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Please check the examination details below before entering your candidate information

Candidate surname	Other names

Pearson Edexcel International GCSE (9–1)

Centre Number | Candidate Number

Friday 7 June 2019

Afternoon (Time: 1 hour 15 minutes) | Paper Reference **4BI1/2B**

Biology

Unit: 4BI1
Paper: 2B

You must have:
Calculator, ruler

Total Marks

Instructions

- Use **black** ink or ball-point pen.
- **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.
- 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 ☒.

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.

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

Global warming and the Great Barrier Reef

The Great Barrier Reef is found in the sea off the North-East coast of Australia. It is the largest coral reef in the world.

Coral reefs are underwater ecosystems. Coral grows best on rock found in shallow, clear moving water. The coral is made from a hard calcium shell that contains small animals. Inside the bodies of these animals there are microscopic organisms called algae. These animals and algae have a mutualistic relationship. In a mutualistic relationship, both species benefit by living together.

A scientific study found that higher sea temperatures in 2016 caused the worst destruction of corals ever recorded on Australia's Great Barrier Reef. Many scientists believe that the increase in sea temperature is the result of an increase in carbon dioxide in the atmosphere.

About 70% of coral died in the northern section of the reef. One of the worst-hit areas was around Lizard Island in North Queensland, where almost 90% of the coral died. The situation was better in the central section, where only about 5% died. The southern section of the reef was healthy. Scientists warn that recovery of the coral reefs will be difficult if climate change continues.

Some coral death is the result of overheating. However, far more coral has been lost through bleaching. Coral bleaching happens when sea temperatures rise for a long period of time. The algae cannot survive so the coral starves. The pigments in the algae give coral its colour. After bleaching, the coral appears white because it is now without the colourful algae that provide its main source of energy.

Some coral survives the higher sea temperatures. However, another study has found that this coral has now come under increased threat from predators such as snails and the crown-of-thorns starfish.

Scientists are hopeful that the reef is capable of recovery, but fear it may not have an opportunity as sea temperatures continue to rise. The Australian Government has published recommendations in a long-term sustainability plan for the coral reef.

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(a) What is meant by the term **ecosystem** (line 3)?

(2)

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(b) Suggest how the mutualistic relationship between the small animals and the algae inside them is of benefit to both species (lines 6 and 7).

(2)

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(c) (i) Explain why coral grows best in shallow, clear water (lines 3 and 4).

(2)

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(ii) Suggest why coral grows best in moving water (lines 3 and 4).

(2)

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(d) Suggest how scientists are able to find the percentage of coral that has died in a section of the reef.

(3)

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(e) Give one reason why coral that survives higher sea temperatures is under increased threat from predators (lines 22 to 24).

(1)

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(f) Suggest what recommendations should be included in the sustainability plan for the coral reef (lines 26 and 27).

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(Total for Question 1 = 15 marks)

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2 The leaves of plants make starch.

(a) Describe how you would test a leaf to show that it contains starch.

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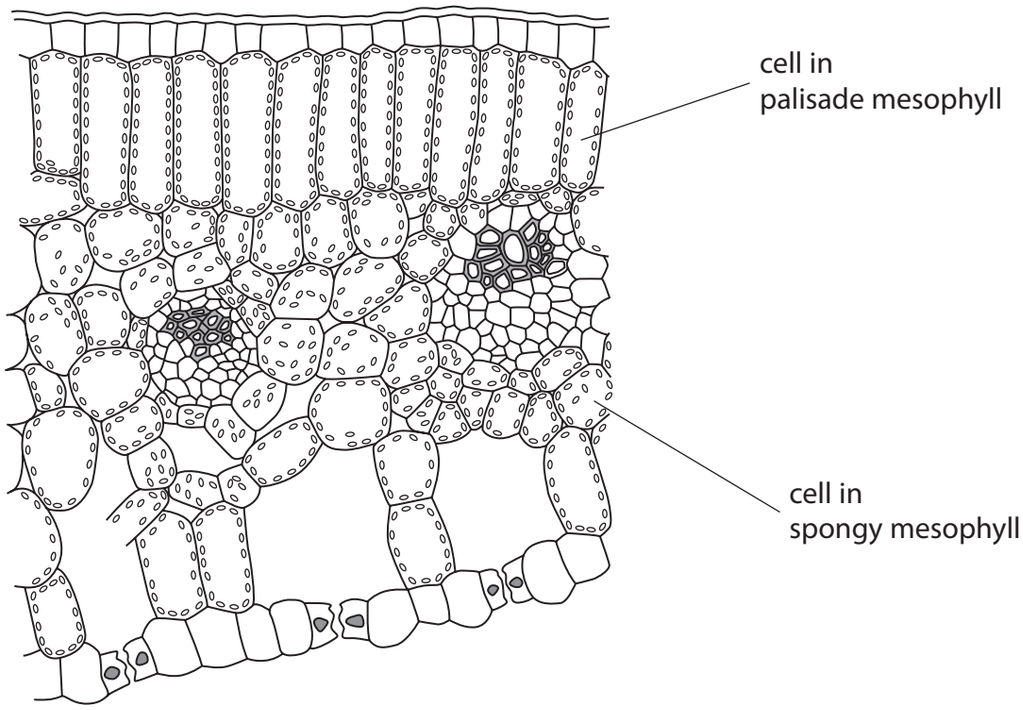
(b) The diagram shows the structure of part of a leaf.



Explain the differences between the palisade mesophyll and the spongy mesophyll.

(4)

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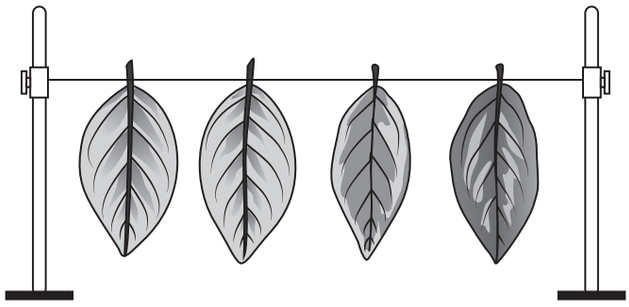
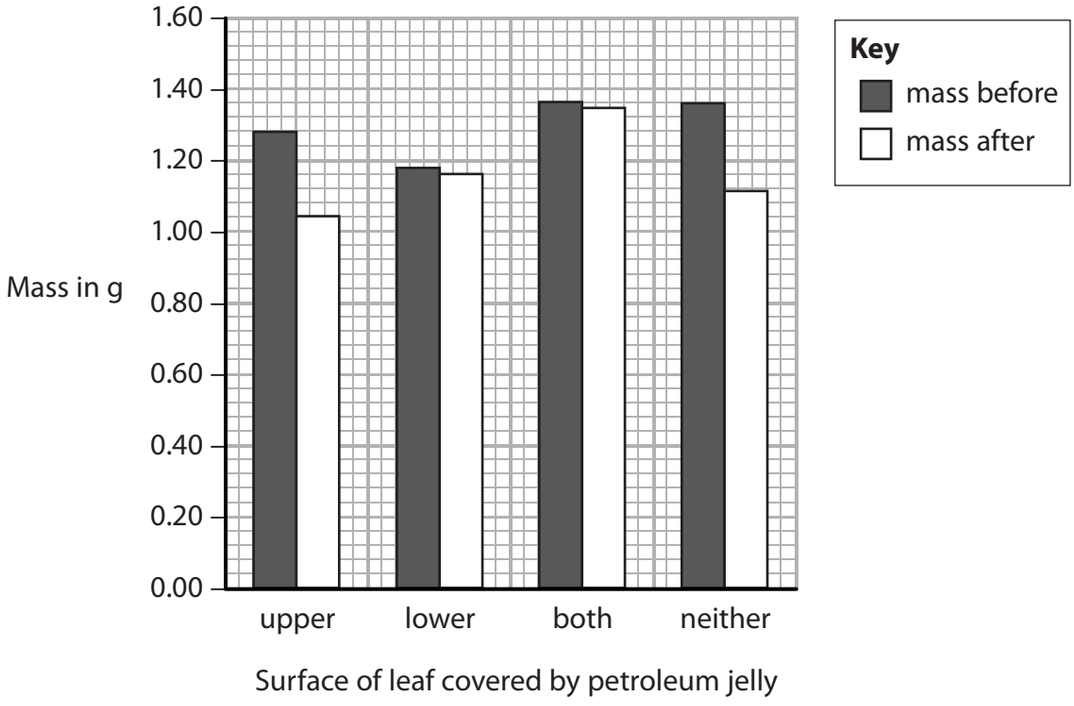
(c) A student uses this method to investigate the role of leaves in transpiration.

- remove four leaves from a plant
- cover the upper surface of one leaf with petroleum jelly
- cover the lower surface of one leaf with petroleum jelly
- cover both surfaces of one leaf with petroleum jelly
- keep one leaf uncovered
- measure the mass of each leaf
- suspend the leaves for several hours in air



After several hours, the student measures the mass of each leaf again.

The graph shows his results.



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The student concludes that transpiration occurs mainly from the upper surface of leaves.

Evaluate this conclusion.

(3)

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(Total for Question 2 = 10 marks)

3 Bags made from starch are better for the environment than plastic bags made from fossil fuels.

Bags made from starch are decomposed by microorganisms such as soil fungi.

(a) (i) Which of these is a feature of fungi?

(1)

☒ **A** chloroplasts in the cytoplasm

☒ **B** starch stored in the cytoplasm

☒ **C** thread-like hyphae

☒ **D** walls made of cellulose

(ii) The soil fungi release an enzyme called amylase that digests the bag.

What is the product of this digestion?

(1)

☒ **A** amino acids

☒ **B** fatty acids

☒ **C** glycerol

☒ **D** maltose

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(iii) Amylase is a protein.

Describe how protein is made in a cell.

(5)

(b) A student investigates the effect of soil pH on the decomposition of bags made from starch.

She uses this method.

- cut two small squares from a bag
- measure the mass of each small square
- place one square in a beaker of soil with a pH of 7.0
- place the other square in a beaker of soil with a pH of 9.0
- after 10 days, remove the squares and measure their mass again

The table shows the student's results.

pH of soil	Mass of square in g		Percentage loss in mass (%)
	at start	after 10 days	
7.0	2.00	1.00	50.0
9.0	2.10	0.62	

(i) Calculate the percentage loss in mass shown by the square in pH 9.0 soil.

(1)

percentage = ...

(ii) Calculate the difference between the percentage loss in mass for the two squares.

(1)

difference = ...

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(iii) Explain how the student could improve her method so that she can obtain more accurate results.

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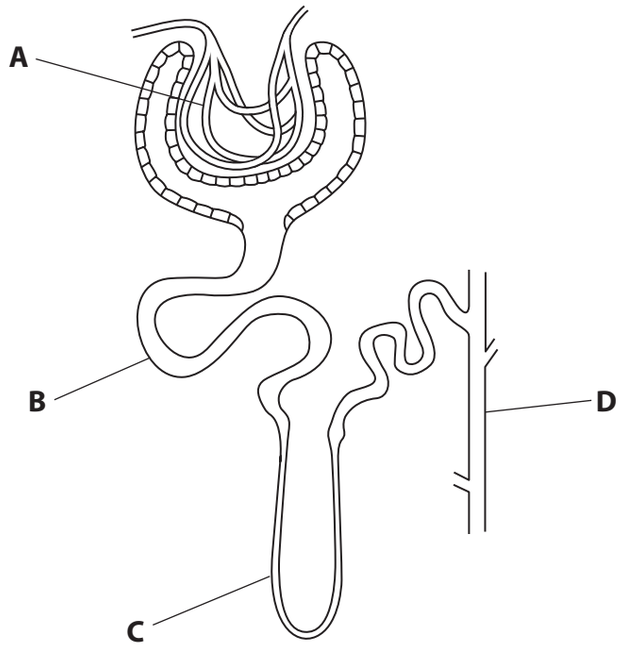
(Total for Question 3 = 13 marks)

4 The diagram shows a nephron from a human kidney, with parts labelled A, B, C and D.



(a) Use the diagram and your knowledge of kidney function to answer these questions.

(i) Where does ultrafiltration take place?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(ii) Where does reabsorption of glucose take place?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

(iii) Which part responds to a change in ADH?

(1)

☒ **A**

☒ **B**

☒ **C**

☒ **D**

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(b) A kangaroo rat is a mammal that lives in hot desert regions of America.

(i) In kangaroo rats, the tissue surrounding the collecting duct contains a high concentration of ions.

Explain how this feature enables kangaroo rats to survive in the desert.

(3)

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(ii) Kangaroo rats stay underground during the day and only come out to feed at night.

Explain how this behaviour enables kangaroo rats to survive in the desert.

(2)

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(iii) Kangaroo rats rarely drink water.

Suggest where they get their water from.

(1)

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(Total for Question 4 = 9 marks)

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5 In humans, males are heterogametic because they have two different sex chromosomes. Females are homogametic because they have two similar sex chromosomes.

(a) Give the sex chromosomes in the body cell of a human male.

(1)

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(b) In birds, females are heterogametic and have a Z chromosome and a W chromosome.

(i) What are the sex chromosomes in the body cell of a male bird?

(1)

☒ **A** XY

☒ **B** ZW

☒ **C** ZY

☒ **D** ZZ

(ii) A male and female bird have four offspring.

Calculate the probability that these offspring will all be female.

(2)

probability = ...

(c) Human females generally reach puberty between the ages of 11 and 16.

At puberty, hormonal changes occur that cause females to start ovulating.

(i) The table lists the four hormones involved in controlling the menstrual cycle. It also shows the source of secretion and a function of each hormone.

Complete the table by giving the missing information.

(4)

Hormone	Source	Function
FSH		stimulates follicle growth
LH	pituitary	
oestrogen		repairs the uterus lining
progesterone	ovary	

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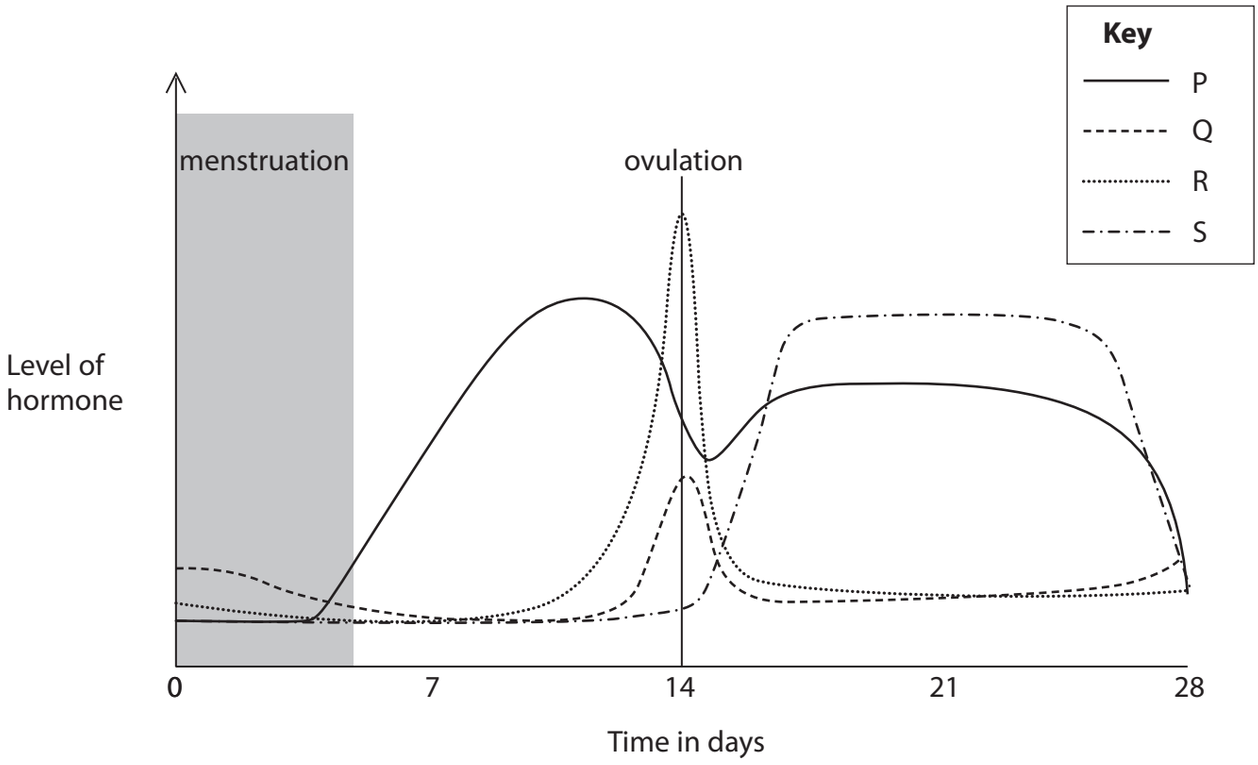
(ii) The chart shows the changes in the levels of the four hormones during the menstrual cycle.



Each letter, P, Q, R and S, represents a different hormone.

Give the correct letter for each hormone.

(3)

FSH .....

LH .....

Oestrogen .....

Progesterone .....

(Total for Question 5 = 11 marks)

6 The surface area of a lung is increased because there are many small alveoli rather than one large one.

(a) A student uses cubes as a model to estimate the additional surface area gained by having many small alveoli.

He uses this method.

- calculate the volume of a large cube with side length 20 cm
- calculate the number of small cubes with side length 1 cm that have the same total volume as the large cube
- calculate the surface area of the large cube
- calculate the total surface area of all the small cubes

The student assumes that the small cubes are not touching so all their surfaces are exposed.

The table shows the student's results.

(i) Complete the table by giving the missing information.

(2)

Side length in cm	Surface area of one cube in cm^2	Total surface area in cm^2	Volume of one cube in cm^3	Total volume in cm^3
20	2400	2400	8000	8000
1			1	8000

(ii) Calculate the ratio of the total surface area of the small cubes to the surface area of the large cube.

(1)

ratio = ...

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(b) Evaluate the student's model as a representation of the lungs.

(2)

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(c) The results show that many alveoli increase the surface area, which will increase the rate of diffusion.

Explain three other ways that alveoli are adapted to maximise gas exchange.

(3)

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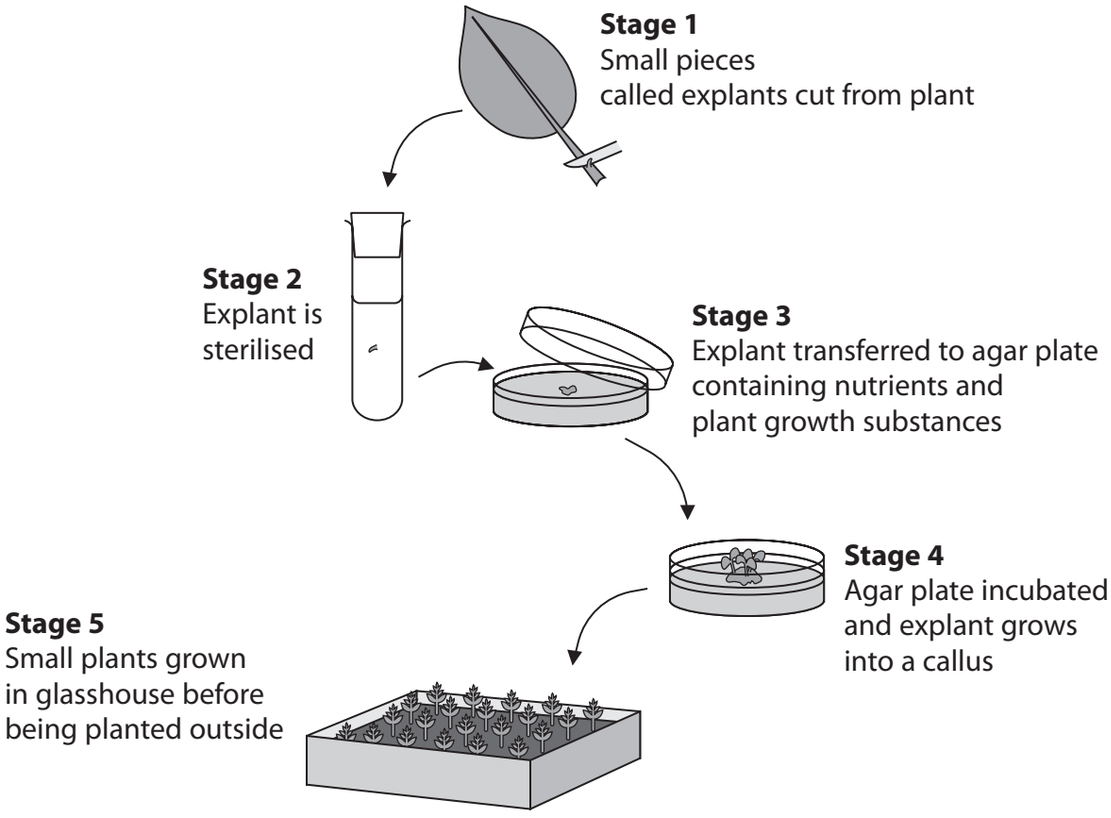
(Total for Question 6 = 8 marks)

7 Scientists produce large numbers of genetically identical plants using micropropagation.

The diagram shows some of the stages of micropropagation.



(a) (i) Give a method that could be used to sterilise the explants in stage 2.

(1)

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(ii) Give the name of one of the nutrients that should be added to the agar plate in stage 3.

(1)

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(b) In micropropagation, small pieces of plant tissue can grow into new individuals.

Explain why small pieces of animal tissue cannot grow into new individuals.

(2)

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(Total for Question 7 = 4 marks)

TOTAL FOR PAPER = 70 MARKS

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