

Please check the examination details below before entering your candidate information

Candidate surname					Other names				
Centre Number					Candidate Number				

Pearson Edexcel International GCSE (9–1)

Monday 8 June 2026

Morning (Time: 1 hour 15 minutes)

Paper reference **4BI1/2BR**

Biology
UNIT: 4BI1
PAPER: 2BR

You must have:
 Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- If pencil is used for diagrams/sketches/graphs it must be dark (HB or B).
- **Fill in the boxes** at the top of this page with your name, centre number and candidate number.
- Answer **all** questions.
- Answer the questions in the spaces provided
 – *there may be more space than you need.*
- Show all the steps in any calculations and state the units.

Information

- The total mark for this paper is 70.
- The marks for **each** question are shown in brackets
 – *use this as a guide as to how much time to spend on each question.*

Advice

- Read each question carefully before you start to answer it.
- Write your answers neatly and in good English.
- Try to answer every question.
- Check your answers if you have time at the end.

Turn over ►

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Answer ALL questions.

Some questions must be answered with a cross in a box ☒. If you change your mind about an answer, put a line through the box ☒ and then mark your new answer with a cross ☒.

- 1 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Hydroponics and Aeroponics

Farmers have used hydroponics to grow crop plants for many years. Hydroponics is the science of growing plants without using soil, by growing them using a solution containing mineral salts dissolved in water.

- 5 The solution used is a balanced mixture of major nutrients (nitrate, phosphate, potassium, magnesium and sulfate) and a very low concentration of minor nutrients or trace elements (copper, boron, iron, manganese, molybdenum and zinc). The pH of the solution is very important, so a pH meter is required to check the pH. Citric acid is used to lower the pH and sodium hydrogen-carbonate is used to raise the pH. A pH of 5.8 to 6.2 is usually used in hydroponics.
- 10 Hydroponics has been successfully used to grow tomatoes, cucumbers and peppers in a glasshouse environment. However, one issue with growing plants using a solution is the possibility that roots become waterlogged. Growing crops in waterlogged soils can result in lower yields.
- 15 There has recently been more interest in hydroponics because of the increased popularity of living walls and roof gardens. Hydroponics is also being used in regions where there is not much soil available.



(Source: © Globe Guide Media Inc/Shutterstock)

Aeroponic system

- 20 Aeroponics is a new system that has been developed to grow plants. This system works in a similar way to hydroponics, but the plant's roots are suspended in the air rather than submerged in a solution. The roots are then supplied with a nutrient-dense mist. The mist provides the plant's roots with water, mineral ions and oxygen. Some scientists have suggested that aeroponics allows plants to grow faster as the plants have more access to oxygen. This can result in higher crop yield, producing more fruit than hydroponics.



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25 Aeroponics uses 30% less water than hydroponics and 95% less water than outdoor farming. Aeroponics has been used to grow a variety of crops, including strawberries, tomatoes and cucumbers in glasshouses or other controlled environments. Aeroponics is only used for certain types of crops as it costs a lot of money to set up the systems.

30 Hydroponics and aeroponics have both been used for vertical farming where plants are grown in layers stacked on top of each other.

(a) Give the function of magnesium in plants (line 5).

(1)

(b) Nitrogen is provided in the form of nitrates (line 4).

Explain why nitrates are supplied to the plants rather than nitrogen gas.

(2)

(c) Explain why it is important to control the pH of the solution supplied to the growing plants (lines 7 to 9).

(2)



P 7 9 3 9 8 A 0 3 2 4

- (d) The solution supplied to plants in hydroponics contains minor nutrients such as iron (line 6).

Describe a simple experiment to discover the role of iron in growing plants.

(3)

- (e) Explain why plants grown in aeroponics can grow faster and produce more fruit than plants grown in hydroponics (lines 21 to 23).

(3)



- (f) (i) Plants grown in aeroponics use less water than plants grown in hydroponics (line 24).

For a hydroponic system, a volume of 14.2 dm^3 of water is used for each square metre of growing area every day.

For an aeroponic system, calculate the volume, in dm^3 , of water used for each square metre of growing area every day.

(2)

volume = dm^3

- (ii) Explain why plants grown in an aeroponic system use less water per day than those grown in a hydroponic system (line 24).

(3)

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- (g) Suggest why aeroponics is only used for certain crops such as strawberries (lines 25 to 28).

(1)

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(h) Give one advantage of using vertical farming rather than traditional glasshouse methods (lines 29 to 30).

(1)

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(Total for Question 1 = 18 marks)

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2 Bread forms an important part of many people’s diet.

Table 1 shows some of the nutrient content of white bread and wholemeal bread.

Content	White bread in 100 g	Wholemeal bread in 100 g
energy	931 kJ	922 kJ
protein	7.9 g	9.4 g
fat	1.6 g	2.5 g
carbohydrates	46.1 g	42.0 g
starch	42.7 g	39.3 g

Table 1

(a) Using data from table 1 explain two advantages of eating wholemeal bread rather than eating white bread.

(4)

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- (b) Table 2 shows the fibre content for 100 g of white bread and for 100 g of wholemeal bread.

Content	White bread in 100 g	Wholemeal bread in 100 g
fibre	2.5 g	6.7 g

Table 2

- (i) A person changes their diet. They now eat 4 slices of wholemeal bread rather than 6 slices of white bread.

A slice of bread has a mass of 38 g.

Calculate the percentage change in the person's fibre intake.

(2)

percentage change = %

- (ii) Give a reason why a person would choose wholemeal bread rather than white bread based on fibre content.

(1)

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(c) A student uses this method to measure the energy content of white bread.

- measure a 2 g sample of white bread
- pour 50 cm³ of water into a boiling tube
- place a thermometer in the boiling tube and record the initial temperature of the water
- place the sample of bread on a mounted needle
- light the sample of bread in a Bunsen flame
- quickly move the burning sample of bread and place it directly under the boiling tube
- repeat until the bread does not burn
- record the final temperature of the water in the boiling tube

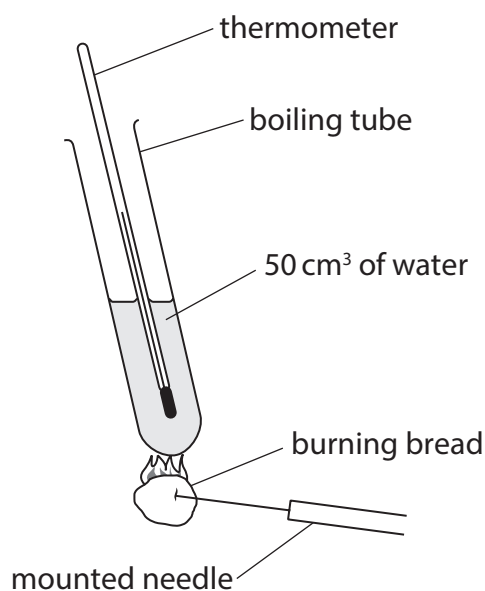


Table 3 shows some of the student's results.

Initial temperature of water in °C	Final temperature of water in °C	Increase in water temperature in °C	Energy released in J	Mass of bread sample in g	Energy released by 100 g of bread in J
20	31			2	

Table 3



- (i) Use this formula to calculate the energy released, in J, by the bread sample.

energy (in J) = mass of water (in g) $\times$ 4.2 $\times$ increase in temperature (in $^{\circ}\text{C}$)

[1 cm³ of water has a mass of 1 g]

(2)

energy released = J

- (ii) Calculate the energy released by 100 g of bread in kJ.

(2)

energy released by 100 g of bread = in kJ

- (iii) Explain why the calculated value of energy released is different from the energy content given in table 1.

(3)

(Total for Question 2 = 14 marks)

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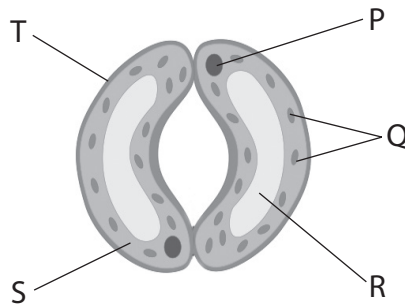
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3 Stomata open and close to allow gas exchange.

The diagram shows one of the stomata from the lower surface of a leaf with some structures labelled.



(Source: © Pearson Asset Library)

(a) (i) Which structure is a cell wall?

(1)

- ☐ **A** P
- ☐ **B** Q
- ☐ **C** R
- ☐ **D** T

(ii) Which structure is a vacuole?

(1)

- ☐ **A** P
- ☐ **B** Q
- ☐ **C** R
- ☐ **D** T

(iii) Which structure absorbs light to use in photosynthesis?

(1)

- ☐ **A** Q
- ☐ **B** R
- ☐ **C** S
- ☐ **D** T

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(b) Explain the changes in the stomata of a leaf under these conditions.

(4)

sunlight

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darkness

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(c) Describe an experiment to show how the net exchange of carbon dioxide in a leaf changes in different levels of light intensity.

(3)

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(Total for Question 3 = 10 marks)



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4 (a) Flowering plants reproduce by producing seeds.

These seeds germinate when conditions are suitable.

(i) Explain two conditions that a seed needs to germinate successfully.

(4)

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(ii) Seeds often germinate below the surface of the soil.

Explain how a seedling is able to grow before it reaches sunlight.

(2)

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(b) Some plants can reproduce naturally by asexual reproduction.

Describe one way that a plant can reproduce asexually.

(3)

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(Total for Question 4 = 9 marks)

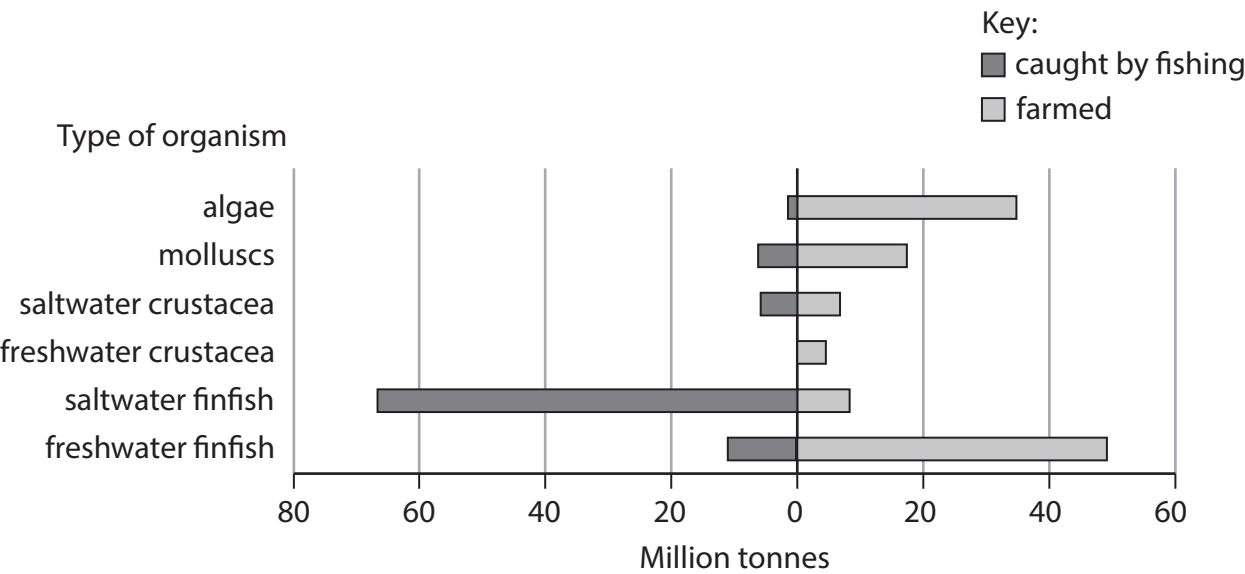
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5 The graph shows the mass of different organisms obtained by traditional fishing and by fish farming in 2020.



The table gives information about the different types of organism in the graph.

Type of organism	Examples	Additional information
algae	<i>Chlorella, Spirulina</i>	microscopic organisms containing chlorophyll
molluscs	oysters, mussels, clams	grow on rocks or other surfaces
crustacea	crabs, prawns, shrimp	can live in freshwater, rivers or the sea
saltwater finfish	mackerel, tuna, cod	live in the sea
freshwater finfish	<i>Tilapia</i> , perch, trout	live in ponds and rivers



- (a) Comment on the relationship between the types of organism and
- the mass obtained by traditional fishing
 - the mass obtained by fish farming

Use data from the graph, information from the table and your own knowledge in your answer.

(5)

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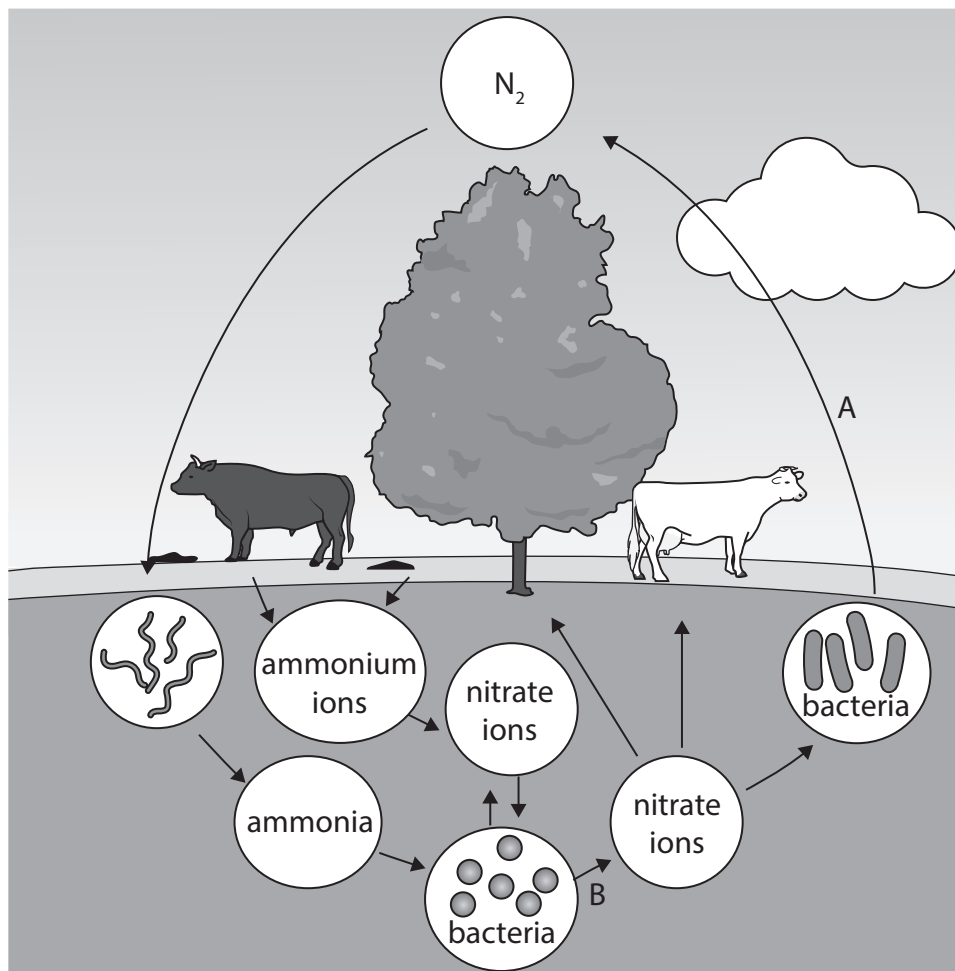
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6 (a) The diagram shows part of a natural cycle.



(i) State the name of this cycle.

(1)

(ii) Identify processes A and B.

(2)

A

B



(b) Deforestation has resulted in changes to ecosystems.

(i) Explain how deforestation can affect the balance of gases in the atmosphere. (2)

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(ii) Describe how deforestation can affect the water cycle and soil conditions in an ecosystem. (4)

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(Total for Question 6 = 9 marks)

TOTAL FOR PAPER = 70 MARKS

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