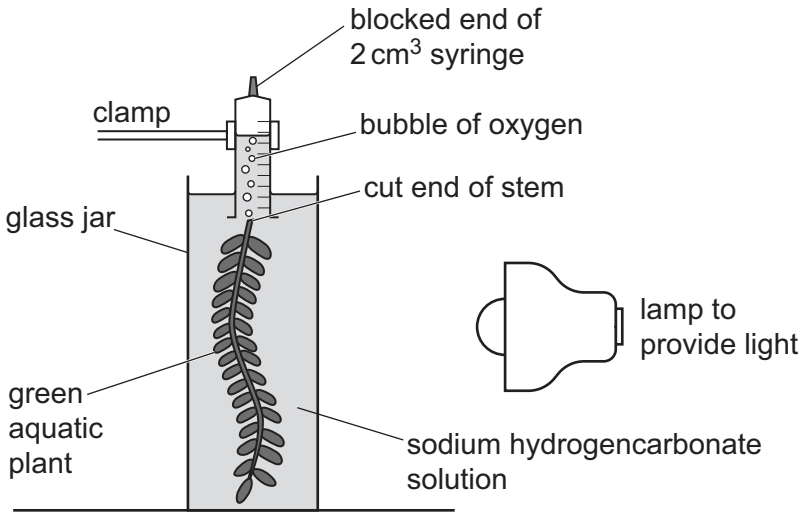


Fig. 2.1

When the student switched the lamp on, bubbles of oxygen formed and entered the syringe. The student recorded the volume of oxygen produced in ten minutes. The syringe was then refilled with sodium hydrogencarbonate solution and the oxygen collected for another ten minutes.

The student then decided to investigate the effect of different colours of light on the rate of photosynthesis. Leaving the same plant in the glass jar, a red transparent filter was wrapped around the glass jar so that the plant only received red light. The volume of oxygen produced in ten minutes was measured. This measurement was then repeated.

The red transparent filter was replaced by a green transparent filter and then by a blue transparent filter. For each filter, the volume of oxygen produced in ten minutes was also measured twice.

The measurements are shown in Table 2.1.

Table 2.1

filter	volume of gas collected in ten minutes / cm^3		
	measurement 1	measurement 2	mean
no filter	1.1	1.3	1.2
red	0.7	0.9	0.8
green	0.3	0.3	0.3
blue	0.6		

The syringe at the end of ten minutes for measurement 2 with the blue filter is shown in Fig. 2.2.

Fig. 2.2

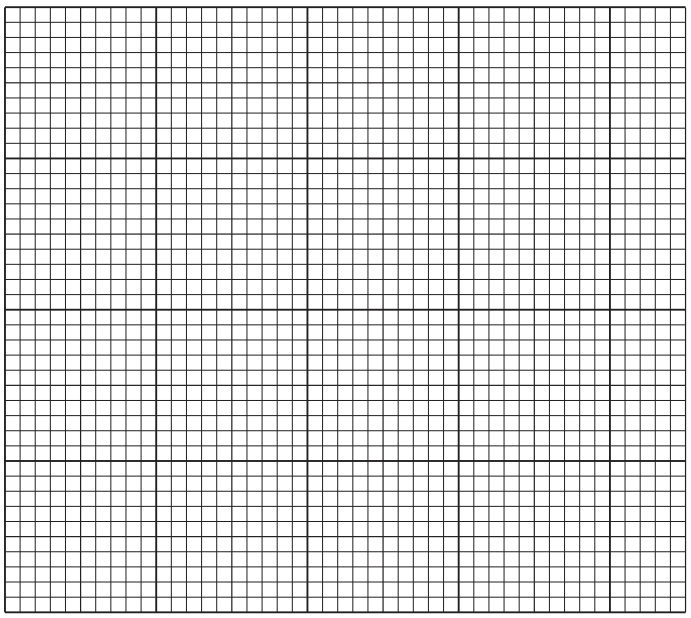
(a) (i) Record the volume of oxygen produced in measurement 2 with the blue filter in Table 2.1. [1]

(ii) Calculate the mean volume of oxygen produced with the blue filter, and record it in Table 2.1. [1]

(iii) Using the mean value, calculate the rate of photosynthesis per minute when **no filter** was used.

..... [1]

(b) (i) Construct a bar chart on the grid to show the mean volume of gas collected with no filter and with the different coloured filters.



[4]

(ii) Use the data given and the bar chart to state **one** conclusion that can be made from the results of this investigation.

.....

..... [1]

(c) Plan an investigation that you could do to determine the effect of light intensity on the rate of photosynthesis, using the apparatus shown in Fig. 2.1.

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..... [6]

[Total: 14]

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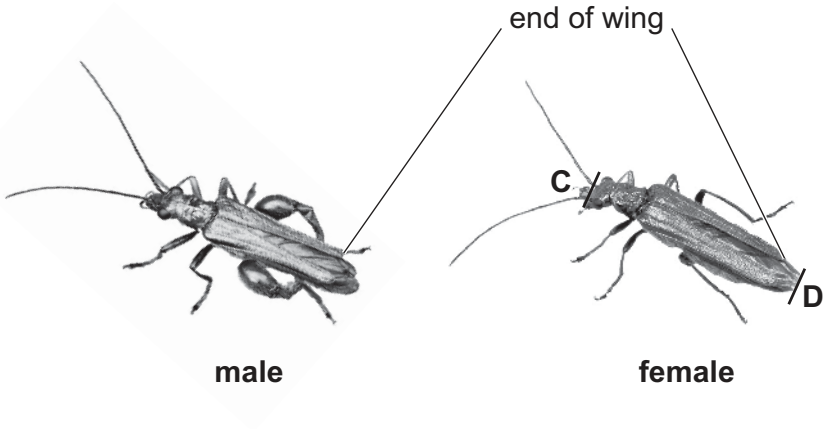
3 Fig. 3.1 shows photographs of a male and a female of an insect species. Both the male and female insects are green in colour.



magnification ×3.5

Fig. 3.1

(a) (i) State **one** visible difference between the male and female in Fig. 3.1.

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..... [1]

(ii) In the space below, make a large drawing of the **male** insect as it appears in Fig. 3.1.

[4]

(iii) **C** and **D** indicate the length of the female insect. **D** indicates the end of the abdomen. Draw a straight line to join **C** and **D** on the photograph.

Measure the length of the line and record it.

.....

Calculate the actual length of the insect and record it to the nearest whole number.

Space for working.

..... mm
[3]

(b) Use the key below to identify and record the name of the insect.

1 wings longer than abdomen ..... *Oedemera femoralis*

wings shorter than abdomen ..... go to 2

2 colour brown ..... *Oedemera barbara*

colour green or grey ..... go to 3

3 length 5–6.5 mm ..... *Oedemera lurida*

length 7–11 mm ..... *Oedemera nobilis*

name of insect ..... [1]

[Total: 9]

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