



General Certificate of Secondary Education
2023–2024

Centre Number

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Candidate Number

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Double Award Science: Biology

Unit B1
Higher Tier



[GDW12]

GDW12

WEDNESDAY 21 FEBRUARY 2024, MORNING

TIME

1 hour.

INSTRUCTIONS TO CANDIDATES

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

You must answer the questions in the spaces provided.

Do not write outside the boxed area on each page or on blank pages.

Complete in black ink only. **Do not write with a gel pen.**

Answer **all eight** questions.

INFORMATION FOR CANDIDATES

The total mark for this paper is 70.

Figures in brackets printed down the right-hand side of pages indicate the marks awarded to each question or part question.

Quality of written communication will be assessed in Question 2.

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24GDW1201

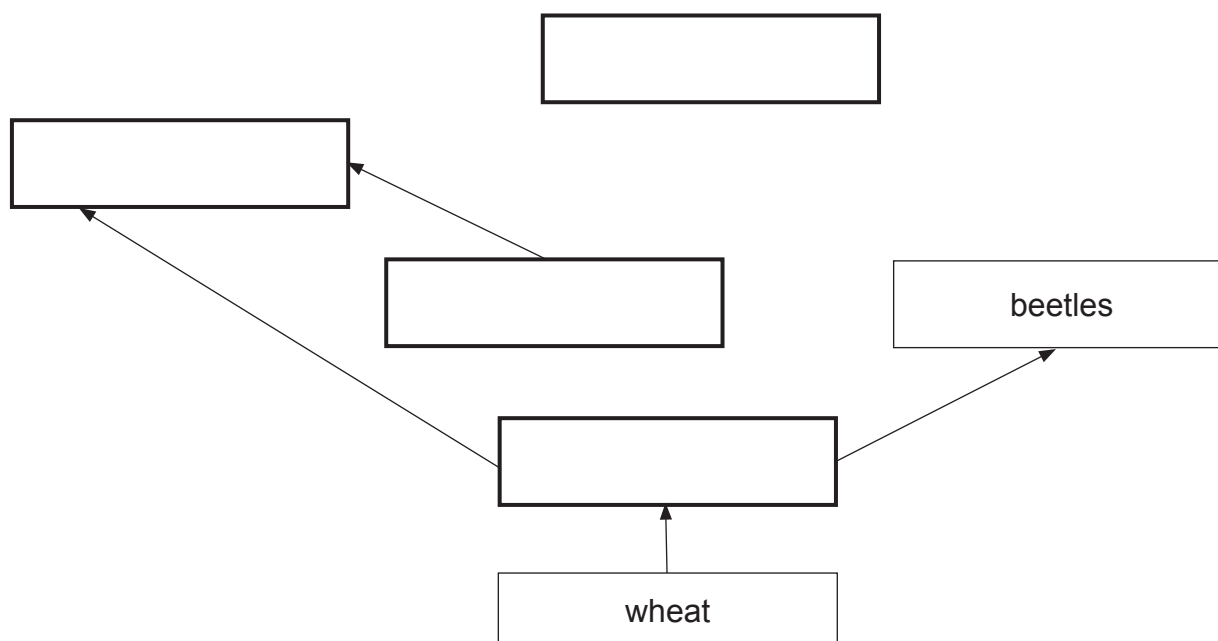
- 1 Wheat is grown in Ireland as a food source.
The photograph shows a wheat field.



The statements give information about some feeding relationships in a wheat field.

Aphids feed on wheat.
Spiders, ladybirds and beetles feed on aphids.
Spiders also feed on ladybirds.
Wasps feed on spiders, ladybirds, beetles and aphids.

- (a) (i) Use the statements to complete the food web.



[4]



(ii) Name the energy source for the food web.

[1]

(iii) What do the arrows represent on the food web?

[1]

(iv) Use the food web to name an organism that is feeding at more than one trophic level.

[1]

The Asian hornet is a predator of wasps, beetles and spiders. It was first found in Ireland in 2021.

(b) Describe and explain the effect the Asian hornet could have on the population of ladybirds in the food web.

Description _____

Explanation _____

_____ [3]

Aphids cause damage to wheat.

Farmers can spray chemicals called insecticides onto the wheat to kill aphids.

(c) Suggest an advantage **to the farmer** of spraying his wheat with an insecticide.

_____ [1]

[Turn over

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- 2 The photograph shows a plant's growth response to light.



Describe and explain how the growth response in the photograph occurs. Your answer should include the name of this growth response.

In this question you will be assessed on the quality of your written communication skills, including the use of specialist scientific terms.

Name of growth response _____

Description _____

Explanation _____





[6]



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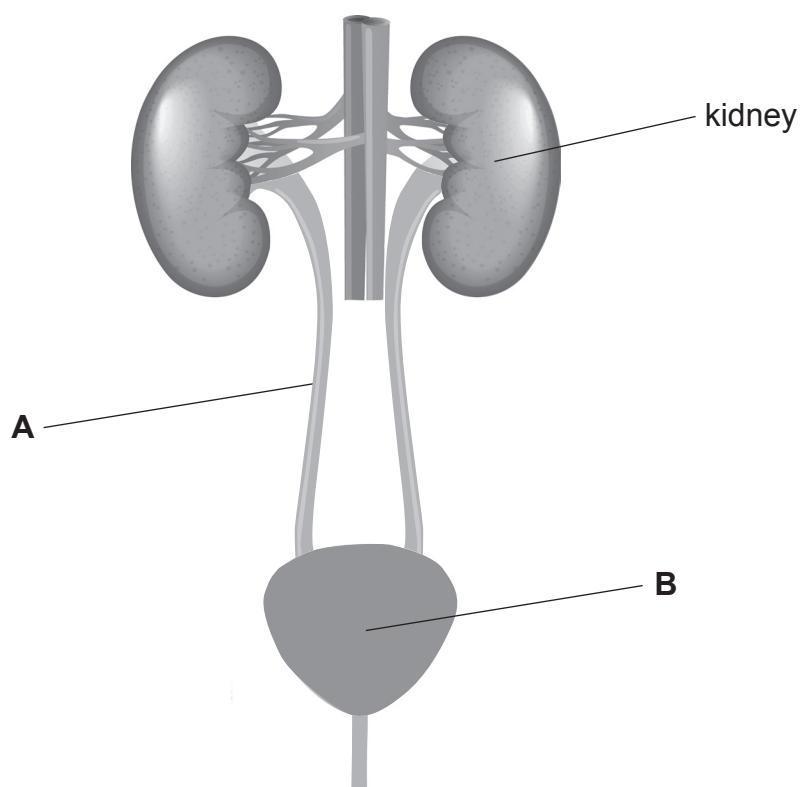
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3 (a) The kidney is the organ responsible for maintaining water balance in the body.

(i) Name the process of maintaining water balance in the body.

[1]

The kidney forms part of the organ system shown in the diagram.



(ii) Name this organ system.

[1]

(iii) Name the parts labelled **A** and **B**.

A _____

B _____

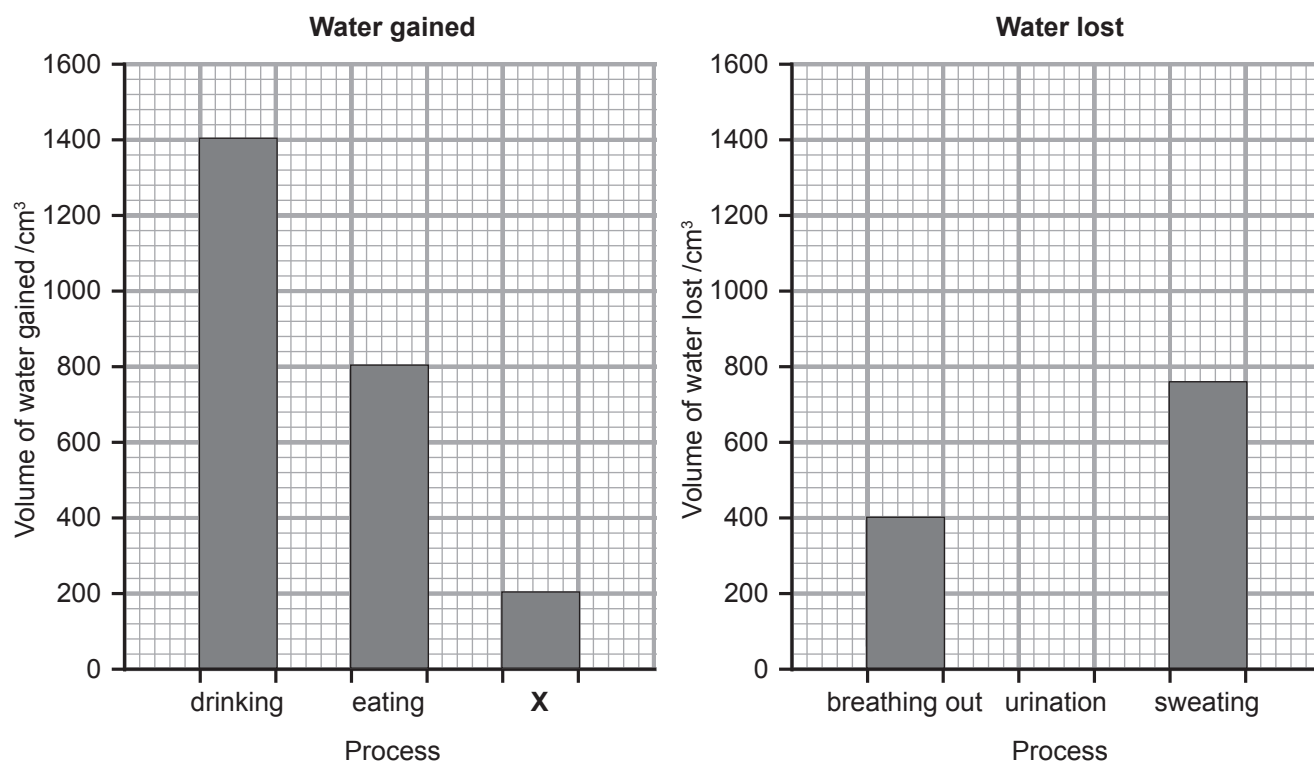
[2]

[Turn over



- (b) A scientist measured the volume of water gained and lost by a woman over 24 hours.

The bar charts show some of the scientist's results.



- (i) Identify process X.

[1]

To maintain water balance in the body, the total water lost in 24 hours equals the total water gained in the same 24 hours.

- (ii) Calculate the volume of water lost by the woman as urine.

Show your working.

_____ cm³ [4]



- (iii) Plot the value you have calculated for the volume of water lost as urine on the bar chart opposite. Shade the bar you have drawn. [1]

The scientist repeated this investigation with the same woman the next day. This time she exercised vigorously for 45 minutes.

- (iv) Use the words in the list to describe what effect, if any, there was on the volume of water **lost** by sweating, breathing out and urination by the woman.

Each effect may be used once, more than once or not at all.

increased

decreased

no effect

sweating _____

breathing out _____

urination _____

[3]

[Turn over

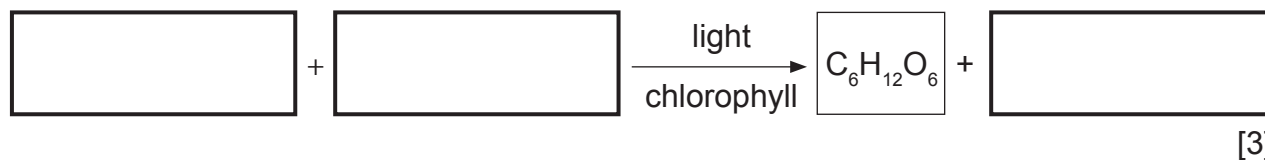
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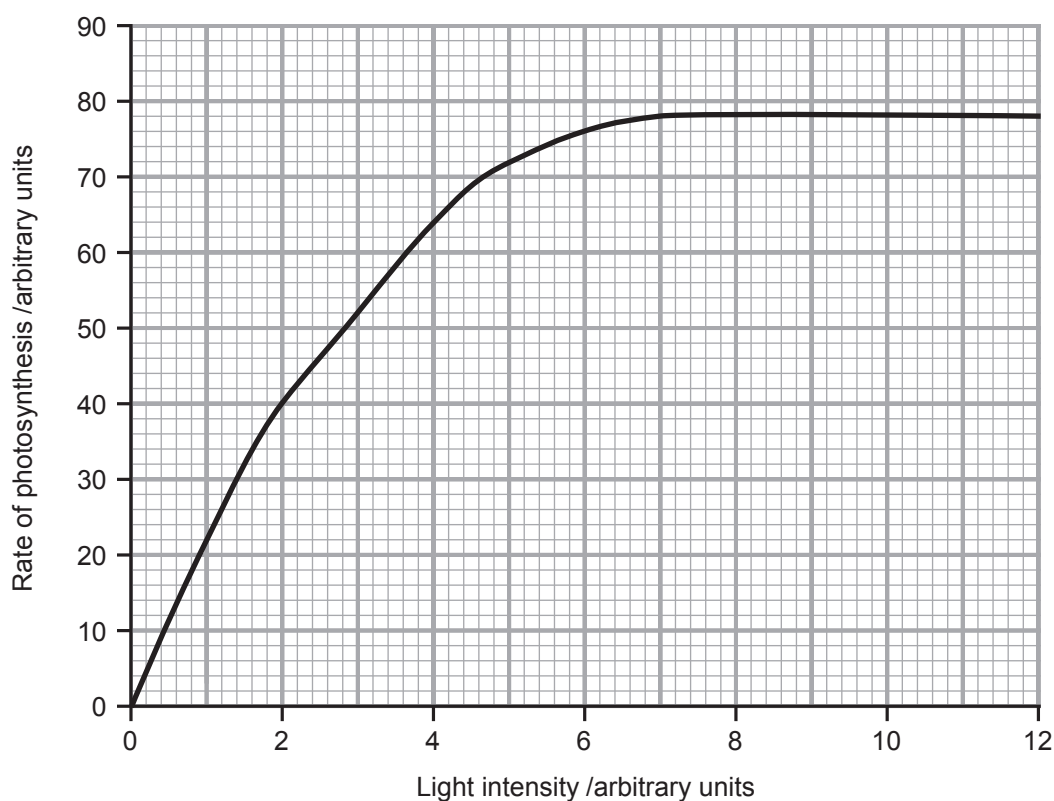
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- 4 Photosynthesis is an endothermic reaction that occurs in plants. It requires energy in the form of light.

(a) Complete the **balanced** chemical equation for photosynthesis by writing in the empty boxes.



(b) The rate of photosynthesis in a plant can be limited by environmental factors. The graph shows the effect of increasing light intensity on the rate of photosynthesis in a plant at 15 °C.



(i) Name **one** environmental factor which may be limiting the rate of photosynthesis between light intensities **8 and 10** arbitrary units.

[1]



At a light intensity of 1 arbitrary unit, the rate of photosynthesis is 22 arbitrary units.

At a light intensity of 10 arbitrary units, the rate of photosynthesis is 78 arbitrary units.

- (ii) Calculate the percentage (%) increase in the rate of photosynthesis between light intensities 1 and 10 arbitrary units.

Show your working.

Give your answer to **two** decimal places.

_____ % [4]

- (iii) Draw a line on the graph to show how decreasing the temperature from 15 °C to 10 °C would affect the rate of photosynthesis in this plant. [3]

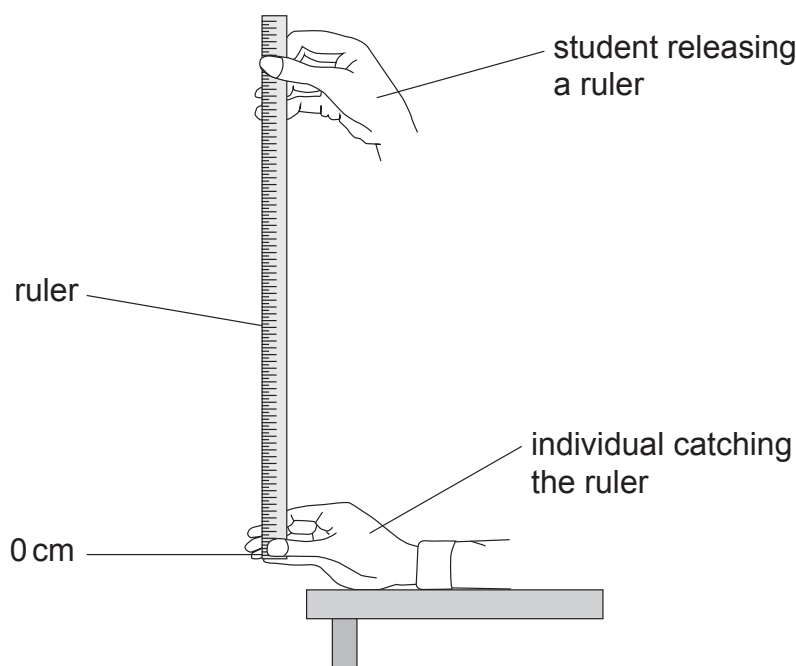
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- 5 A student carried out an investigation into the effect of time of day on speed of response.
- The student measured an individual's speed of response at the beginning and at the end of a day.
- To do this, the student released a ruler and measured the distance it fell before it was caught by the individual, as shown in the diagram.



The results for the individual are shown in the table below.

Repeat	Distance the ruler fell /cm	
	Beginning of day	End of day
1	16	20
2	18	21
3	14	25
Average	16	



- (a) Calculate the average distance the ruler fell when the investigation was carried out at the **end** of the day.

Show your working.

_____ cm [2]

The faster the individual's speed of response, the shorter the distance the ruler fell before it was caught.

- (b) Use the table to describe the relationship between the **time of day** and speed of response.

_____ [1]

- (c) Catching a ruler is an example of a voluntary action.

- (i) How does the speed of response in a voluntary action compare to the speed of response in a reflex action?

_____ [1]

- (ii) Explain your answer.

_____ [1]

[Turn over



- 6 (a) Yeast causes bread dough to rise. The yeast produces bubbles of gas which are trapped in the dough and cause it to rise.

A student investigated the effect of using different masses of yeast to make bread dough.

She mixed four different masses of yeast with the same mass of flour and the same volume of 5% glucose solution.

Each mixture was placed in a separate measuring cylinder.
She kept each measuring cylinder at a temperature of 20 °C for 45 minutes.

Her results are shown in the table.

Mass of yeast added /g	Volume of dough after 45 mins /cm ³
2	47
4	128
6	175
8	203

- (i) Describe and explain the trend shown in the table.

Description _____

Explanation _____

_____ [2]



- (ii) Between which two masses of yeast did the biggest increase in volume of dough occur?

Circle the correct answer in the list.

2 g to 4 g

4 g to 6 g

6 g to 8 g

[1]

The volume of dough did not increase any further in the measuring cylinder containing 8 g of yeast after 45 minutes.

- (iii) Choose **three** of the numbered statements listed below which correctly explain why the volume of dough did not increase any further in this measuring cylinder after 45 minutes.

Write the number of the **three** statements on the answer lines.

1. Lactic acid was produced
2. All the carbon dioxide was used up
3. Respiration stopped
4. No more carbon dioxide was produced
5. No more oxygen was produced
6. All the yeast was used up
7. All the glucose was used up

Statements _____ and _____ and _____ [3]

[Turn over



The student repeated the investigation at 30 °C.

The volumes of dough shown in the table were produced more quickly at 30 °C than at 20 °C.

(b) Use your knowledge of enzymes to explain why.

[3]

The student repeated the investigation again, at 80 °C.

The volumes of dough produced were less than those shown in the table.

(c) Use your knowledge of enzymes to explain why.

[1]



7 (a) Active uptake is a process that occurs in the roots of plants. It is necessary to allow plants to absorb minerals required for growth.

(i) Name the specialised plant cells that carry out the process of active uptake.

[1]

(ii) Describe and explain how these specialised cells are adapted for their function.

[2]

(b) Complete the sentences below about active uptake by writing in the blank spaces.

Active uptake in the roots of plants moves minerals from a

_____ concentration to a

_____ concentration.

The mineral _____ is absorbed by active uptake and is used by plants to make proteins.

A decrease in oxygen in the soil _____ the rate of active uptake.

[3]

[Turn over

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8 Respiration occurs in all cells.

(a) Name the site of respiration in cells.

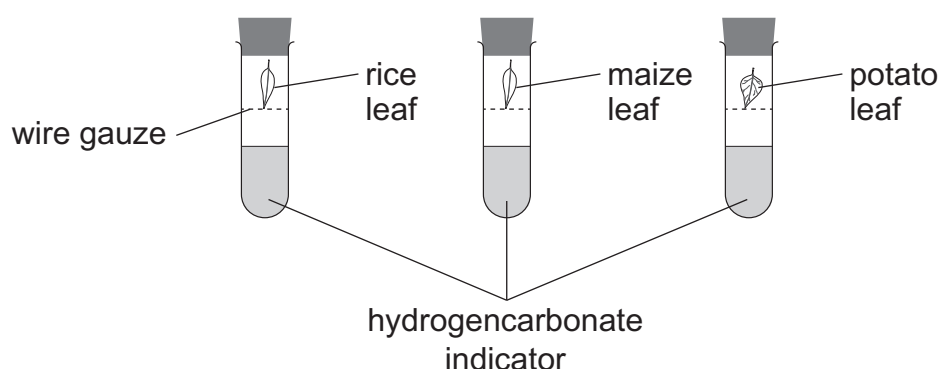
[1]

A student investigated respiration and photosynthesis in the leaves of three types of plant; rice, maize and potato.

The student placed the same mass of each type of leaf in three separate boiling tubes containing hydrogencarbonate indicator.

The diagram shows the experimental set-up.

The student placed the three boiling tubes in a dark cupboard for 12 hours.



When the boiling tubes were removed from the dark cupboard, the hydrogencarbonate indicator was **yellow** in **all** the boiling tubes.

(b) **Circle** the number of **one** statement from **List 1** and the number of **one** statement from **List 2** that applies to the leaves in the boiling tubes after 12 hours in the dark cupboard.

List 1

Statements about photosynthesis and respiration	
1	Only photosynthesis occurred
2	Only respiration occurred
3	The rate of photosynthesis was greater than the rate of respiration
4	The rate of respiration was greater than the rate of photosynthesis
5	The rate of photosynthesis was the same as the rate of respiration

List 2

Statements about carbon dioxide	
6	More carbon dioxide was given out than taken in
7	More carbon dioxide was taken in than given out
8	The same amount of carbon dioxide was given out as taken in

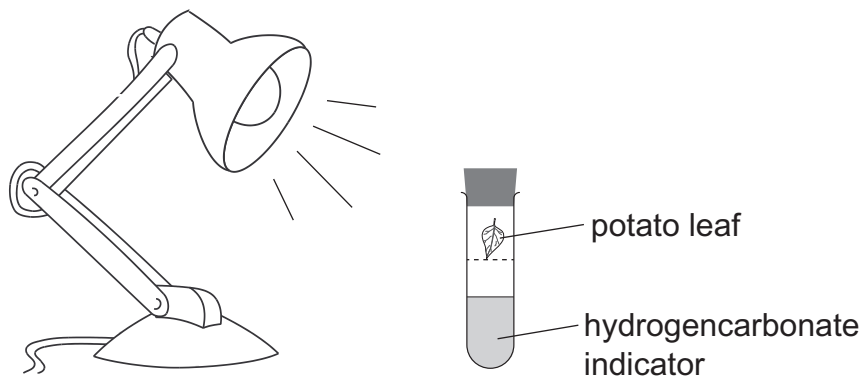
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After the boiling tubes were removed from the dark cupboard, the student set up a lamp at the same distance from each of the three boiling tubes. She then switched the lamps on.

The diagram shows the set-up of **one** of the boiling tubes.



The student recorded the colour of the hydrogencarbonate indicator in each boiling tube after 10 minutes.

The table shows her results.

Time /mins	Colour of hydrogencarbonate indicator		
	Rice	Maize	Potato
0	yellow	yellow	yellow
10	red	purple	yellow



The **rice** leaf was at its compensation point at 10 minutes.

- (c) Give the number of **one** statement from **List 1** and the number of **one** statement from **List 2** to explain what was happening in the rice leaf at its compensation point.

List 1

Statements about photosynthesis and respiration	
1	Only photosynthesis occurred
2	Only respiration occurred
3	The rate of photosynthesis was greater than the rate of respiration
4	The rate of respiration was greater than the rate of photosynthesis
5	The rate of photosynthesis was the same as the rate of respiration

List 2

Statements about carbon dioxide	
6	More carbon dioxide was given out than taken in
7	More carbon dioxide was taken in than given out
8	The same amount of carbon dioxide was given out as taken in

Number of statement from list 1 _____

Number of statement from list 2 _____ [2]

The hydrogencarbonate indicator was purple in the boiling tube containing the **maize** leaf at 10 minutes.

- (d) Give the number of **one** statement from **List 1** and the number of **one** statement from **List 2** that explains this result.

Number of statement from list 1 _____

Number of statement from list 2 _____ [2]

- (e) Suggest how the rate of photosynthesis in the **potato** leaf compares to the rate of photosynthesis in the other leaves.

_____ [1]

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Question 8(a): Principal Examiner

Question 8(c): Principal Examiner

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Question Number	Marks
1	
2	
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7	
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Total Marks	

Examiner Number

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