



General Certificate of Secondary Education  
2024

Centre Number

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Candidate Number

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## Biology

Unit 3 Practical Skills

Booklet A

**MV24**

Higher Tier

[GBL33]

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### Time

2 hours, plus your additional time allowance.

### Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.

Write your answers in the spaces provided in this question paper.

Answer **all** questions.

## **Information for Candidates**

The total mark for this paper is **30**.

Task 1 is a practical exercise worth 15 marks.

Task 2 is a practical exercise worth 15 marks.

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

Follow all health and safety instructions.

You may use a ruler and calculator if required.

**The apparatus and materials required to complete each task are provided.**

**You will not have access to notes or textbooks to assist you.**

## **Task 1: Investigating if the green pigment in a leaf is needed for photosynthesis.**

You must wear eye protection when carrying out this task.

A variegated plant was destarched.

The plant was then placed in bright light for at least 24 hours.

### **Instructions:**

- 1.** Remove one of the variegated leaves from the plant.
- 2.** Place a 250 cm<sup>3</sup> beaker on a heatproof mat on your bench and carefully half fill the beaker with hot water from the kettle.
- 3.** Use forceps to place the leaf into the beaker of hot water for one minute.
- 4.** Use forceps to remove the leaf from the hot water.

5. Use forceps to gently place the leaf into the ethanol in the boiling tube. Take care not to damage the leaf.
6. Immediately place the boiling tube containing the leaf and ethanol into the beaker of hot water and leave until the ethanol boils and the green pigment has been removed from the leaf.
7. Use forceps or a stirring rod to carefully remove the leaf from the boiling tube and dip it into the beaker of hot water for approximately 10 seconds.
8. Place the leaf in a Petri dish or on a white tile, making sure the leaf is spread out fully. Take care not to damage the leaf.
9. Cover the leaf with iodine solution.

**For the remainder of Task 1 you must work alone.**

**Question 1**

**(a) (i)** Describe how the variegated plant was destarched. [2 marks]

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**(ii)** Explain why it was necessary to do this **before** carrying out the investigation. [1 mark]

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**(b) After testing** with iodine solution, give the colour of the area of the leaf which was [2 marks]

- green at the start of the investigation.

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- white at the start of the investigation.

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**Look at the instructions on pages 3 and 4.**

**(c)** Give the number of the step which  
[3 marks]

- kills the leaf. \_\_\_\_\_
- makes the leaf brittle. \_\_\_\_\_
- tests for starch. \_\_\_\_\_

**(d)** Suggest why a Bunsen burner was **not**  
used to heat the beaker of water in  
**step 6.** [1 mark]

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**(e)** Give the function of the green pigment in  
the variegated leaf. [1 mark]

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**(f)** Explain the colour of the iodine solution in the **green** area of the variegated leaf in **step 9**. [3 marks]

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**(Questions continue overleaf)**

Another student used a leaf from another plant to investigate a different factor needed for photosynthesis.

He destarched the plant.

He then placed a strip of black card over one of the leaves and left the plant in bright light for at least 24 hours.

After this time, the student removed the strip of black card and tested the leaf for starch using iodine solution.

The diagram shows the leaf with the strip of black card.



**(g)** Explain why there was no colour change in the iodine solution in the area of the leaf under the strip of black card.

[2 marks]

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## Task 2: Estimating the energy content of crisps.

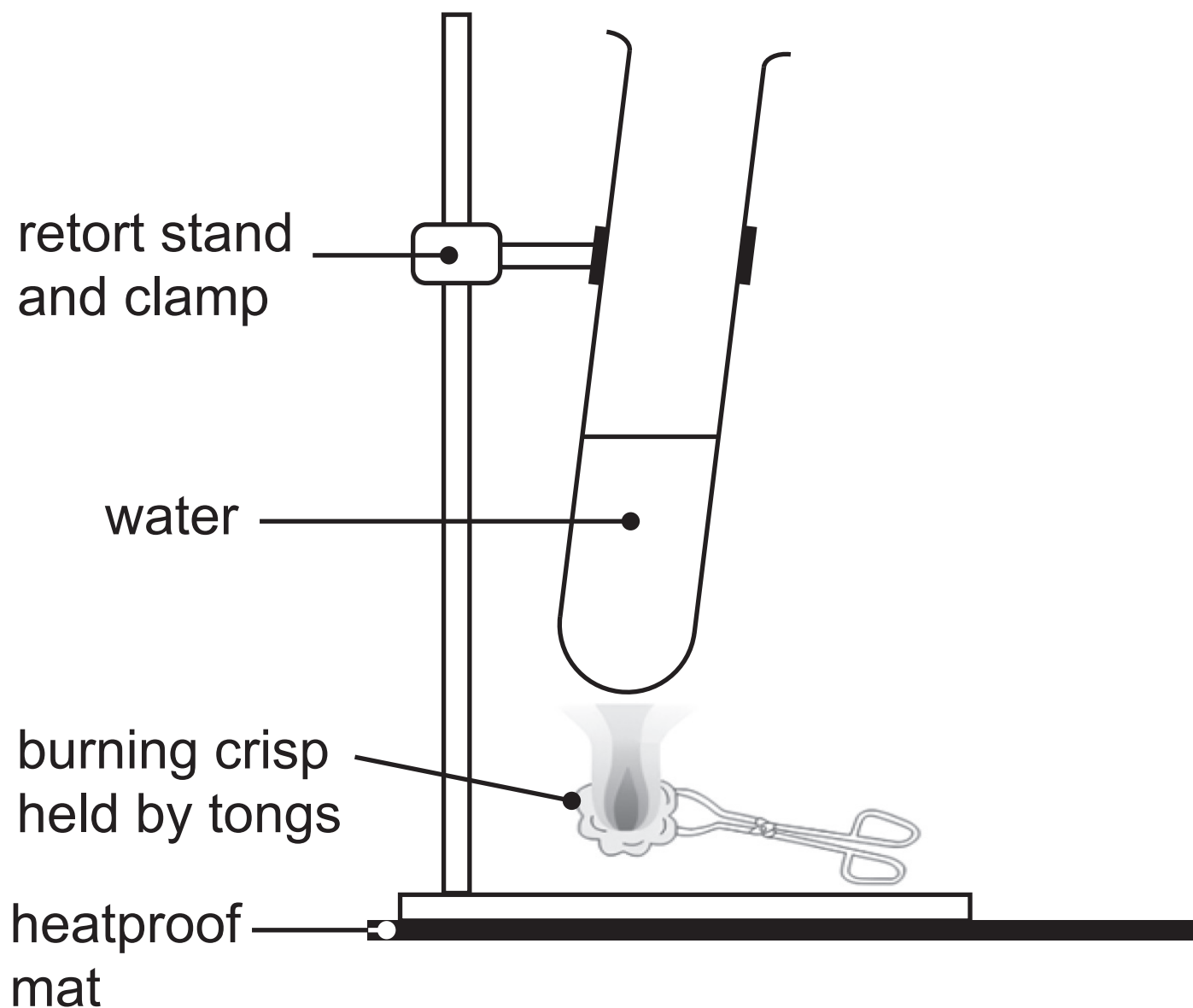
You **must** wear eye protection when carrying out this task.

### Instructions:

1. Set up the apparatus as shown in the diagram opposite.

Take care not to break the glass when clamping the boiling tube.

2. Use the measuring cylinder (or syringe) to add  $20\text{ cm}^3$  of water to the boiling tube.
3. Stir the water in the boiling tube using the stirring rod.
4. Use the thermometer to measure the temperature of the water **at the start** and record this in **Table 1** on page 14.



5. Weigh your crisp and record its mass, **to one decimal place**, in the **box under Table 1** on page 14.
6. Light the Bunsen burner.
7. Use tongs to hold the crisp in the Bunsen flame until it starts to burn.

8. Immediately move the burning crisp under the boiling tube and hold it there until the crisp is completely burnt. If the crisp goes out, relight it in the Bunsen flame and quickly put it back under the boiling tube.
9. When the crisp is completely burnt, stir the water in the boiling tube using the stirring rod.
10. Use the thermometer to measure the temperature of the water and record this in **Table 1**.

**Table 1**

	Temperature /
At the start	
When the crisp is completely burnt	
Increase	

Mass of crisp = \_\_\_\_\_ g

**For the remainder of Task 2 you must work alone.**

## **Question 1**

**(a) Complete Table 1 by: [2 marks]**

- adding suitable units to the column heading.
- calculating the increase in temperature of the water.

**(b) Suggest why it was important to stir the water in **steps 3** and **9** before recording the temperature. [1 mark]**

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**(c)** Another student repeated the investigation and obtained an increase in temperature of 26°C for a crisp of mass 1.2 g.

The energy content of a crisp can be calculated using the following equation.

$$\begin{array}{r} \text{Energy} \\ \text{content} \\ / \text{J} \end{array} = \begin{array}{r} \text{volume of} \\ \text{water} \\ / \text{cm}^3 \end{array} \times \begin{array}{r} \text{increase in} \\ \text{temperature} \\ / ^\circ\text{C} \end{array} \times 4.2$$

**(i)** Calculate the energy content of this student's crisp. [2 marks]

Show your working.

\_\_\_\_\_ J



- (ii) Calculate the energy content per gram of the student's crisp.  
[2 marks]

Show your working.

\_\_\_\_\_  $\text{Jg}^{-1}$

The investigation was repeated with three other types of crisp and the energy content per gram was calculated for each crisp.

**Table 2** shows the results.

**Table 2**

Type of crisp	Energy content of crisp/ $\text{Jg}^{-1}$
Beetroot	2650
Parsnip	3250
Potato	2050

**(d)** Suggest why it was necessary to calculate the energy content per gram of each type of crisp. [2 marks]

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**(e)** Suggest **one** reason why the results for the energy content of each of these crisps may be lower than the value given on each crisp packet. [1 mark]

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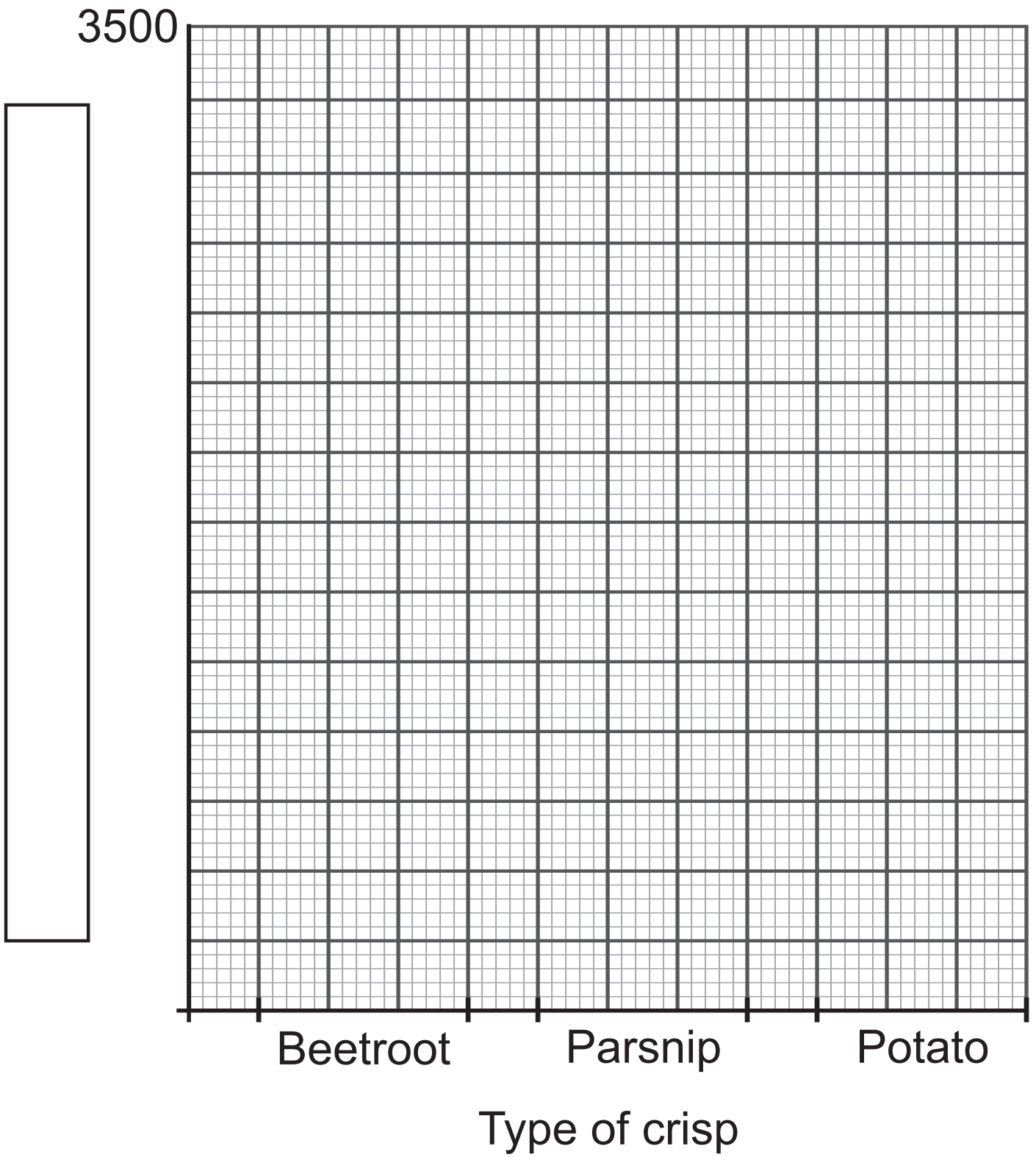
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On the grid opposite, use the results from **Table 2** to draw a bar chart of the energy content of the three types of crisp.

**(f)** Complete the scale given for the y-axis.  
[1 mark]

**(g)** In the box provided, label the y-axis and include appropriate units. [2 marks]

**(h)** Plot the bars accurately. [2 marks]



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**This is the end of the  
question paper**

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## SOURCES

Task 1 . . . Source: © *Chief Examiner*

Task 2 . . . Source: © *Chief Examiner*

For Examiner's use only	
Question Number	Marks
<b>Task 1</b>	
1	
<b>Task 2</b>	
1	
<b>Total Marks</b>	

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