AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.3.3

Land use

Past-paper questions

Tier	**Foundation**
Question groups	**59**
Available paper years	**2007–2025**

Using this booklet

1. Answer the questions in order and show your working.
2. Original question numbers and marks are retained.
3. Print at actual size (100%) for measuring questions.
4. Use the companion answer booklet to check your work.

Name: _____ **Date:** _____

Whole questions are retained for context, so some parts assess other specification points. Current and legacy sources are labelled. Continue on extra paper if needed.

4.7.3.3 Land use

Question 01

June 2007 | BLY1B | Original Q2 | Legacy

QUESTION TWO

The burning of forests to create more land for growing rice is affecting the environment.

Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A biodiversity

B carbon dioxide

C energy

D methane

Forests remove . . . **1** . . . from the atmosphere.

Cutting down forests reduces the amount of . . . **2** . . . .

Growing more rice is increasing the amount of . . . **3** . . . in the atmosphere.

The greenhouse effect is caused by the re-radiation of . . . **4** . . . back to the Earth.

4.7.3.3 Land use

Question 02

June 2007 | BLY1B | Original Q4 | Legacy

QUESTION FOUR

Human activities affect the environment.

Match words, **A**, **B**, **C** and **D**, with the statements **1–4** in the table.

A burning fuels that release sulfur dioxide

B digging a new quarry

C sewage disposal

D using pesticides on crops

	Effect on the environment
1	pollutes hedges that surround fields
2	pollutes river water directly
3	produces acid rain
4	reduces the land available for wild plants

4.7.3.3 Land use

Question 03

June 2008 | BLY1BP | Original Q6 | Legacy

QUESTION SIX

This question is about adult cell cloning.

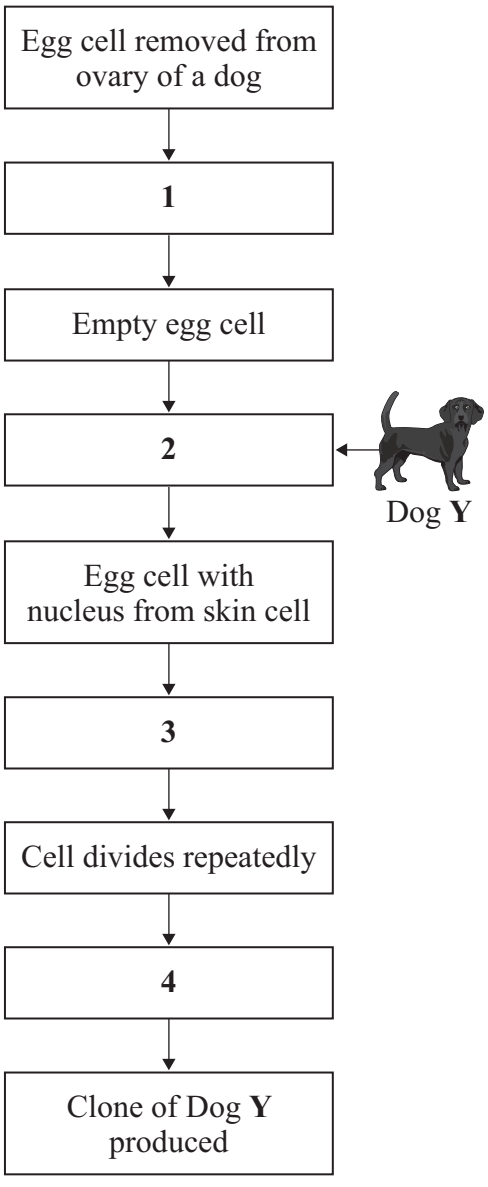
Match stages, **A**, **B**, **C** and **D**, with the labels **1–4** on the diagram to explain how clones of dogs can be produced.

A nucleus transferred from skin cell of Dog **Y**

B electric shock applied

C ball of cells inserted into womb of female

D nucleus removed from egg cell



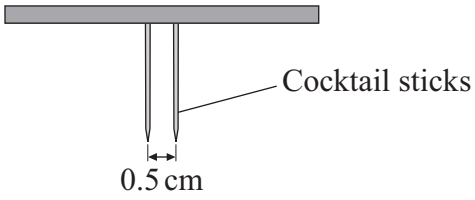
4.7.3.3 Land use

Question 04

November 2008 | BLY1AP | Original Q7 | Legacy

QUESTION SEVEN

A class of 30 students took part in an investigation to find out how sensitive different parts of the body are to touch.



A student set the points of the two cocktail sticks 0.5 cm apart. He then pressed them gently on different parts of the body of a blindfolded student. This was repeated with all 30 students.

The table below shows the number of students who were able to feel both points.

Part of the body tested	Number of students feeling both points
forehead	15
lip	27
fingertip	29
back of hand	14
knee	9

7A What would be the best way to display these results?

1 a pie chart

2 a line graph

3 a bar chart

4 a scattergram

7B From these results, which part of the body is most sensitive to touch?

1 knee

2 fingertip

3 lip

4 forehead

7C Some parts of the body are more sensitive to touch than others.

This is because in these parts the skin contains more . . .

1 cells.

2 hairs.

3 muscles.

4 receptors.

7D A different class of students repeated the same experiment later in the day and got similar results.

What does this suggest?

1 The students all have sensitive skin.

2 The data collected by the students is reliable.

3 The students made errors when collecting their data.

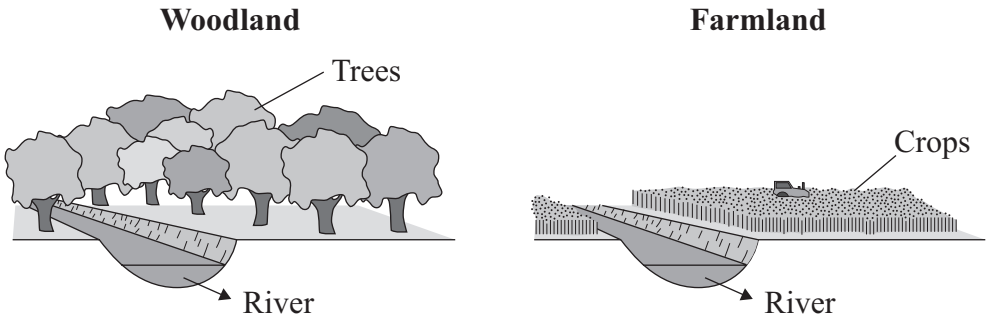
4 The two classes should have tested different parts of the body.

4.7.3.3 Land use

Question 05

June 2009 | BLY1F | Original Q2 | Legacy

2 The drawings show some woodland and some farmland. Both have a river flowing through.



2 (a) (i) There is a wider variety of wildlife in the woodland than in the farmland.

Give **one** reason why.

.....

.....

(1 mark)

(Extra space) .....

2 (a) (ii) Farmers remove woodland to provide space for growing crops.

Give **two** other reasons why humans remove woodland.
Do **not** include the uses of wood in your answers.

1 .....

.....

2 .....

.....

(2 marks)

Question 05 · continued

for mark

2 (b) Many farmers spray chemicals on their fields.

Draw a ring around the correct word to complete each sentence.

2 (b) (i) To make crops grow larger, farmers use

fertilisers
herbicides
pesticides

.

(1 mark)

2 (b) (ii) To kill insects that feed on the crop, farmers use

fertilisers
herbicides
pesticides

.

(1 mark)

2 (b) (iii) There is a wider variety of wildlife in the river flowing through the woodland than in the river flowing through the farmland.

Give **one** reason why.

.....

.....

(1 mark)

(Extra space) .....

2 (c) The population of the UK has increased over the last two hundred years. This increase in population has resulted in damage to the environment.

Apart from farming methods, give **two** ways in which humans damage the environment.

1.....

.....

2.....

.....

(2 marks)

8

4.7.3.3 Land use

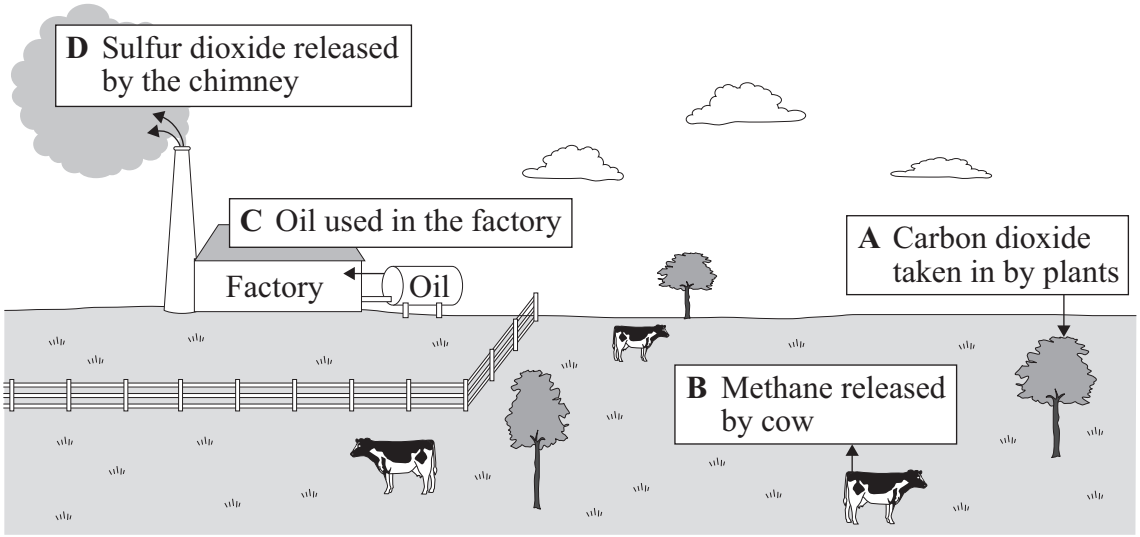
Question 06

November 2009 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

The diagram shows some of the processes occurring at a farm and the factory close by.

Match processes, **A**, **B**, **C** and **D**, with the numbers **1–4** in the table.



	Effect
1	increases global warming
2	may form acid rain
3	reduces the amount of greenhouse gas in the air
4	uses up a fuel

4.7.3.3 Land use

Question 07

January 2010 | BLY3F | Original Q3 | Legacy

3 (a) Why did the students set up three flasks like **Flask A** rather than just one?

.....

.....

(1 mark)

3 (b) After one week, the students looked at one drop of liquid from each flask under a microscope.

Their results are given in the table.

Repeat number	Flask A	Flask B
1	No bacteria	Bacteria visible
2	No bacteria	Bacteria visible
3	No bacteria	Bacteria visible

4.7.3.3 Land use

Question 07 · continued

for mark

Explain the results for **Flask A** and **Flask B**.

Flask A

.....

.....

.....

.....

Flask B

.....

.....

.....

.....

(3 marks)

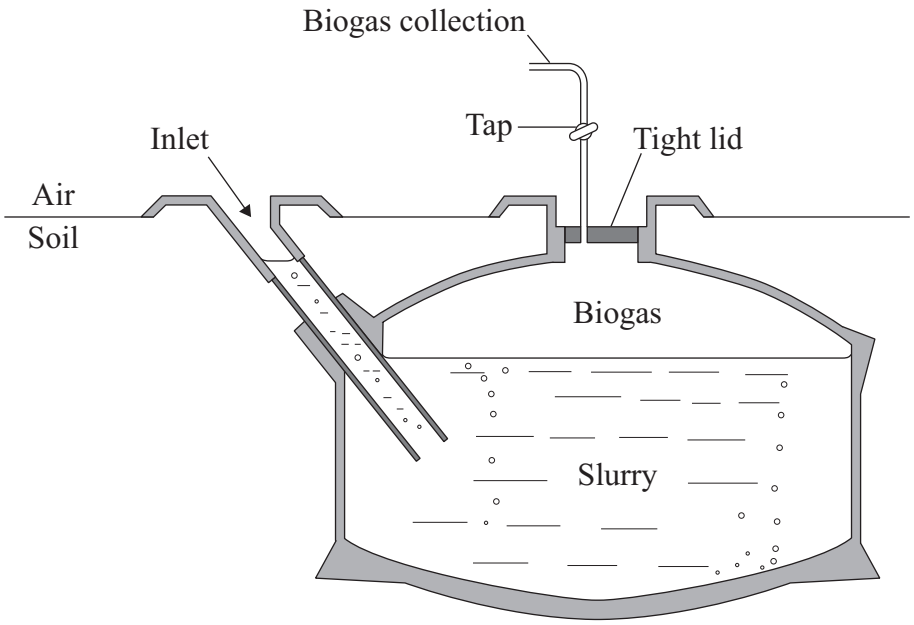
4

4.7.3.3 Land use

Question 07 · continued

for mark

4 The diagram shows one type of biogas generator.



4.7.3.3 Land use

Question 08

March 2010 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

The drawing shows trees being cleared to make more land for farming.



Match words, **A**, **B**, **C** and **D**, with the numbers **1–4** in the sentences.

A biodiversity

B pollution

C global warming

D deforestation

The removal of vast areas of trees is called . . . **1** . . . .

This can reduce . . . **2** . . . .

The trees no longer remove carbon dioxide from the atmosphere. This results in increased . . . **3** . . . .

The lorries used to move the trees cause air . . . **4** . . . .

4.7.3.3 Land use

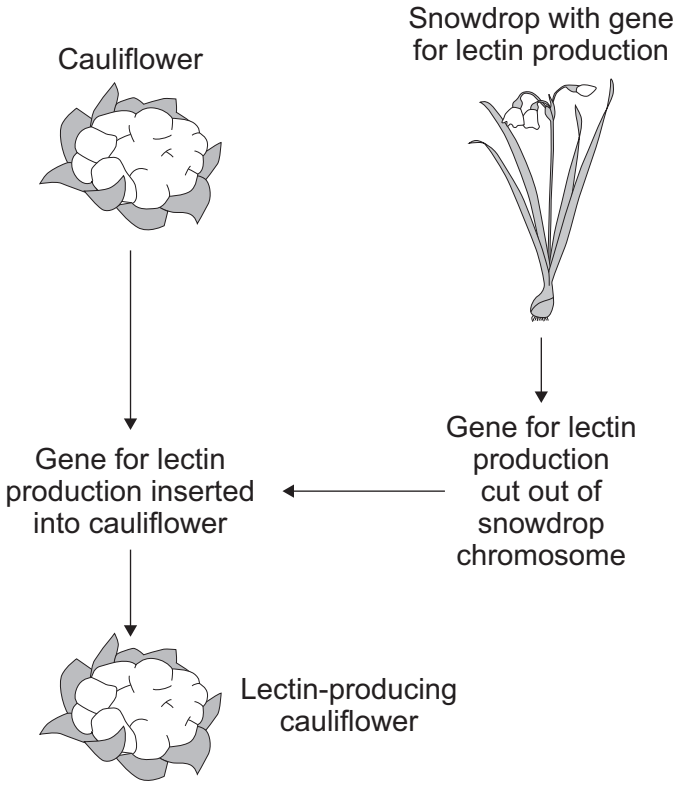
Question 09

June 2010 | BLY1BP | Original Q9 | Legacy

QUESTION NINE

Up to 40 % of cauliflower crops may be eaten by insects.
Snowdrops can survive attacks by insects because they produce a substance called lectin.
Lectin interferes with the insect's digestive system.

The diagram shows one method of introducing the gene for lectin production into cauliflowers.



9A The gene for lectin production is cut from the snowdrop chromosome using . . .

1 lectin.

2 a herbicide.

3 an enzyme.

4 an electric shock.

9B The technique used to transfer the gene from the snowdrop to the cauliflower is called . . .

1 biodiversity.

2 embryo transplant.

3 cloning.

4 genetic engineering.

4.7.3.3 Land use

9C What is the main benefit to the environment of farmers growing lectin-producing cauliflowers?

1 More snowdrops will survive.

2 Less pesticide will be used.

3 Insects will eat something else.

4 Less fertiliser will be needed.

9D An ethical concern about this technique is that . . .

1 it will make farmers richer.

2 it will increase biodiversity.

3 it is interfering with nature.

4 it is sustainable.

END OF TEST

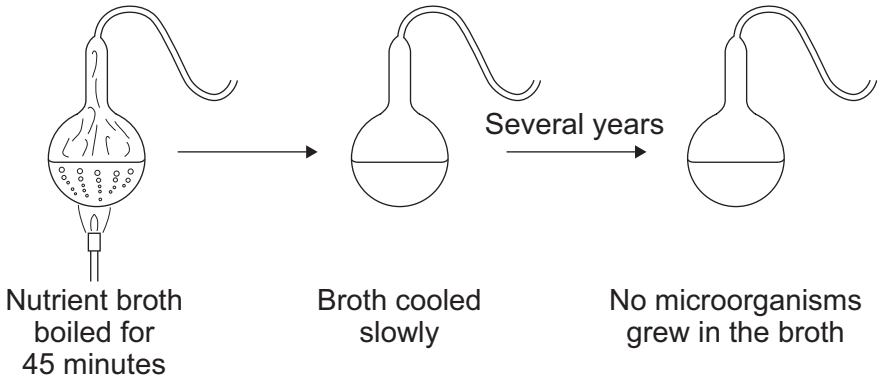
4.7.3.3 Land use

Question 10

June 2010 | BLY3F | Original Q8 | Legacy

8 **Diagram 1** shows some details of an investigation carried out by Louis Pasteur.

Diagram 1



8 (a) (i) Why did Pasteur boil the nutrient broth?

.....

.....

(1 mark)

8 (a) (ii) Because of the shape of the flask, no microorganisms grew even after several years.

Explain why.

.....

.....

(1 mark)

8 (b) Pasteur repeated the investigation several times.

Why is it useful to repeat a scientific investigation several times?

.....

.....

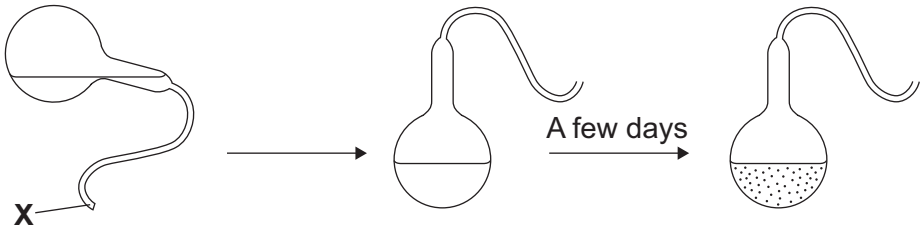
(1 mark)

4.7.3.3 Land use

Question 10 · continued

8 (c) After several years, some of Pasteur's flasks were tilted so that the broth flowed to point **X**, as shown in **Diagram 2**. The flasks were then returned to the upright position and left for a few days.

Diagram 2



Flask tilted so broth flowed to point **X**

Flask returned to upright position

Microorganisms grew in the broth

Microorganisms grew in the broth.

Explain why.

.....

.....

.....

.....

(2 marks)

8 (d) Complete the sentence.

This investigation provides evidence for the theory of ..... .

(1 mark)

6

4.7.3.3 Land use

Question 11

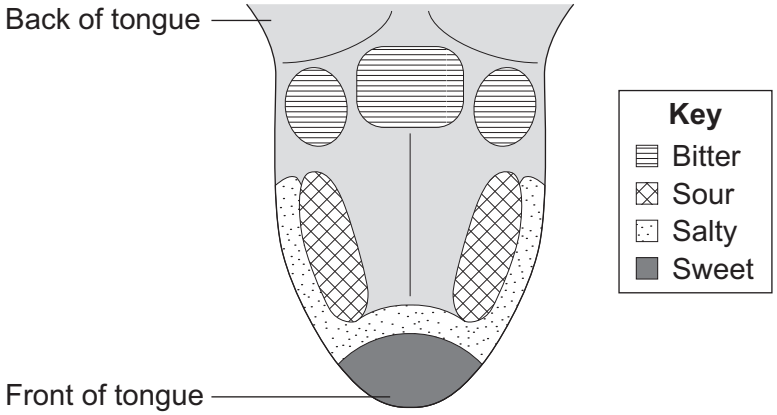
November 2010 | BLY1AP | Original Q8 | Legacy

QUESTION EIGHT

A student found **diagram 1** in a science book.

Diagram 1 shows how different areas of the tongue are sensitive to different tastes.

Diagram 1

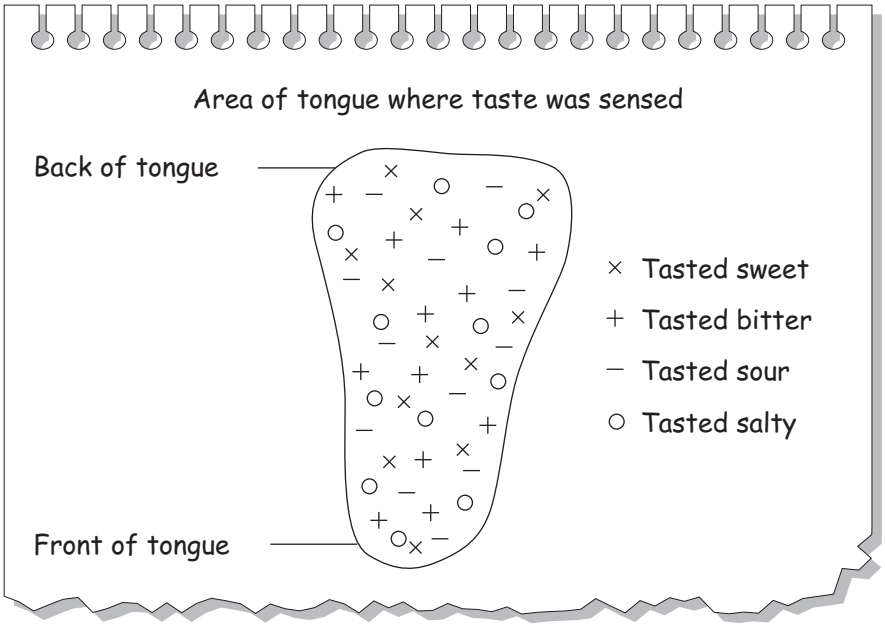


The student decided to find out if the book was correct.

She tested three people.

- She put a small drop of a sweet-tasting liquid on different parts of each person's tongue.
- She recorded each part of the tongue where the sweet-tasting liquid could be tasted.
- This was repeated for the other tastes.
- Her results are shown in **diagram 2**.

Diagram 2



Question 11 · continued

8A The cells in the tongue that sense the different tastes are called . . .

1 stimuli.

2 effectors.

3 receptors.

4 synapses.

8B These results would have been more reliable if . . .

1 a teacher had carried out the investigation.

2 more than three students had been tested.

3 more concentrated solutions had been used.

4 more areas of the tongue had been tested.

8C The best description of the student's results is that . . .

1 bitter tastes are sensed at the back of the tongue.

2 there are areas of the tongue where particular tastes are grouped.

3 sour tastes are always sensed at the sides of the tongue.

4 there are no definite areas of the tongue for sensing particular tastes.

8D The information about the tongue in the science book . . .

1 is not supported by the student's data.

2 must be correct.

3 proves that the student's data is not valid.

4 proves that the student's method is wrong.

4.7.3.3 Land use

Question 12

January 2011 | BLY1F | Original Q6 | Legacy

6 The photograph shows water buffalo.
The water buffalo are being used to get a field ready for growing rice.



Draw a ring around the correct answer to complete each sentence.

6 (a) Rice crops add to global warming because rice produces

methane.
oxygen.
sulfur dioxide.

(1 mark)

6 (b) Waste from the buffalo is spread on the rice fields.

This means that the farmer needs to use less

fertiliser.
herbicide.
pesticide.

(1 mark)

6 (c) Using buffalo instead of a tractor helps to save

biodiversity.
fuel.
trees.

(1 mark)

6 (d) Global warming is caused by

acid rain.
the greenhouse effect.
toxic chemicals.

(1 mark)

4

4.7.3.3 Land use

Question 13

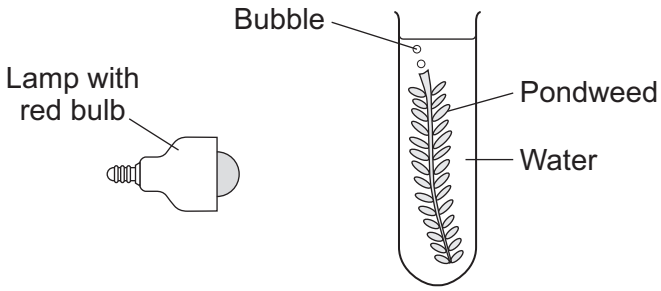
January 2011 | BLY2F | Original Q7 | Legacy

7 A group of pupils investigated the way in which the colour of light affects photosynthesis.

The pupils:

- put a piece of pondweed into a test tube of water
- shone light from a lamp with a red light bulb onto the pondweed
- counted the bubbles of gas produced by the pondweed every minute for three minutes.

The diagram shows the experiment.



The pupils repeated their experiment using a yellow light bulb, a green light bulb and a blue light bulb.

7 (a) (i) What was the independent variable in the investigation?

.....

(1 mark)

7 (a) (ii) To make the investigation fair the pupils needed to control some variables.

Suggest **one** variable that the pupils should have controlled during their investigation.

.....

(1 mark)

7 (a) (iii) It is better to count the bubbles every minute for three minutes than to count all the bubbles in three minutes.

Why?

.....

.....

(1 mark)

4.7.3.3 Land use

Question 13 · continued

7 (b) The table shows the pupils' results.

Colour of bulb	Number of bubbles produced in one minute			
	1st minute	2nd minute	3rd minute	Mean
Red	24	19	21	21
Yellow	18	14	15	16
Green	6	4	3	4
Blue	32	34	32	33

Algae are tiny organisms that photosynthesise.
In natural light algae grow very quickly on the sides of a fish tank.
The algae make it difficult to see the fish.

7 (b) (i) What would be the best colour of light bulb to illuminate the fish tank to reduce the growth of algae?

Use the results in the table to help you to decide.

Draw a ring around **one** answer.

red **yellow** **green** **blue**

(1 mark)

7 (b) (ii) Explain why the colour you have chosen is the best.

.....

.....

.....

.....

(2 marks)

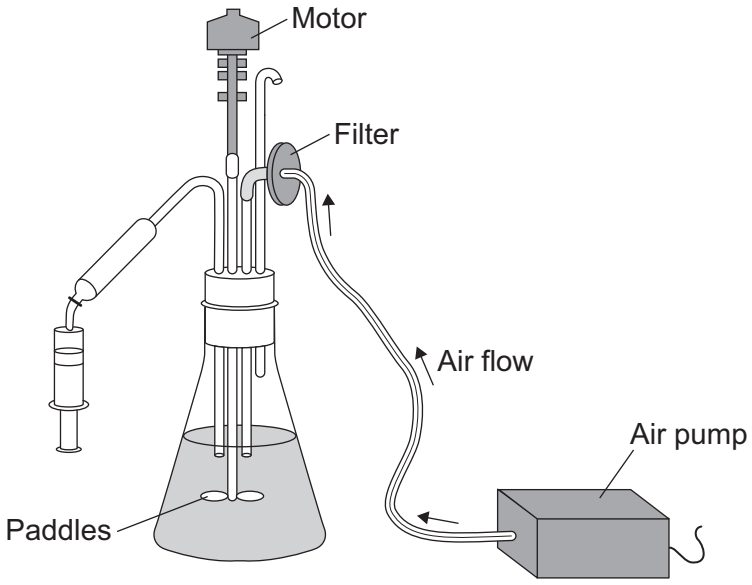
6

4.7.3.3 Land use

Question 14

January 2011 | BLY3F | Original Q6 | Legacy

6 The diagram shows a simple laboratory fermenter.



Some students grew the fungus *Fusarium* in this fermenter.
After 5 days the students measured the dry mass of the *Fusarium*.

6 (a) **List A** gives the names of three pieces of apparatus in the diagram.
List B gives four possible functions of these pieces of apparatus.

Draw **one** line from each piece of apparatus in **List A** to its correct function in **List B**.

List A Apparatus	List B Function
Air pump	To stop microorganisms entering the flask
Filter	To allow gases to escape from the flask
Paddles	To supply oxygen to the fungus
	To keep the contents well mixed

(3 marks)

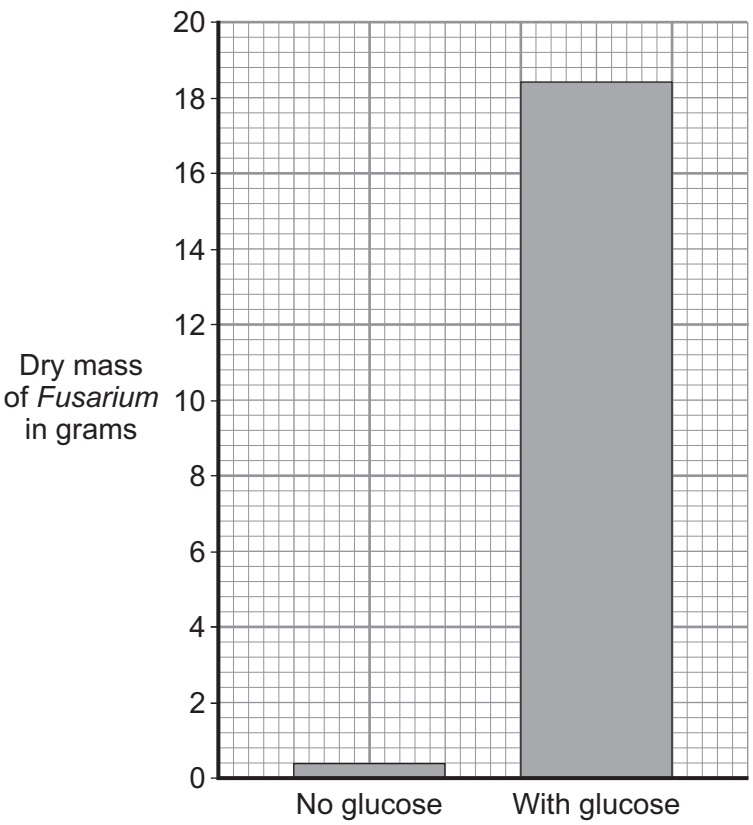
Question 6 continues on the next page

Question 14 · continued

6 (b) The students grew the *Fusarium* in a culture solution of minerals dissolved in water.

The students repeated the experiment with the same concentration of minerals, but this time they also added glucose.

The bar chart shows the effect of adding glucose to the culture solution.



6 (b) (i) Describe, in detail, the effect of adding glucose to the culture solution.

.....

.....

.....

.....

(2 marks)

6 (b) (ii) Suggest an explanation for the effect of adding glucose.

.....

.....

(1 mark)

Question 14 · continued

6 (c) The students repeated the investigation four more times. They used the culture solution with added glucose but each time they left out one of the minerals.

Their results are given in the table.

Mineral left out of the culture solution	Dry mass of *Fusarium* in grams
Calcium	18.50
Iron	16.80
Magnesium	1.90
Potassium	10.80

Which mineral is most important for the growth of *Fusarium*?

Draw a ring around **one** answer.

calcium **iron** **magnesium** **potassium**

(1 mark)

6 (d) Draw a ring around the correct answer to complete the sentence.

In industry, *Fusarium* is usually grown to make

alcohol.

biogas.

mycoprotein.

(1 mark)

8

4.7.3.3 Land use

Question 15

March 2011 | BLY1BP | Original Q8 | Legacy

QUESTION EIGHT

The picture shows part of a forest burning in Mexico.



8A The main reason for burning forests like this is to . . .

1 reduce the need for fertilisers.

2 use the land for agriculture.

3 use the land for roads.

4 reduce the 'greenhouse effect'.

8B Many scientists believe that large-scale deforestation has led to an increase in the carbon dioxide concentration in the atmosphere.

Which row in the table shows the effects of deforestation?

	Amount of carbon dioxide locked up in wood	Amount of carbon dioxide released by burning	Amount of carbon dioxide released by microorganisms
1	increases	decreases	increases
2	decreases	increases	increases
3	increases	increases	increases
4	decreases	decreases	decreases

4.7.3.3 Land use

Question 15 · continued

March 2011 | BLY1BP | Original Q8 | Legacy

8C Deforestation affects biodiversity.

What does the biodiversity of a habitat measure?

1 the total number of all living things in the habitat

2 the number of animal and plant species that have become extinct in the habitat

3 the number of different species in the habitat

4 the total number of animals of the most common species in the habitat

8D Sometimes cattle may be kept on areas that have been deforested.

Which gas in the atmosphere is produced in large amounts by cattle but not by humans?

1 carbon dioxide

2 methane

3 oxygen

4 sulfur dioxide

4.7.3.3 Land use

Question 16

June 2011 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

Human activities affect the environment.

Match activities, **A**, **B**, **C** and **D**, with the statements **1**–**4** in the table.

A burning fuels that release carbon dioxide

B building new houses

C spraying crops with pesticides

D using weedkillers on crops

	Effect on the environment
1	may damage hedges that surround fields
2	may kill useful insects such as bees
3	may cause global warming
4	may reduce the land available for wild plants

4.7.3.3 Land use

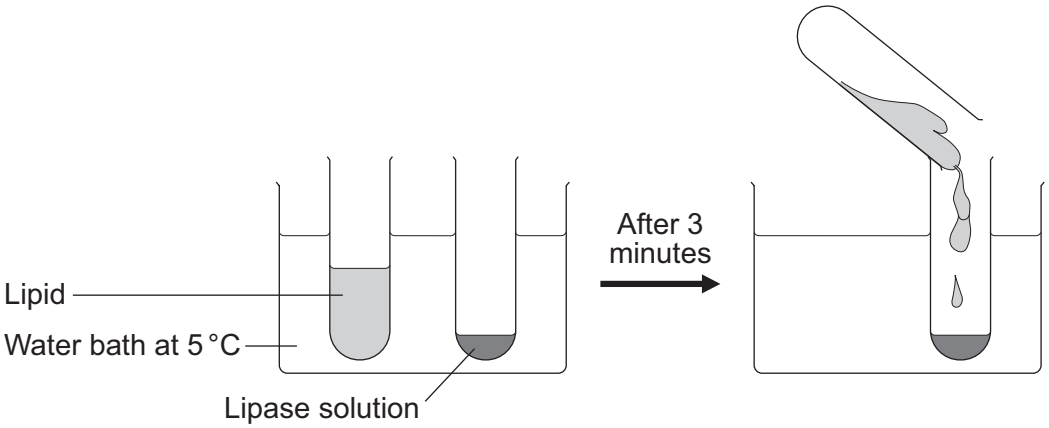
Question 17

June 2011 | BLY2F | Original Q8 | Legacy

8 A group of students investigated the effect of temperature on the action of the enzyme lipase.

The students:

- put 1 cm^3 of lipase solution into a test tube
- put 5 cm^3 of lipid into a different test tube
- put both tubes in a water bath at 5 °C for 3 minutes
- mixed the lipid with the lipase solution.



Every five minutes the students tested a sample of the mixture for lipid, until no lipid remained.
The students repeated the experiment at different temperatures.

8 (a) To make their investigation fair the students needed to control some variables.

Give **one** variable the students controlled in their investigation.

.....

(1 mark)

8 (b) The tubes of lipase solution and lipid were kept separately in the water bath for 3 minutes before mixing. Why?

Tick (✓) **one** box.

So that the lipase broke down the lipid quickly ☐

So that the lipase and the lipid reached the right temperature ☐

To give enough time for the lipase to break down the lipid ☐

To give enough time for the water bath to heat up ☐

(1 mark)

4.7.3.3 Land use

Question 17 · continued

The table shows the students' results.

Temperature in °C	Time taken until no lipid remained in minutes
5	40
20	15
35	5
50	30
95	lipid still there after 120 minutes

8 (c) Describe the effect on the breakdown of the lipid of increasing the temperature from 5 °C to 50 °C.

.....

.....

.....

.....

(2 marks)

8 (d) Suggest **two** ways in which the students could have improved their investigation.

Use information from the students' method and the results table to help you.

1 .....

.....

.....

2 .....

.....

.....

(2 marks)

Question 8 continues on the next page

4.7.3.3 Land use

Question 17 · continued

8 (e) (i) The lipase did **not** break down the lipid at 95°C.

Why?

.....

.....

(1 mark)

8 (e) (ii) At 35°C the lipase broke down the lipid after 5 minutes.

What new substances will be in the tube?

Draw a ring around **one** answer.

amino acids **fatty acids and glycerol** **sugars**

(1 mark)

8

4.7.3.3 Land use

Question 18

November 2011 | BLY1BP | Original Q2 | Legacy

QUESTION TWO

Human activities affect the environment.

Match activities, **A**, **B**, **C** and **D**, with the statements **1**–**4** in the table.

A deforestation

B recycling waste

C less cattle farming

D treating sewage

	Effect on the environment
1	reduces river pollution
2	reduces the need for landfill sites
3	reduces biodiversity
4	reduces the production of methane

4.7.3.3 Land use

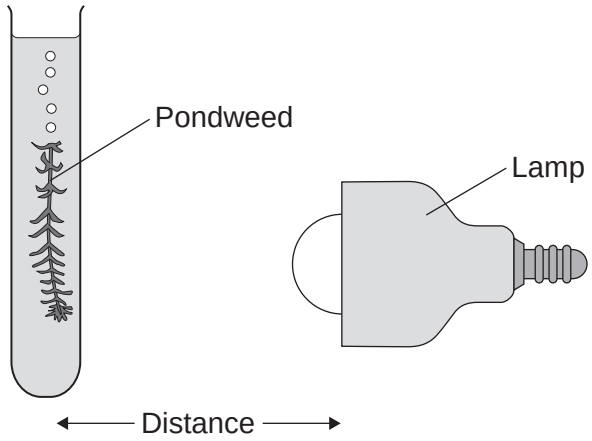
Question 19

January 2013 | BL2FP | Original Q7 | Legacy

7 Some students investigated the effect of light intensity on the rate of photosynthesis.

They used the apparatus shown in **Diagram 1**.

Diagram 1



The students:

- placed the lamp 10 cm from the pondweed
- counted the number of bubbles of gas released from the pondweed in 1 minute
- repeated this for different distances between the lamp and the pondweed.

7 (a) The lamp gives out heat as well as light.

What could the students do to make sure that heat from the lamp did **not** affect the rate of photosynthesis?

.....

.....

(1 mark)

4.7.3.3 Land use

Question 19 · continued

7 (b) The table shows the students' results.

Distance in cm	Number of bubbles per minute
10	84
15	84
20	76
40	52
50	26

7 (b) (i) At distances between 15cm and 50cm, light was a limiting factor for photosynthesis.

What evidence is there for this in the table?

.....

.....

(1 mark)

7 (b) (ii) Give **one** factor that could have limited the rate of photosynthesis when the distance was between 10cm and 15cm.

.....

(1 mark)

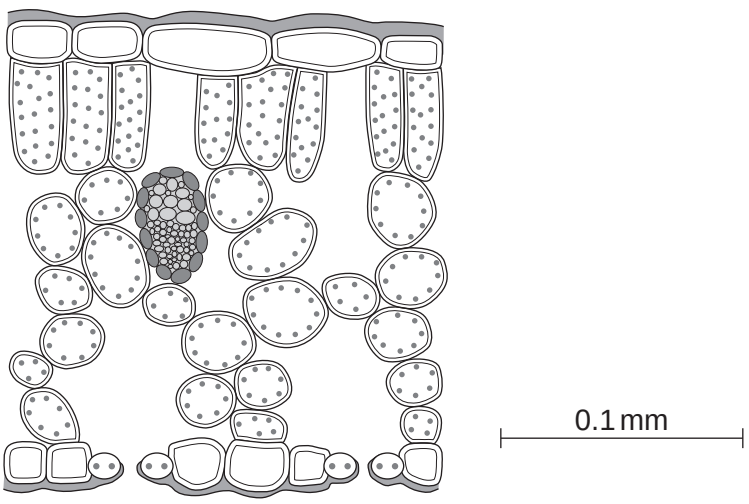
Question 7 continues on the next page

Question 19 · continued

7 (c) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Diagram 2 shows a section through a plant leaf.

Diagram 2



Describe the structure of the leaf and the functions of the tissues in the leaf.

You should use the names of the tissues in your answer.

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4.7.3.3 Land use

Question 20

June 2013 | BL2FP | Original Q6 | Legacy

6 (a) Use words from the box to complete the equation for aerobic respiration.

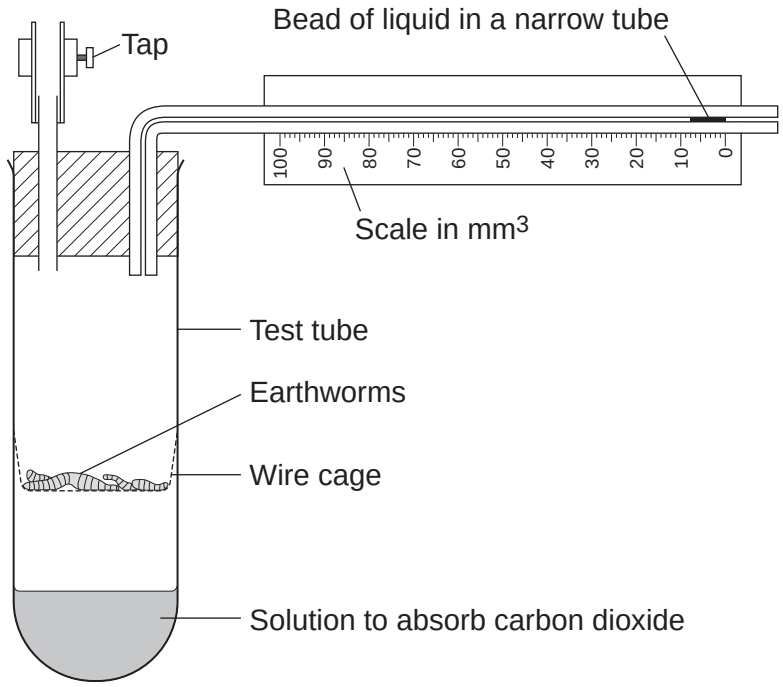
alcohol	glucose	lactic acid	water

..... + oxygen ⟶ carbon dioxide + ... (+ energy)

(2 marks)

6 (b) Some students investigated the effect of temperature on the rate of aerobic respiration in earthworms.

The diagram shows the apparatus the students used.
When the tap is closed, the bead of liquid moves to the left as the earthworms take in oxygen.



The students put the test tube into a water bath at 20 °C for 10 minutes.
They left the tap open during this time.

4.7.3.3 Land use

Question 20 · continued

Why did the students put the test tube in the water bath at 20 °C for 10 minutes?

Tick (✓) **one** box.

Because the air contains more oxygen at 20°C. ☐

Because the air contains less carbon dioxide at 20°C. ☐

So the earthworms' body temperature would change to 20°C. ☐

(1 mark)

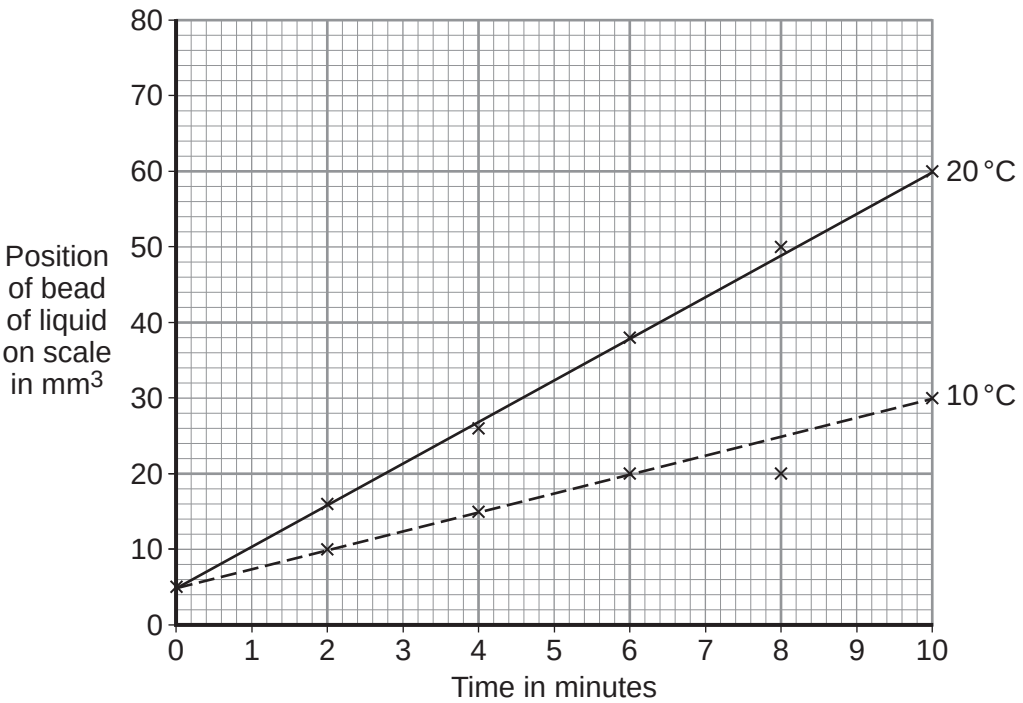
Question 6 continues on the next page

Question 20 · continued

6 (c) The students then:

- closed the tap
- started a stopwatch
- recorded the position of the bead of liquid every 2 minutes for 10 minutes
- repeated the experiment at 10 °C.

The graph shows the students' results.



6 (c) (i) How much oxygen did the earthworms take in during the 10 minutes at 20 °C?

Use information from the graph to work out your answer.

.....

.....

.....

Volume of oxygen taken in = ... mm^3

(2 marks)

4.7.3.3 Land use

Question 20 · continued

6 (c) (ii) The earthworms took in this volume of oxygen in 10 minutes.

Use your answer from part **(c)(i)** to calculate how much oxygen the earthworms took in each minute.

.....

.....

Volume of oxygen taken in = ... mm^3 per minute

(1 mark)

6 (c) (iii) The earthworms took in less oxygen each minute at 10 °C than they took in at 20 °C.

Explain why.

.....

.....

.....

.....

(2 marks)

6 (d) When drawing the line on the graph for the experiment at 10 °C, the students ignored the reading at 8 minutes.

6 (d) (i) Suggest why they ignored the reading at 8 minutes.

.....

.....

(1 mark)

6 (d) (ii) One student suggested they should repeat the experiment twice more at each temperature.

How would repeating the experiment improve the investigation?

.....

.....

(1 mark)

10

4.7.3.3 Land use

Question 21

June 2013 | BL3FP | Original Q1 | Legacy

1 Human activities affect the environment.

1 (a) **List A** gives four human activities.

List B gives the effect of the activities on the environment.

Draw **one** line from each human activity in **List A** to its effect on the environment in **List B**.

List A Human activity	List B Effect on the environment
	Adds methane to the atmosphere
Digging a new quarry	
	Pollutes hedges around fields
Spraying pesticides on crops	
	Reduces the land available for wild animals
Growing rice	
	Produces lots of litter
Driving cars that release sulfur dioxide	
	Produces acid rain

(4 marks)

4.7.3.3 Land use

Question 21 · continued

1 (b) Human activities are increasing *global warming*.

Give **two** effects of *global warming* on the environment.

1 .....

.....

2 .....

.....

(2 marks)

6

Turn over for the next question

4.7.3.3 Land use

Question 22

June 2014 | BL2FP | Original Q9 | Legacy

9 **Figure 13** shows an athlete running on a treadmill.

Figure 13



After running for several minutes, the athlete's leg muscles began to ache.
This ache was caused by a high concentration of lactic acid in the muscles.

9 (a) The equation shows how lactic acid is made.

glucose ⟶ lactic acid (+ energy)

Name the process that makes lactic acid in the athlete's muscles.

[1 mark]

.....

9 (b) Scientists investigated the production of lactic acid by an athlete running at different speeds.

In the investigation:

- the athlete ran on the treadmill at 4 km per hour
- the scientists measured the concentration of lactic acid in the athlete's blood after 2 minutes of running.

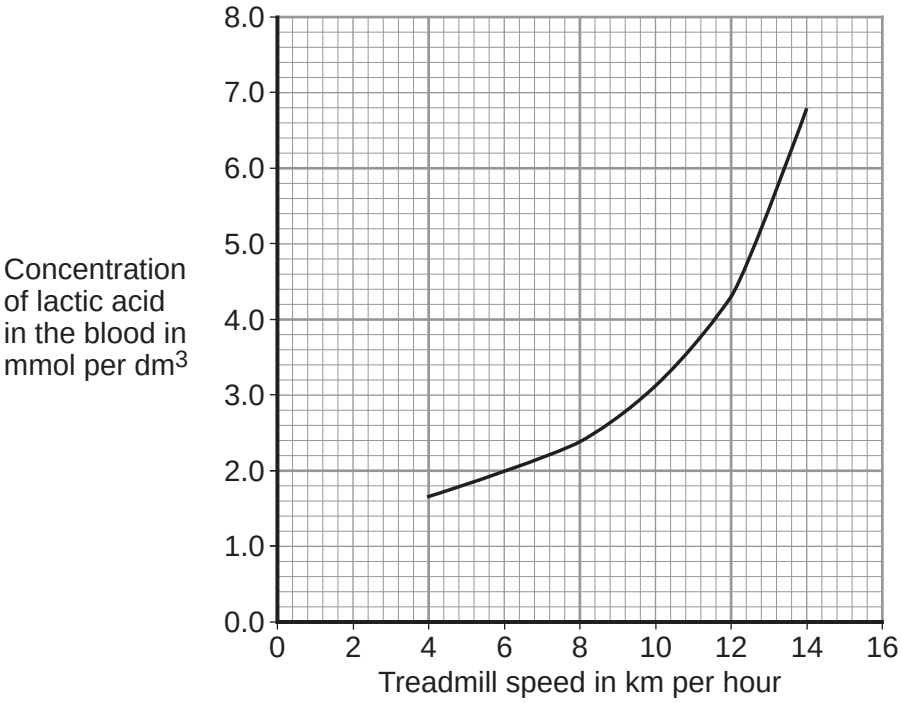
The investigation was repeated for different running speeds.

Figure 14 shows the scientists' results.

4.7.3.3 Land use

Question 22 · continued

Figure 14



9 (b) (i) How much more lactic acid was there in the athlete's blood when he ran at 14 km per hour than when he ran at 8 km per hour?

[2 marks]

.....

.....

.....

Answer = ... mmol per dm^3

9 (b) (ii) Why is more lactic acid made in the muscles when running at 14 km per hour than when running at 8 km per hour?

[3 marks]

.....

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6

4.7.3.3 Land use

Question 23

June 2014 | BL3FP | Original Q7 | Legacy

7 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Deforestation affects the environment.

Deforestation is causing a change in the amounts of different gases in the atmosphere. This change causes global warming and climate change.

Figure 11 shows an area of deforestation.

Figure 11



Give the reasons why deforestation is taking place.

Describe how deforestation is causing the change in the amounts of different gases in the atmosphere.

[6 marks]

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4.7.3.3 Land use

Question 24

June 2015 | BL2FP | Original Q7 | Legacy

7 Lipase is an enzyme that digests fat.

7 (a) (i) Complete the equation to show the digestion of fat.

Use the correct answer from the box.

[1 mark]

glucose	**glycerol**	**glycogen**

fat $\xrightarrow{\text{lipase}}$ fatty acids + ...

7 (a) (ii) Name **one** organ that makes lipase.

[1 mark]

.....

7 (b) Some students investigated the effect of bile on the digestion of fat by lipase.

The students:
1 mixed milk and bile in a beaker
2 put the pH sensor of a pH meter into the beaker
3 added lipase solution
4 recorded the pH at 2-minute intervals
5 repeated steps 1 to 4, but used water instead of bile.

Suggest **two** variables that the students should have controlled in this investigation.

[2 marks]

1 .....

.....

2 .....

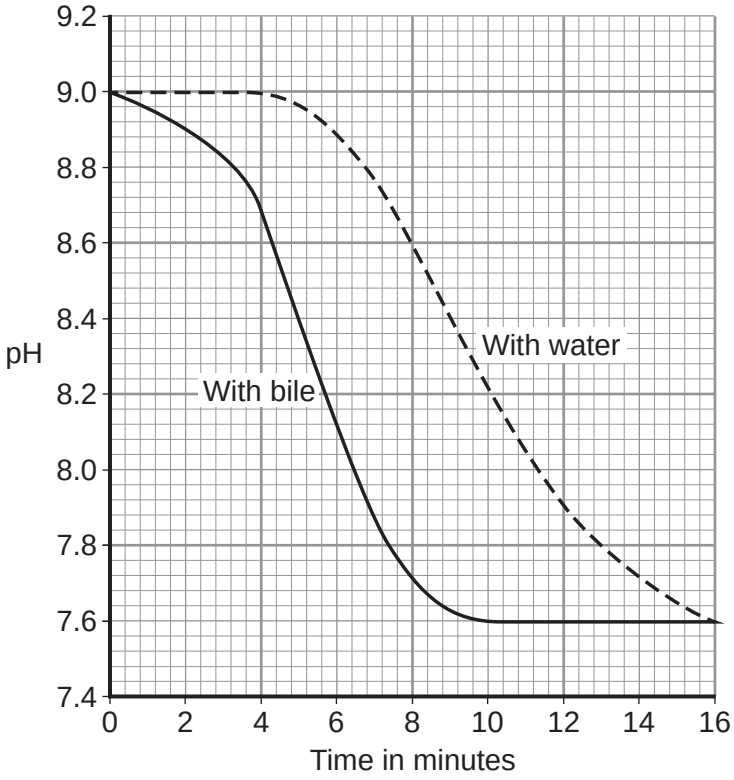
.....

4.7.3.3 Land use

Question 24 · continued

7 (c) **Figure 7** shows the students' results.

Figure 7



7 (c) (i) Why did the pH decrease in both investigations?

[1 mark]

.....

.....

7 (c) (ii) Bile helps lipase to digest fat.

What evidence is there in **Figure 7** to support this conclusion?

[1 mark]

.....

.....

7 (c) (iii) Suggest **one** reason why the contents of both beakers had the same pH at the end of the investigations.

[1 mark]

.....

.....

7

4.7.3.3 Land use

Question 25

June 2015 | BL3FP | Original Q2 | Legacy

2 The human population is increasing and more household waste is being produced.

2 (a) Give **one** way in which an increase in household waste affects our environment.

[1 mark]

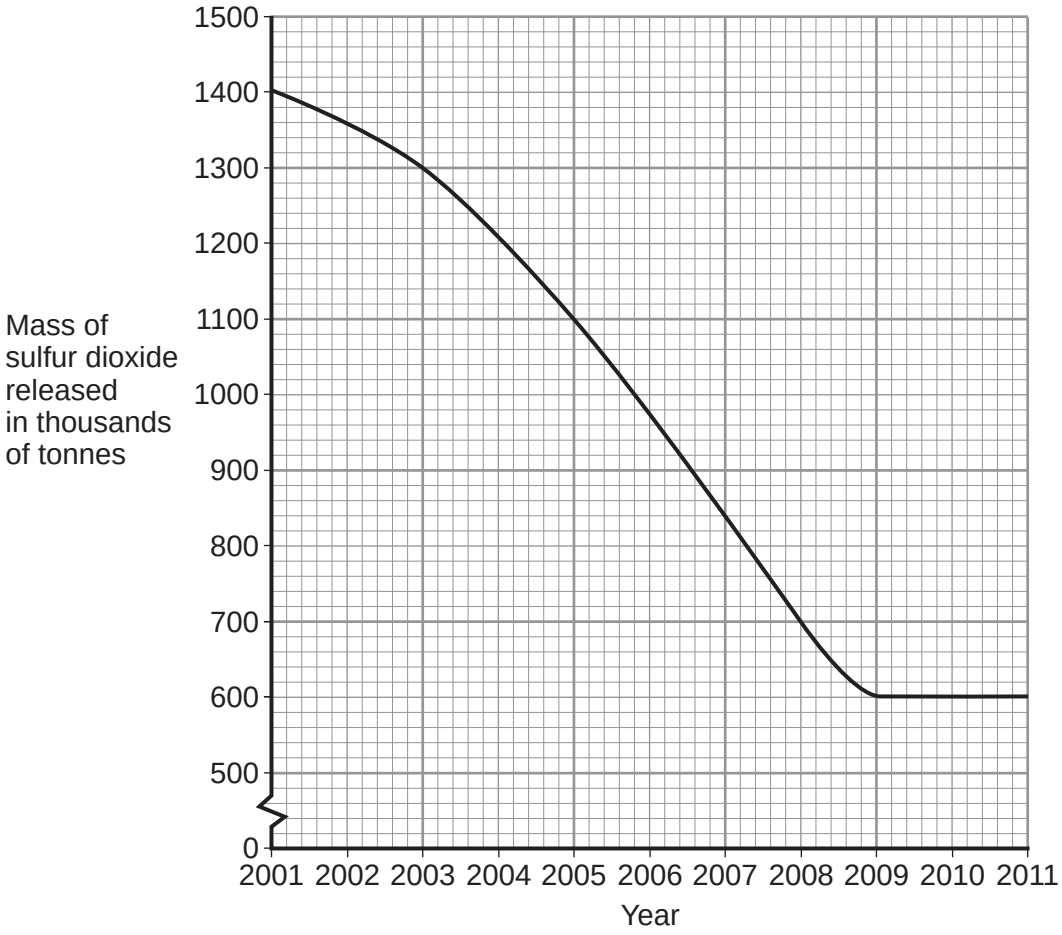
.....

.....

2 (b) The release of sulfur dioxide affects our environment.

Figure 2 shows how the mass of sulfur dioxide released in the UK has changed from 2001 to 2011.

Figure 2



2 (b) (i) Describe the pattern shown in **Figure 2**.

[2 marks]

.....

.....

.....

.....

4.7.3.3 Land use

Question 25 · continued

2 (b) (ii) In 2001, 1400 thousand tonnes of sulfur dioxide were released.

By which year had the amount of sulfur dioxide released reduced to half of this amount?

[2 marks]

.....

.....

.....

Year = ...

2 (b) (iii) Give **one** problem caused when sulfur dioxide gas is in the air.

[1 mark]

.....

.....

2 (c) Carbon dioxide is another gas that affects the environment.

Which **two** of the following help to reduce the levels of carbon dioxide in the atmosphere by storing carbon dioxide?

[2 marks]

Tick (✓) **two** boxes.

Animals respiring ☐

Carbon dioxide being absorbed in oceans and lakes ☐

Photosynthesis by trees ☐

The production of biogas ☐

8

4.7.3.3 Land use

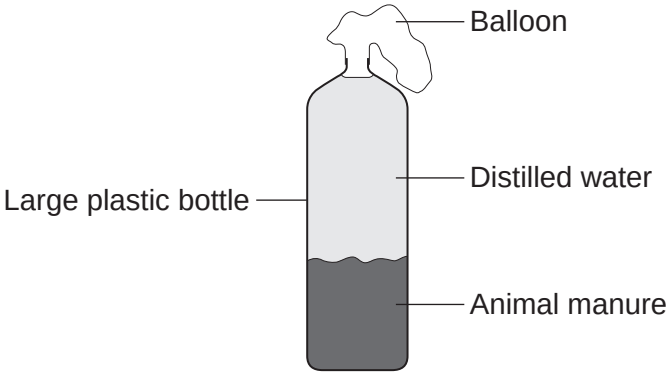
Question 26

June 2015 | BL3FP | Original Q4 | Legacy

4 Some students set up biogas generators to find out which type of animal manure produced the most biogas.

Figure 3 shows the apparatus they used.

Figure 3



The students:
Step 1: Put some cow manure into the plastic bottle
Step 2: Filled the bottle with distilled water
Step 3: Attached a balloon over the top of the bottle
Step 4: Put the bottle in a warm room for 10 days
Step 5: Measured the diameter of the balloon on day 10
Step 6: Repeated steps 1 to 5 using each type of animal manure.

The students' results are shown in **Table 2**.

Table 2

Type of animal manure	Diameter of balloon on day 10 in cm
Cow	29
Horse	26
Sheep	34
Pig	32

4.7.3.3 Land use

Question 26 · continued

4 (a) What is the main gas found in biogas?

[1 mark]

.....

4 (b) The students concluded that sheep manure is the best type of manure to use in a biogas generator.

A teacher told the students that the design of their investigation meant that their conclusion might **not** be correct.

Suggest **two** reasons why.

[2 marks]

1 .....

.....

2 .....

.....

4 (c) Another student suggested that adding potato to the manure would increase the amount of biogas produced.

Why would adding potato increase the amount of biogas produced?

[1 mark]

Tick (✓) **one** box.

The potato contains a lot of carbohydrate. ☐

The potato contains a lot of protein. ☐

The potato contains a lot of water. ☐

4

4.7.3.3 Land use

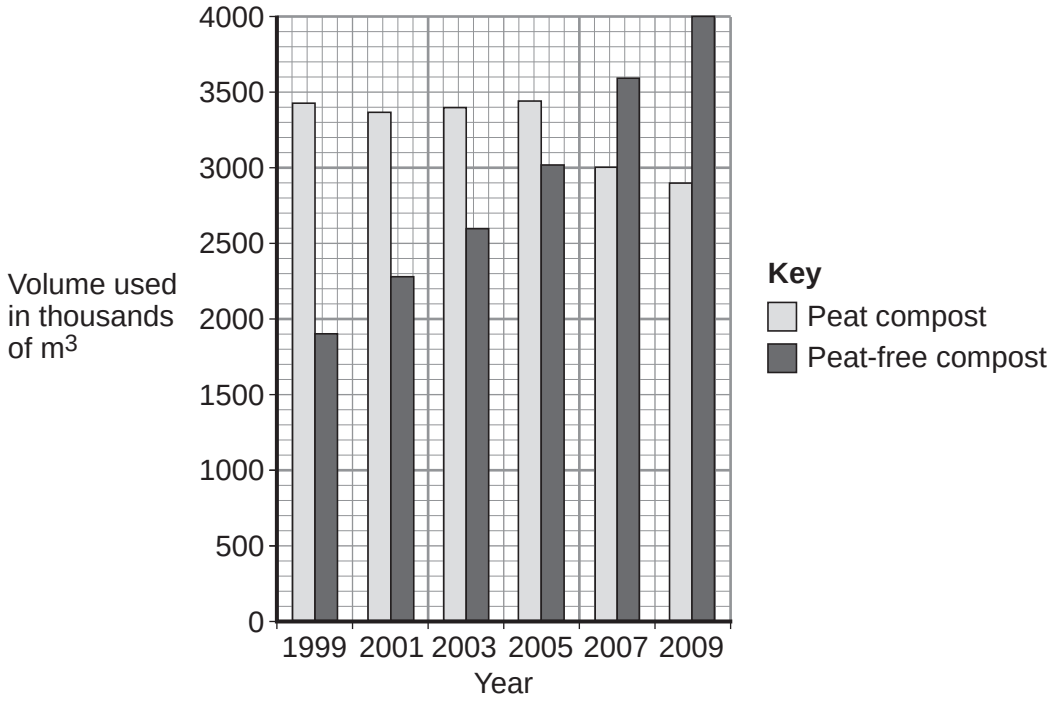
Question 27

June 2015 | BL3FP | Original Q9 | Legacy

9 Human activities have many effects on our ecosystem.

Figure 10 shows the volume of peat compost and peat-free compost used in gardening from 1999 to 2009.

Figure 10



9 (a) Describe the trends shown in **Figure 10**.

[2 marks]

.....

.....

.....

.....

.....

4.7.3.3 Land use

Question 27 · continued

9 (b) What effect does the destruction of peat bogs have on the gases in the atmosphere?

[1 mark]

.....

.....

9 (c) Deforestation is also damaging ecosystems.

Describe **one** effect of deforestation on ecosystems.

[1 mark]

.....

.....

4

4.7.3.3 Land use

Question 28

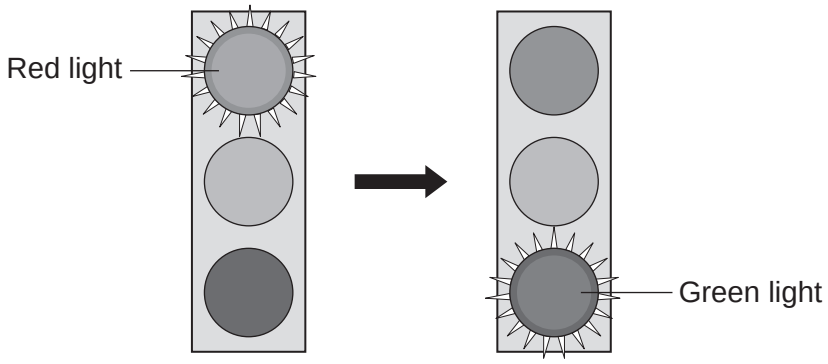
June 2016 | BL1FP | Original Q2 | Legacy

2 Car drivers need quick reactions to avoid accidents.

A student uses a computer program to measure reaction time.
The computer screen shows a traffic light on red. The traffic light then changes to green.

Figure 2 shows the change the person sees on the computer screen.

Figure 2



When the traffic light changes to green the person has to click the computer mouse as quickly as possible.
The computer program works out the time taken to react to the light changing colour.

2 (a) Special cells detect the change in colour.

2 (a) (i) What word is used to describe special cells that detect a change in the environment?

[1 mark]

Draw a ring around the correct answer.

receptor cells **reflex cells** **stimulus cells**

2 (a) (ii) Where in the body are the special cells that detect the change in colour of the traffic lights?

[1 mark]

_____

2 (b) The student used the computer program on one computer to measure the reaction times of people of different ages.

2 (b) (i) Give **one** variable the student should control so that a fair comparison can be made between the people of different ages.

[1 mark]

_____

_____

2 (b) (ii) The student did each measurement three times to calculate a mean value. **Table 1** shows the results.

Table 1

Age in years	Mean reaction time in milliseconds
15	242
30	
45	221
60	258
75	364
90	526

The reaction times for the 30-year-old person were **192**, **174** and **180** milliseconds.

Calculate the mean reaction time of the 30-year-old person.

[1 mark]

_____

_____

Mean reaction time = _____ milliseconds

2 (b) (iii) Which **one** of the following is an advantage of repeating each test three times and **not** doing the test just once?

[1 mark]

Tick (✓) **one** box.

Any anomalies can be identified. ☐

The results will be more precise. ☐

There will be no errors. ☐

4.7.3.3 Land use

Question 28 · continued

2 (b) (iv) Some people think that old people should **not** be allowed to drive a car.

Why is it more dangerous for old people to drive cars?

Use information from **Table 1** to support your answer.

[2 marks]

7

Turn over for the next question

4.7.3.3 Land use

Question 29

June 2016 | BL3FP | Original Q6 | Legacy

6 Human activity affects ecosystems.

6 (a) Draw **one** line from each human activity to the effect on ecosystems.

[2 marks]

Human activity	Effect on ecosystems
Increase in rice fields	Increases the amount of methane in the atmosphere
Destruction of peat bogs	Increases the amount of carbon dioxide that is released into the atmosphere
	Reduces the rate at which carbon dioxide is locked up as wood

6 (b) (i) Deforestation also affects the atmosphere.

Give **two** reasons why deforestation takes place.

[2 marks]

1 _____

_____

2 _____

_____

6 (b) (ii) Changes in the gases in our atmosphere can cause global warming.

Give **two** possible effects of a rise in the Earth's temperature.

[2 marks]

1 _____

_____

2 _____

_____

6

4.7.3.3 Land use

Question 30

June 2017 | BL2FP | Original Q8 | Legacy

8 Amylase is an enzyme that breaks down starch.

8 (a) Complete the equation to show the breakdown of starch.

[1 mark]

Starch $\xrightarrow{\text{amylase}}$ _____

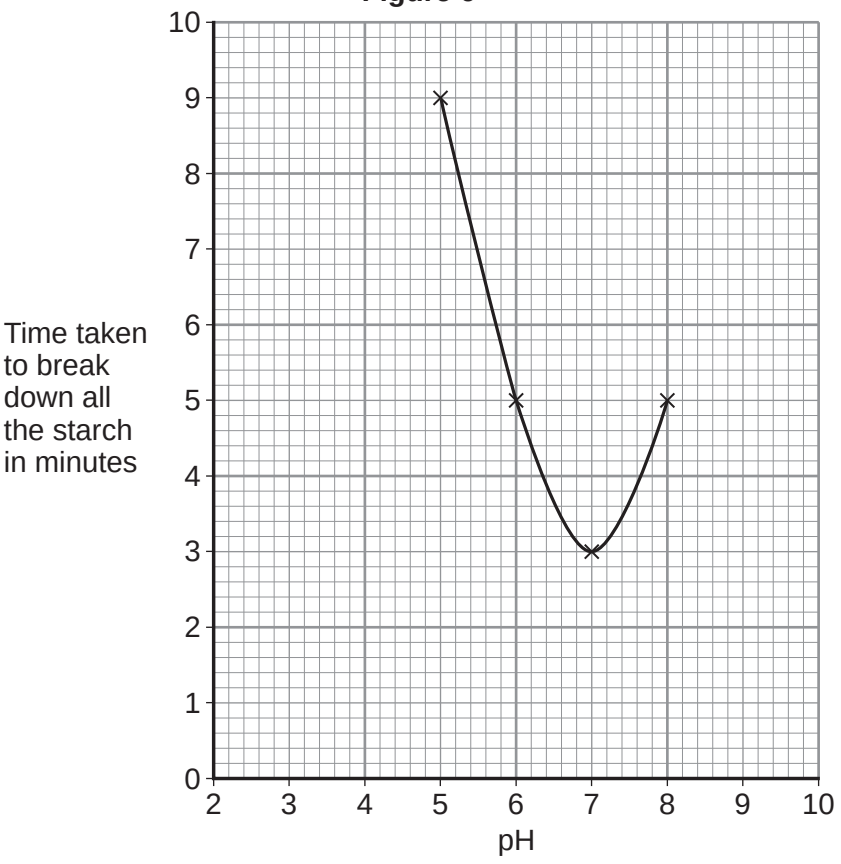
8 (b) Some students investigated the effect of pH on the activity of amylase.

The students:

- put 5 cm^3 of pH5 solution + 1 cm^3 of amylase solution into a test tube
- put 4 cm^3 of starch suspension into a second test tube
- left both test tubes at room temperature for 5 minutes
- mixed the contents of the two test tubes
- removed a small sample of the mixture at 1-minute intervals
- tested each sample for starch
- timed how long it took to break down all the starch
- repeated each of the above steps at pH6, pH7 and pH8.

Figure 9 shows the students' results.

Figure 9



4.7.3.3 Land use

Question 30 · continued

8 (b) (i) Give **two** variables which were controlled in this investigation.

[2 marks]

1 _____

_____

2 _____

_____

8 (b) (ii) The students tested samples of the reaction mixture for starch.
In each test, they added one drop of the reaction mixture to one drop of iodine solution on a white tile.

- Iodine solution = light brown colour
- Iodine solution + starch = dark blue colour

Predict the colour seen in the iodine test on the samples of the pH6 reaction mixture at 4 minutes and at 6 minutes.

[1 mark]

4 minutes _____

6 minutes _____

8 (b) (iii) The students concluded that amylase works best at pH7.
This may **not** be a valid conclusion.

Suggest **two** improvements to the investigation that would increase the validity of the students' conclusion.

[2 marks]

1 _____

_____

2 _____

_____

Question 8 continues on the next page

4.7.3.3 Land use

Question 30 · continued

8 (b) (iv) The students repeated the investigation at pH3.

What result would you expect at pH3?

Give a reason for your answer.

[2 marks]

8

4.7.3.3 Land use

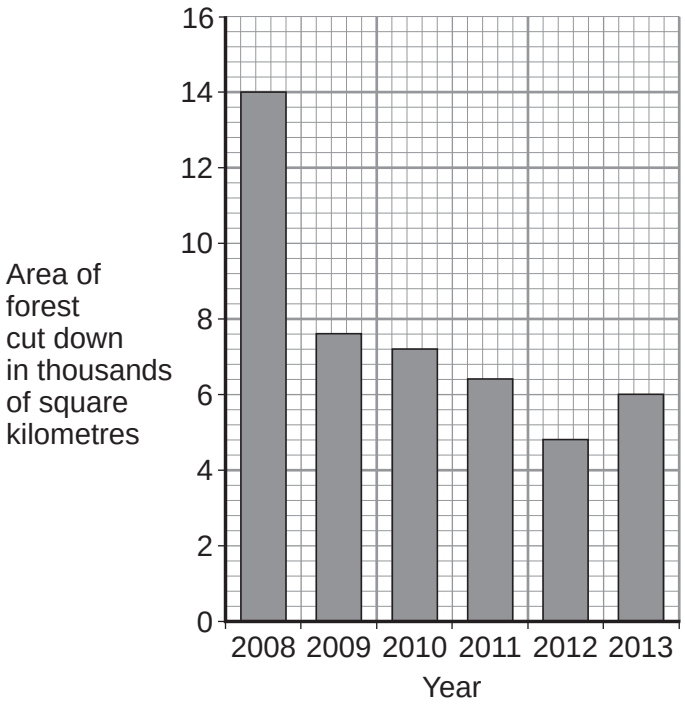
Question 31

June 2017 | BL3FP | Original Q1 | Legacy

1 Large areas of the Amazon rainforest have been cut down.

Figure 1 shows the area of forest cut down each year between 2008 and 2013 in the Amazon.

Figure 1



1 (a) (i) How many more thousand square kilometres of forest were cut down in 2008 than in 2013?

[1 mark]

Tick (✓) **one** box.

6.0 ☐

6.5 ☐

7.0 ☐

8.0 ☐

4.7.3.3 Land use

Question 31 · continued

1 (a) (ii) Give **two** reasons why forests are cut down.

[2 marks]

Tick (✓) **two** boxes.

- To decrease global warming ☐
- To decrease the amount of sulfur dioxide released ☐
- To increase biodiversity ☐
- To provide land to grow crops ☐
- To provide space for building ☐

1 (b) Deforestation changes the concentration of gases in the atmosphere.

The changes contribute to global warming.

Which **two** gases contribute to global warming?

[2 marks]

Tick (✓) **two** boxes.

- Carbon dioxide ☐
- Hydrogen ☐
- Methane ☐
- Nitrogen ☐
- Oxygen ☐

5

4.7.3.3 Land use

Question 32

June 2017 | BL3FP | Original Q4 | Legacy

4 Biogas is produced when bacteria break down some plant or animal materials.

4 (a) What is the main useful gas found in biogas?

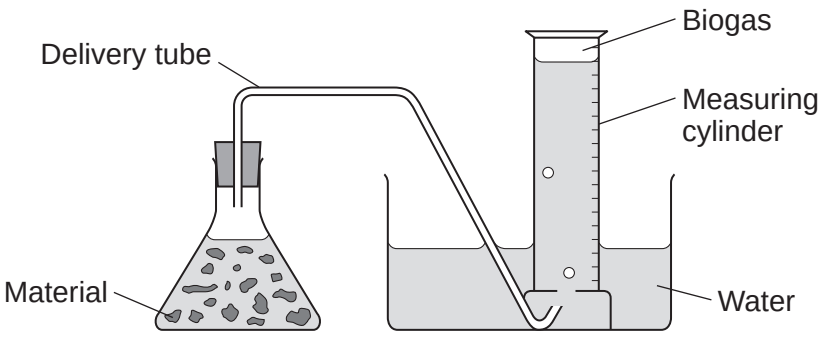
[1 mark]

4 (b) Some students investigated which of four types of material produced the most biogas.

The students:

- chopped the material into small pieces
- placed 200 g of each material into a different flask with 100 cm^3 of water
- set up the apparatus as shown in **Figure 5** to collect the biogas produced
- left each set of apparatus at 25 °C for 7 days
- repeated the investigation twice more.

Figure 5



Give **two** variables the students controlled in their investigation.

[2 marks]

1 _____

_____

2 _____

_____

4.7.3.3 Land use

Question 32 · continued

4 (c) **Table 2** shows the students' results.

Table 2

Type of material	Volume of biogas collected in 7 days in cm^3			
	Test 1	Test 2	Test 3	Mean
Beans	12.0	12.4	12.2	12.2
Manure	15.0	15.2	8.2	15.1
Manure and beans	18.6	18.8	18.4	18.6
Sweet potato	14.3	14.1	14.5	

4 (c) (i) One of the results in **Table 2** is anomalous.

Draw a ring around the anomalous result shown in **Table 2**.

[1 mark]

4 (c) (ii) Calculate the mean volume of biogas collected, in 7 days, for sweet potato in **Table 2**.

[1 mark]

_____

_____

4 (c) (iii) Which type of material in **Table 2** would be the most effective to use in a biogas generator?

Give a reason for your answer.

[2 marks]

_____

_____

_____

_____

Question 4 continues on the next page

4.7.3.3 Land use

Question 32 · continued

4 (d) A farmer built a biogas generator on his cow farm.

Suggest **one** advantage and **one** disadvantage of having a biogas generator.

[2 marks]

Advantage _____

_____

Disadvantage _____

_____

9

4.7.3.3 Land use

Question 33

June 2018 | 8461/1F | Original Q7

0 7 Eating food containing *Salmonella* bacteria can cause illness.

0 7 . 1 Two symptoms of infection by *Salmonella* are vomiting and diarrhoea.

What causes these symptoms?

[1 mark]

0 7 . 2 Give **two** ways a person with a mild infection of *Salmonella* can help prevent the spread of the bacteria to other people.

[2 marks]

1

2

0 7 . 3 In very serious infections of *Salmonella*, a doctor can prescribe drugs to kill the bacteria.

What type of drug can the doctor prescribe to kill the bacteria?

[1 mark]

0 7 . 4 A person with AIDS may take longer than a healthy person to recover from a *Salmonella* infection.

Explain why.

[2 marks]

Question 33 · continued

0 7 . 5 *Salmonella* bacteria can be transmitted from chickens to humans. Chickens can be vaccinated to prevent the transmission of *Salmonella* bacteria to humans.

Suggest **one** other way farmers could prevent the transmission of *Salmonella* from chickens to humans.

[1 mark]

A restaurant owner employed a scientist to test the effectiveness of two kitchen cleaning liquids.

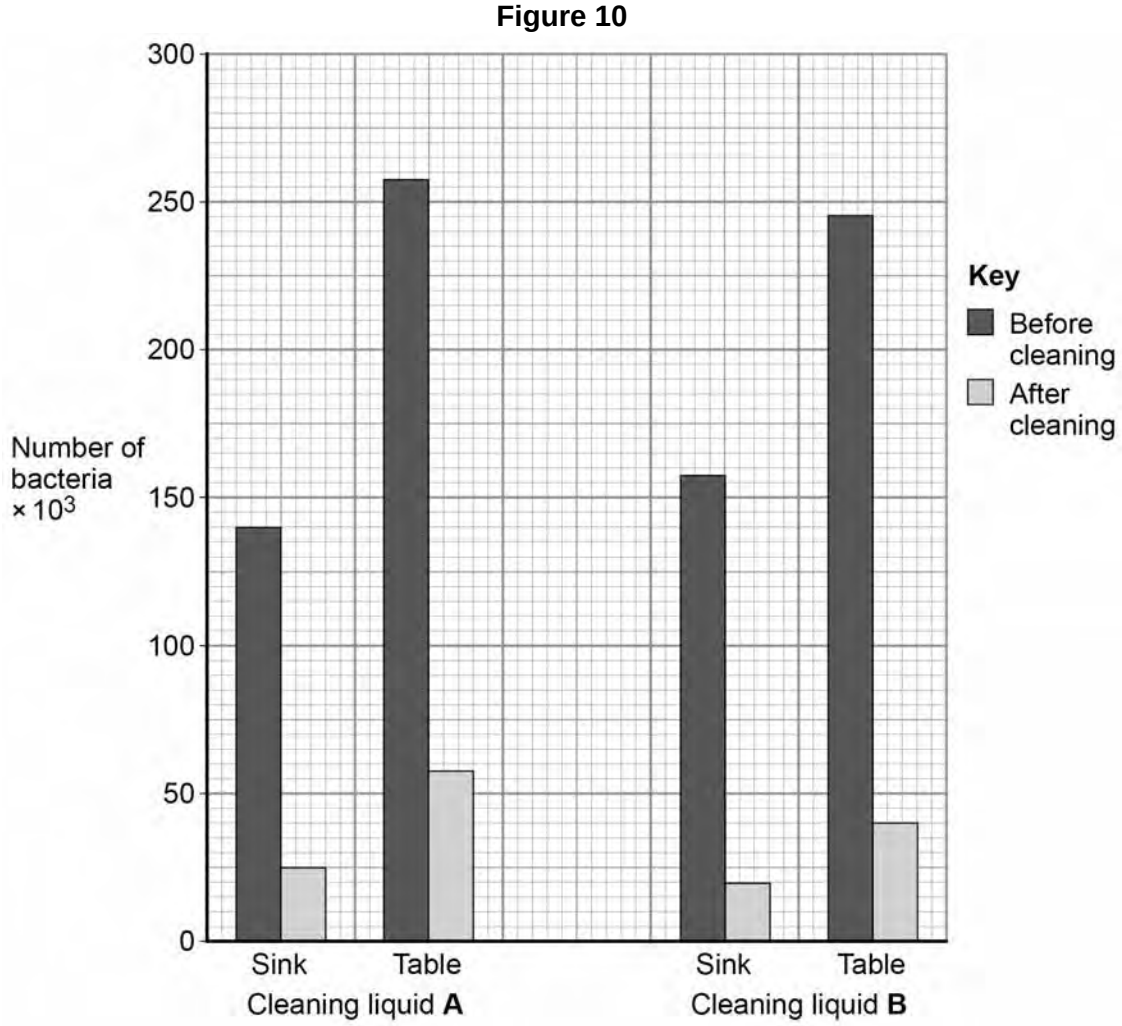
The scientist took samples from two work surfaces:

- before the surfaces had been cleaned with the cleaning liquids
- after the surfaces had been cleaned with the cleaning liquids.

The samples were then analysed for the number of bacteria they contained.

The results are shown in **Figure 10**.

Figure 10



4.7.3.3 Land use

Question 33 · continued

0 7 . 6 Which cleaning liquid is the more effective?

Give a reason for your answer.

[1 mark]

Cleaning liquid _____

Reason _____

_____

_____

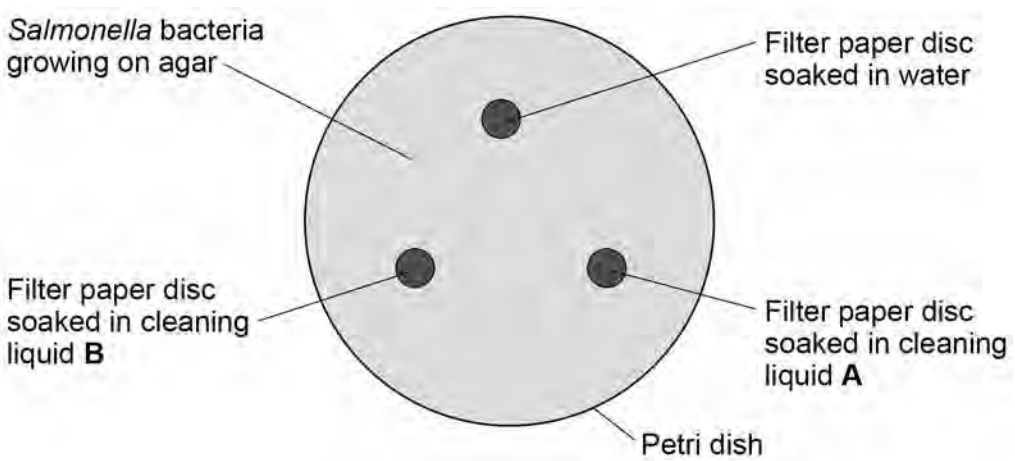
Question 7 continues on the next page

Question 33 · continued

The scientist investigated the effect of cleaning liquid **A** and cleaning liquid **B** on *Salmonella* bacteria grown in a laboratory.

Figure 11 shows the way the investigation was set up.

Figure 11



The Petri dish was placed in an incubator at 25 °C for 48 hours.

After 48 hours, the scientist calculated the area around each paper disc where no bacteria were growing.

The results are shown in **Table 4**.

Table 4

Filter paper disc	Area around disc with no bacteria growing in cm^2
Water	0
Cleaning liquid **A**	11
Cleaning liquid **B**	13

0 7 . 7 What measurement would the scientist need to take to calculate the area where no bacteria were growing?

[1 mark]

4.7.3.3 Land use

Question 33 · continued

June 2018 | 8461/1F | Original Q7

0 7 . 8 Give **one** change to the investigation that would allow the scientist to check if the results are repeatable.

[1 mark]

0 7 . 9 The scientist showed the results to the restaurant owner.

Both cleaning liquids cost the same per dm^3.

Suggest **one** other factor the restaurant owner should consider when choosing which cleaning liquid to use.

[1 mark]

11

4.7.3.3 Land use

Question 34

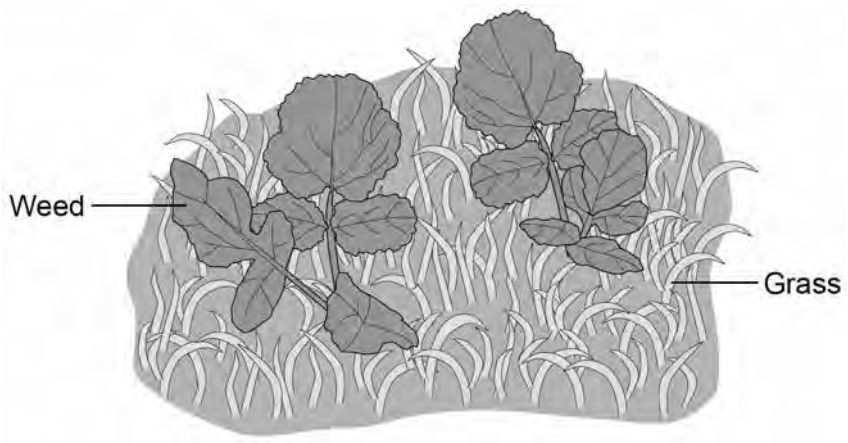
June 2018 | 8461/2F | Original Q6

0 6 Some weed killers are selective.

Selective weed killers kill broad-leaved weed plants, but do **not** kill narrow-leaved grass plants.

Figure 8 shows some weeds growing on a grassy lawn.

Figure 8



Some students investigated the effect of a selective weed killer on the weeds growing in a lawn. They used 0.5 m × 0.5 m quadrats.

The lawn was 20 metres long and 10 metres wide.

This is the method used.

1. Divide the lawn into two halves, side **A** and side **B**.
2. Place 5 quadrats in different positions on side **A**.
3. Place 5 more quadrats in different positions on side **B**.
4. Count the number of weed plants in each quadrat.
5. Spray side **A** with weed killer solution.
6. Spray side **B** with the same volume of water.
7. Repeat steps 2-4 after 2 weeks.

0 6 . 1 Suggest a method the students should have used to place each quadrat.

[1 mark]

Question 34 · continued

0 6 . 2 Give the reason for the method you suggested in Question **06.1**.

[1 mark]

0 6 . 3 Explain why the students used water on one side of the lawn instead of weed killer.

[2 marks]

Table 3 shows the students' results.

Table 3

	Number of weeds per quadrat			
	At start		After 2 weeks	
	Side A (Weed killer)	Side B (Water)	Side A (Weed killer)	Side B (Water)
	8	14	3	8
	2	9	4	15
	12	3	0	7
	15	16	2	12
	13	3	1	13
Mean	10	9	2	**X**

0 6 . 4 Calculate the mean value, **X**, in **Table 3**.

[1 mark]

Mean value, **X** = _____

4.7.3.3 Land use

Question 34 · continued

0 6 . 5 Calculate the percentage decrease in the number of weeds on side **A** after 2 weeks.

[2 marks]

Use the following equation:

$$\text{percentage decrease} = \frac{(\text{mean at start} - \text{mean after 2 weeks})}{\text{mean at start}} \times 100$$

Percentage decrease = _____

0 6 . 6 One student thought the results were **not** valid.

Suggest **one** improvement the students could have made to the method to make the results more valid.

Give the reason for your answer.

[2 marks]

Improvement _____

Reason _____

9

4.7.3.3 Land use

Question 35

June 2019 | 8461/1F | Original Q5

0 5 A man has the following symptoms:

- yellow discharge from his penis
- pain when urinating.

0 5 . 1 The man has a bacterial infection.

What is the most likely cause of the man's symptoms?

[1 mark]

Tick (✓) **one** box.

Gonorrhoea ☐

HIV ☐

Measles ☐

Salmonella poisoning ☐

0 5 . 2 The man took a full course of antibiotics.

The man's symptoms did **not** improve.

Why did the antibiotics **not** cure the symptoms?

[1 mark]

Tick (✓) **one** box.

The bacteria are immune to the antibiotics. ☐

The bacteria are resistant to the antibiotics. ☐

The man is immune to the antibiotics. ☐

The man is resistant to the antibiotics. ☐

4.7.3.3 Land use

Question 35 · continued

0 5 . 3 Using a condom can stop the bacteria being passed to another person during sexual intercourse.

Suggest a different way the man could avoid passing the bacteria on to someone else.

[1 mark]

Question 5 continues on the next page

4.7.3.3 Land use

Question 35 · continued

A scientist investigated the effect of three different antibiotics on three different types of bacteria, **A**, **B** and **C**.

This is the method used.

1. Grow bacteria **A** on an agar plate.

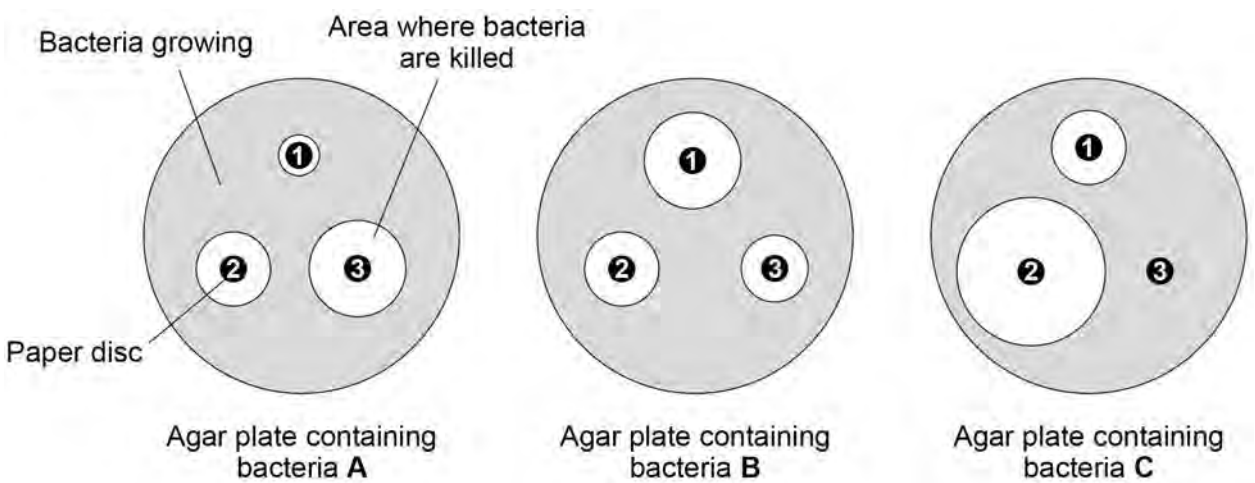
2. Put three separate paper discs each containing one of the antibiotics (**1**, **2** and **3**) onto the agar plate.

3. Put the agar plate into an incubator for 48 hours.

4. Repeat steps 1–3 for bacteria **B** and for bacteria **C**.

Figure 9 shows the scientist's results.

Figure 9



4.7.3.3 Land use

Question 35 · continued

0 5 . 4 Compare the effectiveness of the three antibiotics at killing the different types of bacteria.

[6 marks]

Question 5 continues on the next page

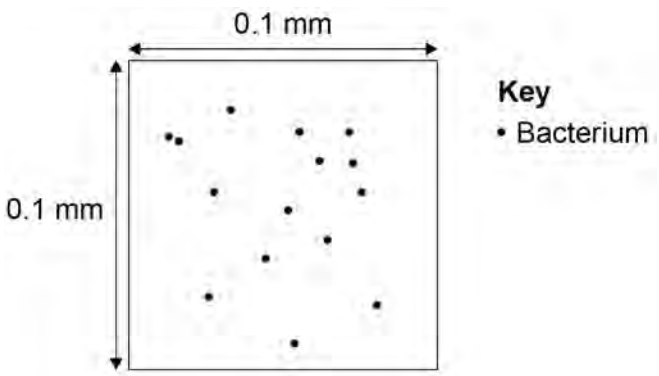
Question 35 · continued

Milk contains bacteria.

A small volume of raw milk was placed in a counting chamber in a special type of microscope slide.

Figure 10 shows what the counting chamber looked like when viewed using a microscope.

Figure 10



A scientist counted the number of bacteria in four samples of raw milk.

Table 4 shows the results.

Table 4

Milk sample	Number of bacteria in counting chamber
E	15
F	12
G	13
H	16

0 5 . 5 Which milk sample is shown in **Figure 10**?

[1 mark]

Tick (✓) **one** box.

Sample **E** ☐

Sample **F** ☐

Sample **G** ☐

Sample **H** ☐

Question 35 · continued

0 5 . 6 Calculate the mean number of bacteria in the four samples in **Table 4**.

[2 marks]

Mean number of bacteria = _____

0 5 . 7 Calculate the mean number of bacteria per mm^3 of milk in the samples.

Complete the following steps.

[3 marks]

Calculate the total area of the counting chamber in **Figure 10**.

Total area of counting chamber = _____ mm^2

The depth of the counting chamber is 0.01 mm

Calculate the volume of the counting chamber in **Figure 10**.

Use the equation:

$$\text{volume} = \text{area} \times \text{depth}$$

Volume of counting chamber = _____ mm^3

Calculate the mean number of bacteria per mm^3 of milk in the samples.

Use the equation:

$$\text{mean number of bacteria per mm}^3\text{ of milk} = \frac{\text{mean number of bacteria from Question } \mathbf{05.6}}{\text{volume of counting chamber}}$$

Mean number of bacteria per mm^3 of milk = _____

Question 35 · continued

Milk is heated to reduce the number of bacteria it contains before it is sold for humans to drink.

Milk with more than 20 000 bacteria per cm^3 cannot be sold for humans to drink.

Table 5 shows the number of bacteria per cm^3 in four different samples of milk.

Table 5

Milk sample	Number of bacteria per cm^3 of milk
P	1.8×10^4
Q	2.2×10^4
R	2.2×10^{-5}
S	1.8×10^3

0 5 . 8 Which of the milk samples could **not** be sold for humans to drink?

[1 mark]

Tick (✓) **one** box.

P ☐ **Q** ☐ **R** ☐ **S** ☐

0 5 . 9 Why should milk sold for humans to drink **not** contain large numbers of bacteria?

[1 mark]

17

4.7.3.3 Land use

Question 36

0 9 This question is about photosynthesis.

0 9 . 1 Complete the word equation for photosynthesis:

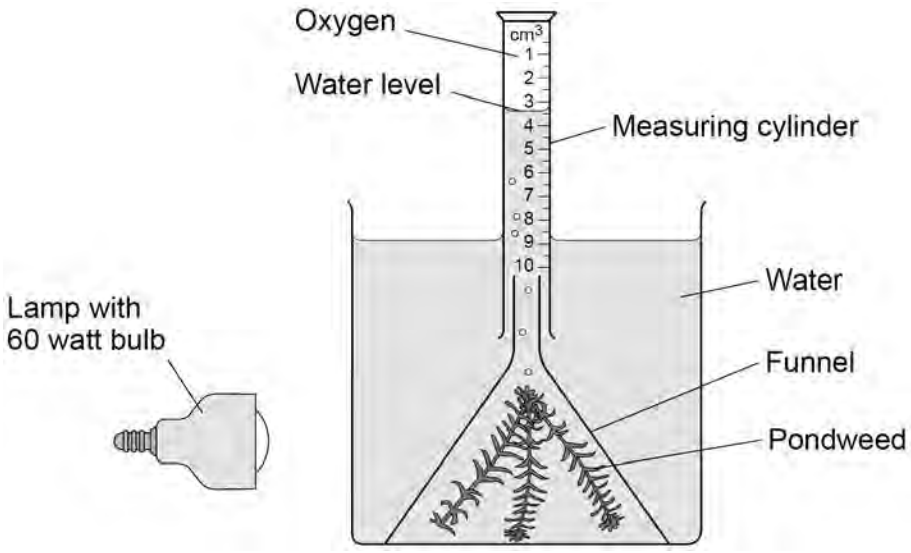
[2 marks]

_____ + _____ ⟶ _____ + oxygen

A student investigated photosynthesis using pondweed.

Figure 14 shows the apparatus the student used.

Figure 14



This is the method used.

1. Set up the apparatus as shown in **Figure 14**.
2. Switch on the lamp.
3. After 20 minutes, record the volume of oxygen collected in the measuring cylinder.
4. Repeat steps 1–3 using bulbs of different power output.

4.7.3.3 Land use

Question 36 · continued

0 9 . 2 What was the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Power output of bulb ☐
- Rate of photosynthesis ☐
- Time to collect oxygen ☐
- Volume of oxygen collected ☐

0 9 . 3 Suggest **two** ways the method could be improved so the results would be more valid.

[2 marks]

1 _____

_____

2 _____

_____

Question 9 continues on the next page

Question 36 · continued

Table 9 shows the student's results.

Table 9

Power output of bulb in watts	Volume of oxygen collected in 20 minutes in cm^3	Rate of photosynthesis in cm^3/hour
60	0.5	1.5
100	0.8	2.4
150	1.1	**X**
200	1.2	3.6
250	1.2	3.6

0 9 . 4 Calculate value **X** in **Table 9**.

[1 mark]

X = _____ cm^3/hour

4.7.3.3 Land use

Question 36 · continued

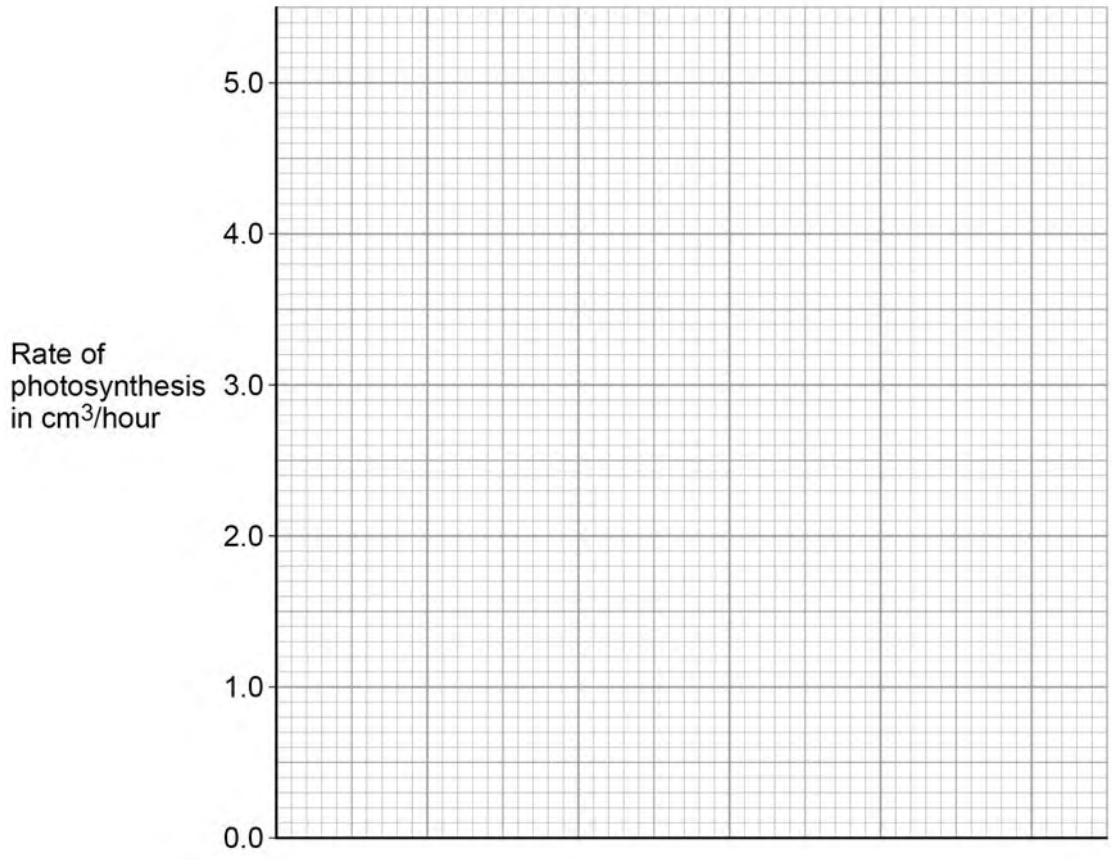
0 9 . 5 Complete **Figure 15**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale
- plot the data from **Table 9** and your answer to Question **09.4**
- draw a line of best fit.

Figure 15



0 9 . 6 Determine the expected rate of photosynthesis with a bulb of power output 75 watts.

Use **Figure 15**.

[1 mark]

Rate of photosynthesis at 75 watts = _____ cm^3/hour

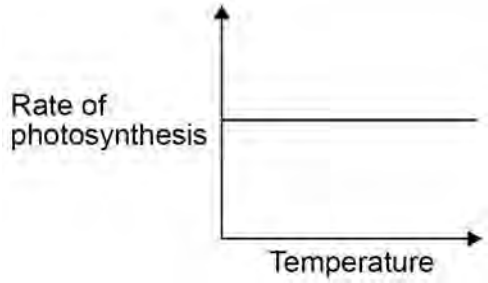
4.7.3.3 Land use

Question 36 · continued

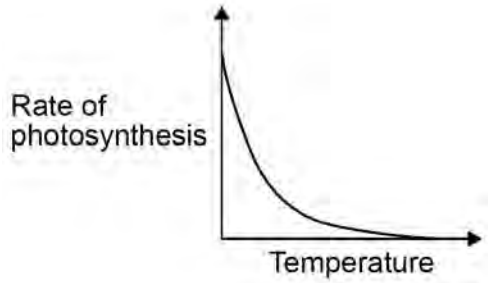
0 9 . 7 Which graph shows the effect of temperature on the rate of photosynthesis?

[1 mark]

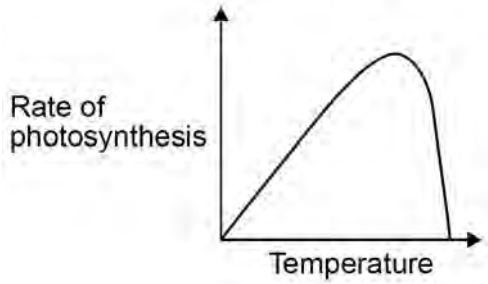
Tick (✓) **one** box.



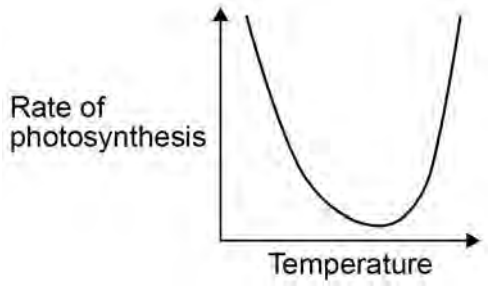
☐



☐



☐



☐

12

4.7.3.3 Land use

Question 37

June 2019 | 8461/2F | Original Q5

0 5 **Figure 10** shows a flightless bird called the dodo (*Raphus cucullatus*).

Figure 10



The dodo:

- was 1 m tall
- had a mass of 20 kg
- lived in rainforests on a tropical island
- ate fruits
- made its nest on the ground.

A female dodo laid only one egg each year.

Humans arrived on the island in the year 1507. By 1681 the dodo was extinct.

0 5 . 1 What is the genus of the dodo?

[1 mark]

Tick (✓) **one** box.

Animal ☐

Bird ☐

Raphus ☐

4.7.3.3 Land use

Question 37 · continued

0 5 . 2 Before the arrival of humans, there were no other large animals living on the island.

Suggest **two** reasons why the dodo became extinct soon after the arrival of humans.

[2 marks]

1 _____

_____

2 _____

_____

Today, humans are cutting down large areas of tropical rainforests.

0 5 . 3 Suggest **one** use of the land after the trees have been removed.

[1 mark]

_____

_____

0 5 . 4 Why does the removal of trees cause an increase in carbon dioxide in the atmosphere?

[2 marks]

Tick (✓) **two** boxes.

- There are fewer animals. ☐
- There is less photosynthesis. ☐
- There is less respiration. ☐
- The soil dries out. ☐
- The trees are burned. ☐

Question 37 · continued

0 5 . 5 What effect would an increase in carbon dioxide in the atmosphere have on global air temperature?

[1 mark]

Tick (✓) **one** box.

Decrease ☐

Increase ☐

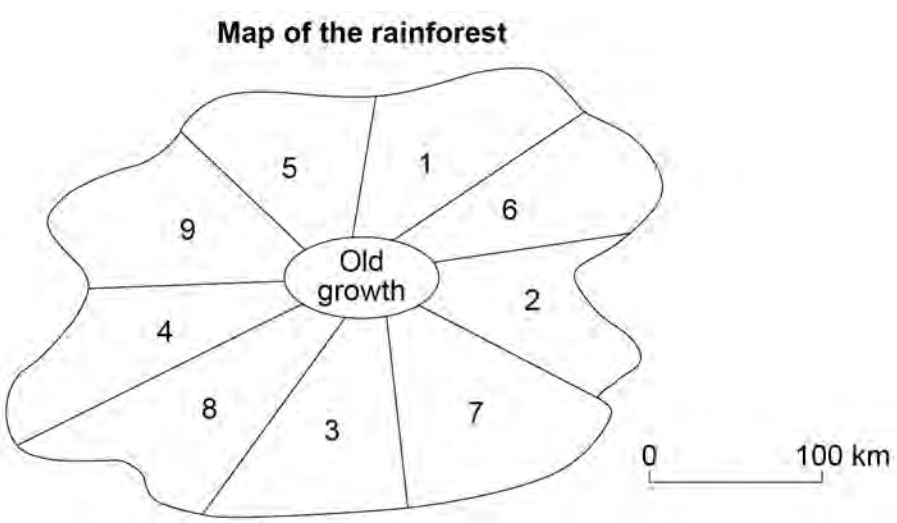
Stay the same ☐

'Sustainable forestry' reduces the harmful effects of cutting down trees on the environment.

Figure 11 shows a method of 'sustainable forestry'.

Numbers 1–9 show different parts of a rainforest.

Figure 11



The trees are cut down in the sequence 1 – 2 – 3 – 4 – 5 – 6 – 7 – 8 – 9

- The trees are cut down in only one area at any one time.
- It takes 30 years to cut down the trees in each area.
- The trees in the 'Old growth' area are never cut down.

4.7.3.3 Land use

Question 37 · continued

0 5 . 6 How many years would it take to cut down the trees in all of the numbered areas in **Figure 11**?

[2 marks]

Number of years = _____

0 5 . 7 The rainforest contains:

- 750 species of trees
- 400 species of birds
- 150 species of butterflies
- many other species of plants and animals.

Explain how the pattern of cutting down trees shown in **Figure 11** stops the biodiversity of the rainforest being reduced.

[4 marks]

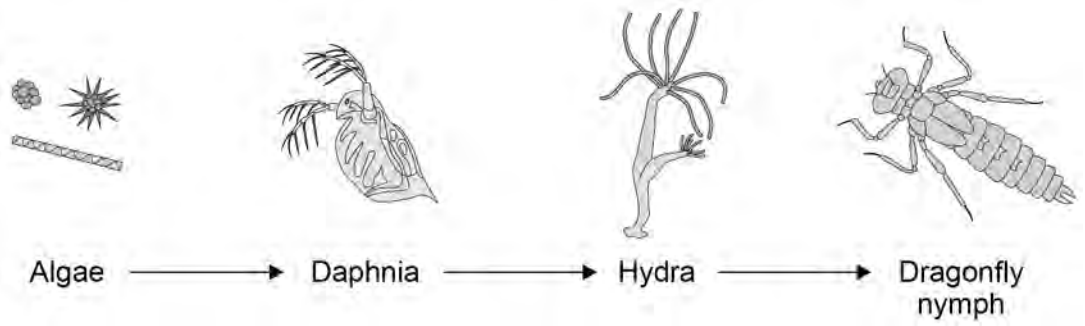
13

4.7.3.3 Land use

Question 38

0 7 **Figure 14** shows a food chain in a pond.

Figure 14



0 7 . 1 Which term describes the Daphnia in this food chain?

[1 mark]

Tick (✓) **one** box.

- Apex predator ☐
- Primary consumer ☐
- Producer ☐
- Secondary consumer ☐

4.7.3.3 Land use

Question 38 · continued

0 7 . 2 Draw a pyramid of biomass for the food chain.

Label each trophic level.

[2 marks]

0 7 . 3 Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

[1 mark]

_____

_____

Question 7 continues on the next page

Question 38 · continued

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm^3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

Table 3 shows the results.

Table 3

Sample number	Number of Daphnia in 1 dm^3 water
1	5
2	21
3	0
4	16
5	28

0 7 . 4 Calculate the mean number of Daphnia in 1 m^3 of pond water.

1 m^3 = 1000 dm^3

[2 marks]

Mean number of Daphnia in 1 m^3 of pond water = _____

4.7.3.3 Land use

Question 38 · continued

0 7 . 5 The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from Question **07.4**.

Give your answer in standard form.

[4 marks]

Number of Daphnia in the pond = _____

Question 7 continues on the next page

Question 38 · continued

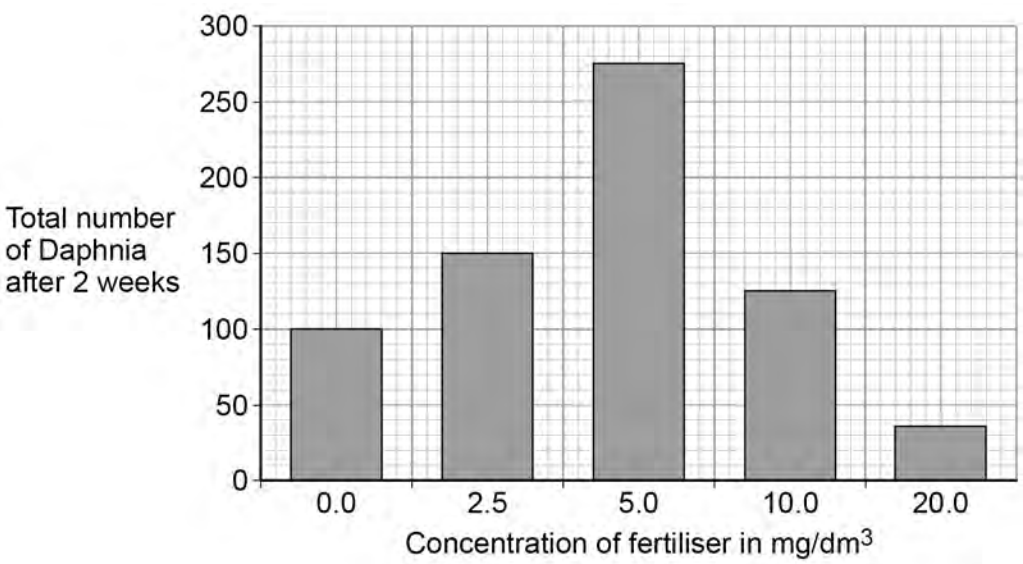
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 15 shows the results.

Figure 15



0 7 . 6 A concentration of 5.0 mg/dm^3 of fertiliser caused a large increase in the population of Daphnia.

Explain why.

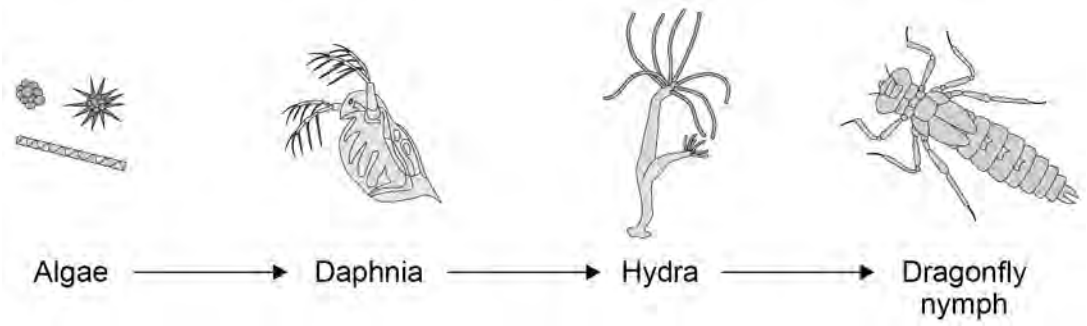
[2 marks]

4.7.3.3 Land use

Question 38 · continued

0 7 . 7 **Figure 14** is repeated below.

Figure 14



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

[2 marks]

14

4.7.3.3 Land use

Question 39

November 2020 | 8461/1F | Original Q7

0 7 This question is about photosynthesis.

0 7 . 1 Complete the word equation for photosynthesis.

[2 marks]

_____ + _____ → _____ + oxygen

0 7 . 2 Describe how energy for the photosynthesis reaction is gained by plants.

[2 marks]

Students investigated the effect of temperature on the rate of photosynthesis.

The students shone light from a lamp onto pondweed and measured the volume of oxygen produced per hour.

Table 3 shows the results.

Table 3

Temperature in °C	Rate of photosynthesis in cm^3/hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	**X**
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

4.7.3.3 Land use

Question 39 · continued

0 7 . 3 Calculate mean value **X**.

[2 marks]

X = _____ cm^3/hour

The students identified one anomalous result in **Table 3**.

0 7 . 4 Draw a ring around the anomalous result in **Table 3**.

[1 mark]

0 7 . 5 Suggest **one** possible cause of the anomalous result.

[1 mark]

0 7 . 6 How did the students deal with the anomalous result?

[1 mark]

0 7 . 7 Give **one** factor the students should have kept constant in this investigation.

[1 mark]

Question 39 · continued

Table 3 is repeated below.

Table 3

Temperature in °C	Rate of photosynthesis in cm^3/hour			
	Test 1	Test 2	Test 3	Mean
20	18.5	19.3	19.5	**X**
25	32.6	34.1	32.9	33.2
30	41.9	45.2	44.9	44.0
35	38.6	39.8	44.0	40.8
40	23.1	20.5	22.4	22.0
45	1.9	14.2	2.2	2.1

0 7 . 8 Why did the rate of photosynthesis decrease from 35 °C to 45 °C?

[1 mark]

4.7.3.3 Land use

Question 39 · continued

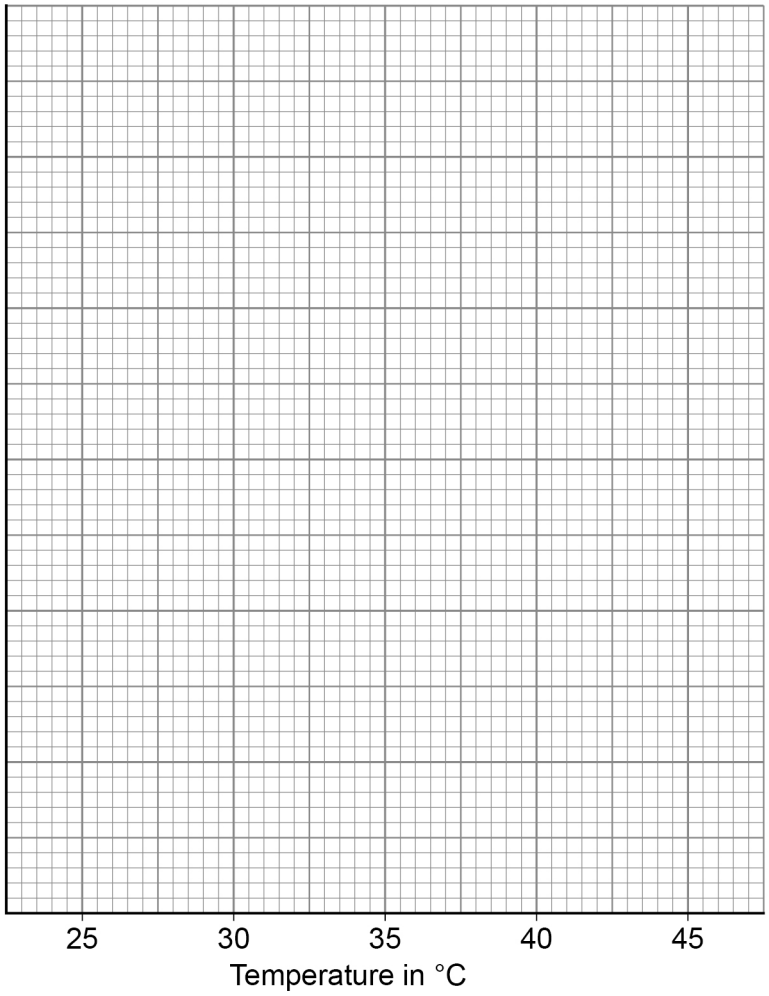
0 7 . 9 Complete **Figure 10** using data from **Table 3**.

You should:

- label the y-axis
- use a suitable scale for the y-axis
- plot the mean data from **Table 3** for temperatures from 25 °C to 45 °C
- draw a line of best fit.

[5 marks]

Figure 10



16

4.7.3.3 Land use

Question 40

November 2020 | 8461/2F | Original Q7

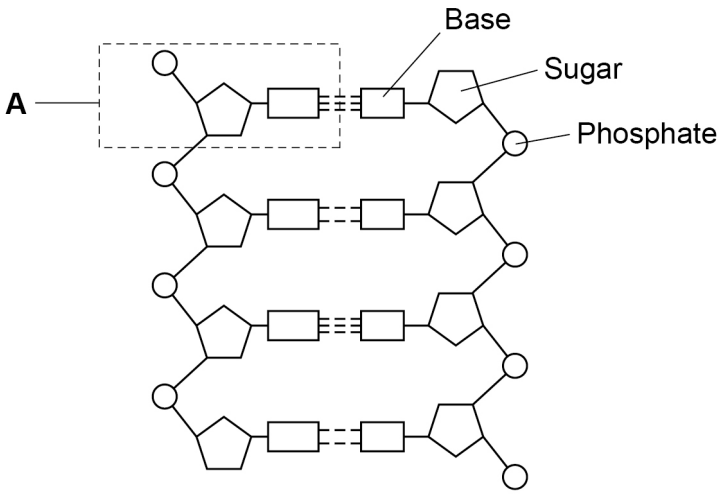
0 7 This question is about DNA.

0 7 . 1 Describe the shape of a DNA molecule.

[2 marks]

Figure 10 shows part of a DNA molecule.

Figure 10



0 7 . 2 DNA codes for a sequence of amino acids.

Which part of DNA forms the code for a particular amino acid?

[1 mark]

Tick (✓) **one** box.

- Bases ☐
- Phosphates ☐
- Sugars ☐

4.7.3.3 Land use

Question 40 · continued

0 7 . 3 Which substance is produced when amino acids are joined together?

[1 mark]

Tick (✓) **one** box.

Carbohydrate ☐

Fat ☐

Protein ☐

0 7 . 4 DNA is made of repeating units. One of the units is labelled **A** in **Figure 10**.

What is the name of the repeating unit labelled **A**?

[1 mark]

Tick (✓) **one** box.

Chromosome ☐

Enzyme ☐

Nucleotide ☐

Question 7 continues on the next page

Question 40 · continued

0 7 . 5 The DNA in one human body cell is the length of 6 000 million repeating units (part **A**).

Each repeating unit is 0.34 nanometres (nm) long.

Calculate the length of the DNA in the cell in millions of nanometres.

[2 marks]

Length = _____ million nm

0 7 . 6 Give your answer to Question **07.5** in metres.

1 metre = 1×10^9 nanometres

[1 mark]

Length = _____ m

0 7 . 7 DNA analysis can show people which alleles they have.

Patients who have certain types of cancer can be offered DNA analysis.

The family of the patient can also be offered DNA analysis.

Suggest **one** advantage of having DNA analysis.

[1 mark]

9

4.7.3.3 Land use

Question 41

November 2020 | 8461/2F | Original Q8

0 8 This question is about the decay of milk.

0 8 . 1 Name **two** types of microorganism that cause decay.

[2 marks]

1 _____

2 _____

0 8 . 2 Cows' milk is pH 6.6.

As milk decays, lipids in the milk are broken down.

One of the products of the breakdown of lipids causes the pH of milk to decrease.

Name the product that causes the pH to decrease.

[1 mark]

_____

4.7.3.3 Land use

Question 41 · continued

A student investigated the effect of temperature on the time taken for different types of milk to decay.

This is the method used.

1. Put cows' milk in six test tubes.

2. Keep each test tube at a different temperature.

3. Measure the pH of the milk in each tube every day for 12 days.

4. Record the number of days taken to reach pH 5.

5. Repeat steps 1 to 4 with goats' milk and with almond milk.

0 8 . 3 Give **one** way the pH can be measured.

[1 mark]

_____

0 8 . 4 Give **two** control variables the student should have used in this investigation.

[2 marks]

1 _____

2 _____

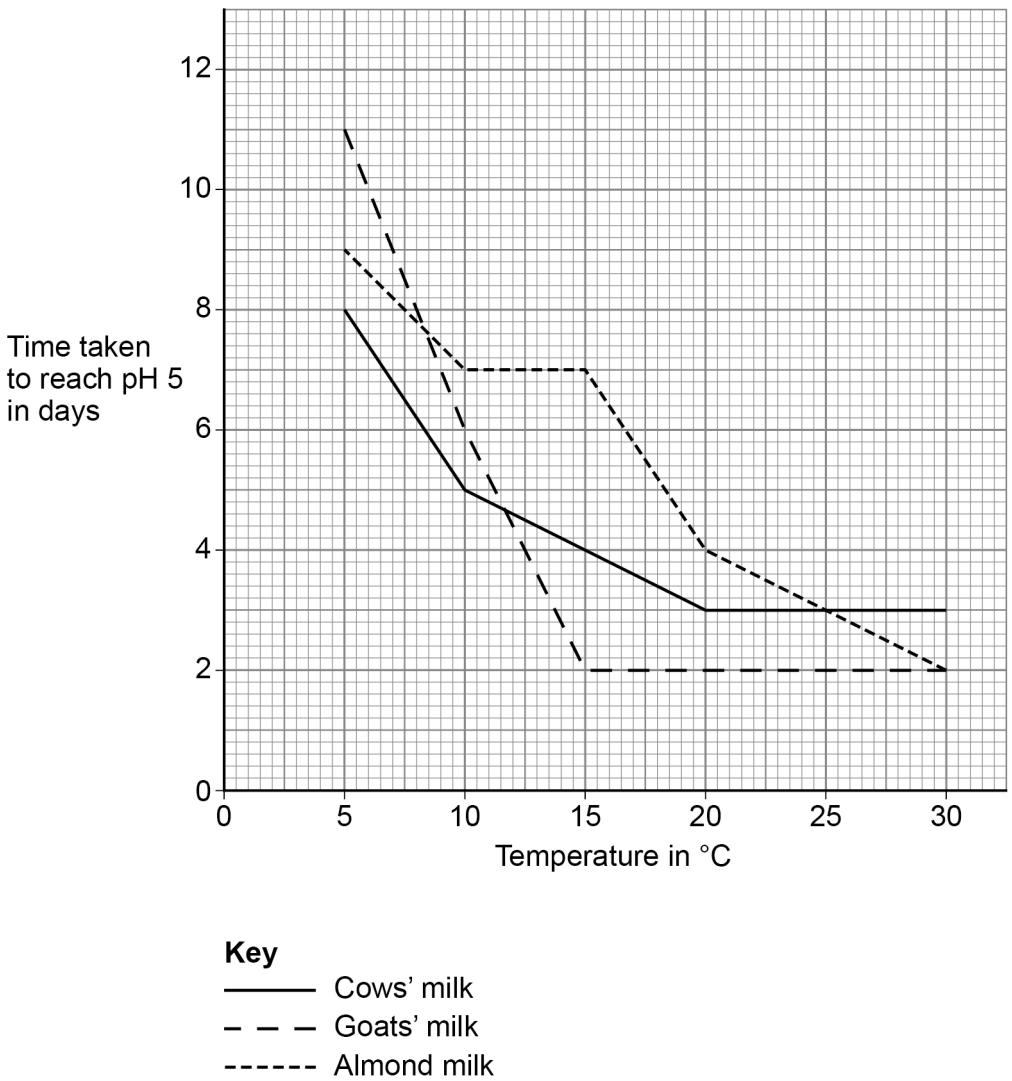
Question 8 continues on the next page

Question 41 · continued

The student improved the investigation to produce valid results.

Figure 11 shows the results.

Figure 11



0 8 . 5 Which type of milk stays fresh the longest at 10 °C?

[1 mark]

Question 41 · continued

November 2020 | 8461/2F | Original Q8

0 8 . 6 Describe the effect of temperature on the time taken for **goats'** milk to reach pH 5.

Use data from **Figure 11** in your answer.

[2 marks]

0 8 . 7 The time taken for cows' milk to reach pH 5 at 10 °C is less than the time taken for cows' milk to reach pH 5 at 5 °C.

Suggest **one** reason why.

[1 mark]

0 8 . 8 Suggest **two** reasons why the different types of milk took different lengths of time to reach pH 5.

[2 marks]

1

2

Question 8 continues on the next page

4.7.3.3 Land use

Question 41 · continued

0 8 . 9 The student said:

'The temperature milk is stored at affects how likely the milk is to cause food poisoning.'

How can the investigation be developed to find out if the student is correct?

[1 mark]

Tick (✓) **one** box.

Determine the types of bacteria present in the milk ☐

Record the pH every 12 hours ☐

Use more than three different types of milk ☐

13

Question 9 starts on page 36

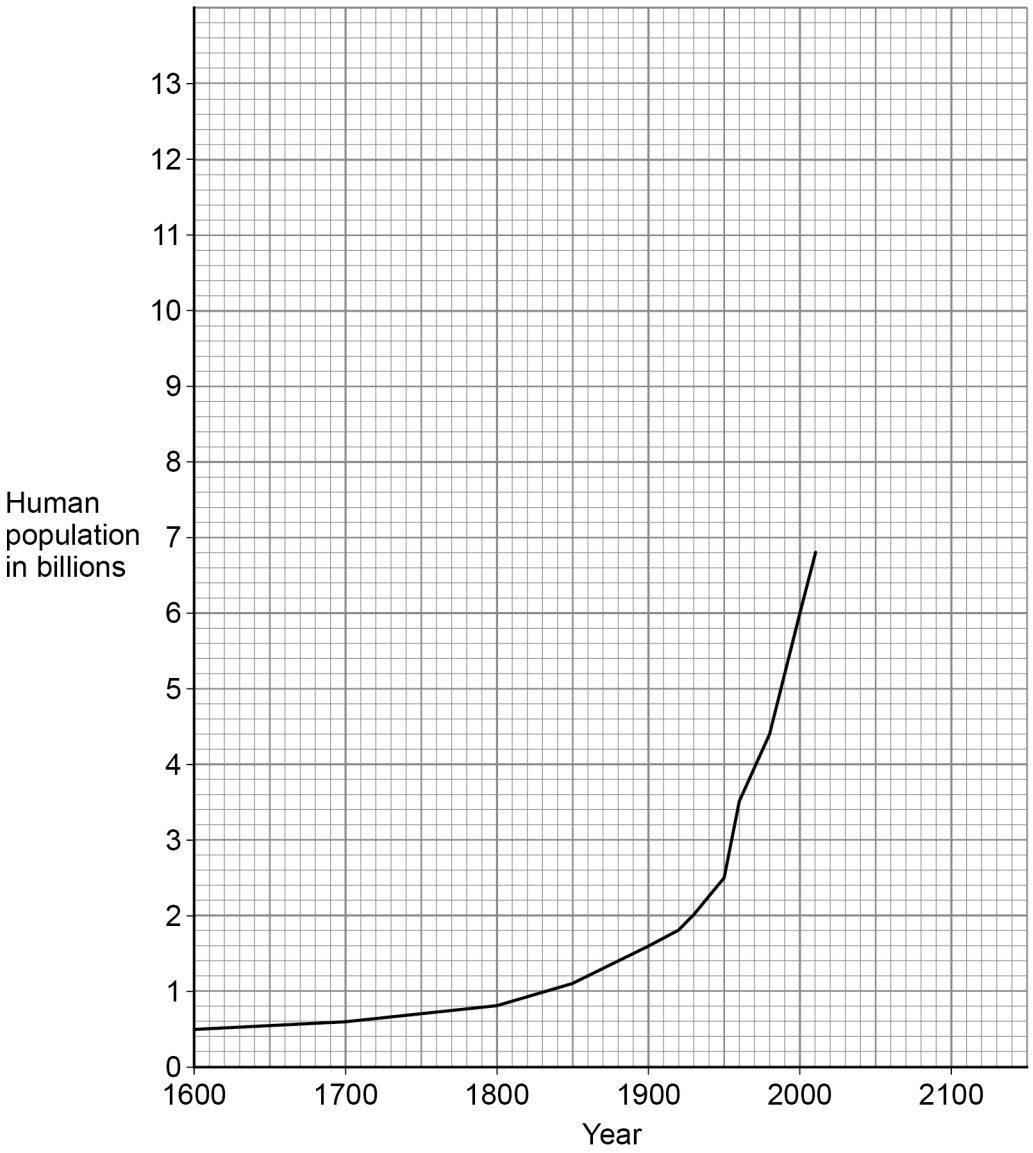
4.7.3.3 Land use

Question 42

November 2020 | 8461/2F | Original Q9

0 9 **Figure 12** shows the human population from 1600 to 2010.

Figure 12



In 1900 the human population was 1.6 billion.

0 9 . 1 Calculate how many times greater the human population was in the year 2000 compared with the year 1900.

[2 marks]

Number of times greater = _____

4.7.3.3 Land use

Question 42 · continued

0 9 . 2 In 1950 the human population was 2.5 billion.

Calculate the mean annual increase in the human population between 1900 and 1950.

[2 marks]

Mean annual increase = _____ billion per year

0 9 . 3 Predict the human population in 2050 if the current rate of population increase continues.

You should draw an extrapolation line on **Figure 12**.

[2 marks]

Predicted human population = _____

0 9 . 4 The increasing human population has caused a decline in fish stocks.

Describe how fishing quotas can help to return fish stocks to a sustainable level.

[2 marks]

Question 9 continues on the next page

4.7.3.3 Land use

Question 42 · continued

0 9 . 5 Farming techniques have changed in recent years.

Describe:

- why more land is being used for farming
- how increased farming has decreased biodiversity.

[6 marks]

4.7.3.3 Land use

Question 42 · continued

November 2020 | 8461/2F | Original Q9

0 9 . 6 Genetic modification of crop plants can help meet the demands of the increasing human population.

Golden rice is a genetically modified (GM) crop.

What is the advantage of golden rice compared with non-GM rice?

[1 mark]

Tick (✓) **one** box.

Golden rice contains protein-rich mycoprotein ☐

Golden rice has improved nutritional value ☐

Golden rice produces human insulin ☐

0 9 . 7 Suggest **one** reason why some people are concerned about the use of golden rice.

[1 mark]

_____

_____

16

4.7.3.3 Land use

Question 43

November 2021 | 8461/1F | Original Q4

0 4 Carbohydrates are needed as part of a balanced diet.

0 4 . 1 Which formula shows glucose?

[1 mark]

Tick (✓) **one** box.

$C_6H_{12}O_6$ ☐

CO_2 ☐

H_2O ☐

O_2 ☐

0 4 . 2 Which type of enzyme breaks down starch?

[1 mark]

Tick (✓) **one** box.

Carbohydrase ☐

Lipase ☐

Protease ☐

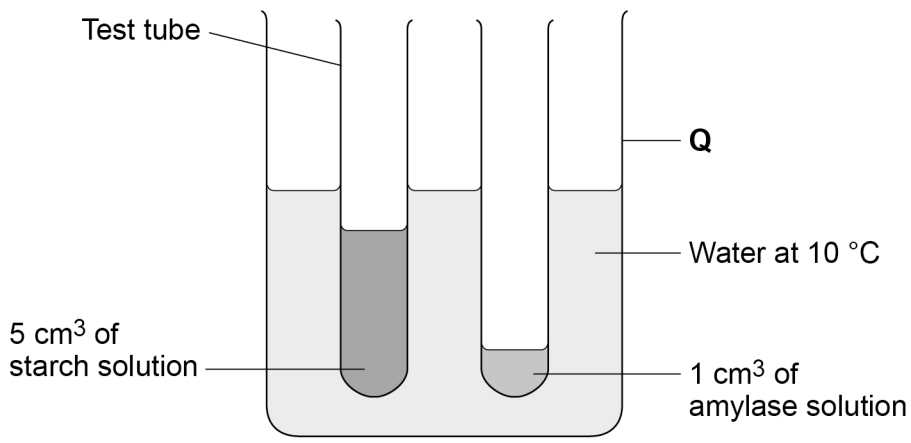
Question 4 continues on the next page

Question 43 · continued

A student investigated the effect of temperature on the activity of the enzyme amylase.

Figure 7 shows the apparatus used.

Figure 7



This is the method used.

1. Set up the apparatus as shown in **Figure 7**.
2. After 5 minutes, pour the starch solution into the amylase solution and mix.
3. Remove one drop of the amylase-starch solution mixture and place onto a spotting tile.
4. Immediately add two drops of iodine solution to the amylase-starch solution mixture on the spotting tile.
5. Record the colour of the iodine solution added to the amylase-starch solution mixture.
6. Repeat steps 3 to 5 every minute until the iodine solution is yellow-brown.

0 4 . 3 Name apparatus **Q** in **Figure 7**.

[1 mark]

4.7.3.3 Land use

Question 43 · continued

0 4 . 4 Why were the starch solution and the amylase solution left for five minutes before mixing them together?

[1 mark]

Tick (✓) **one** box.

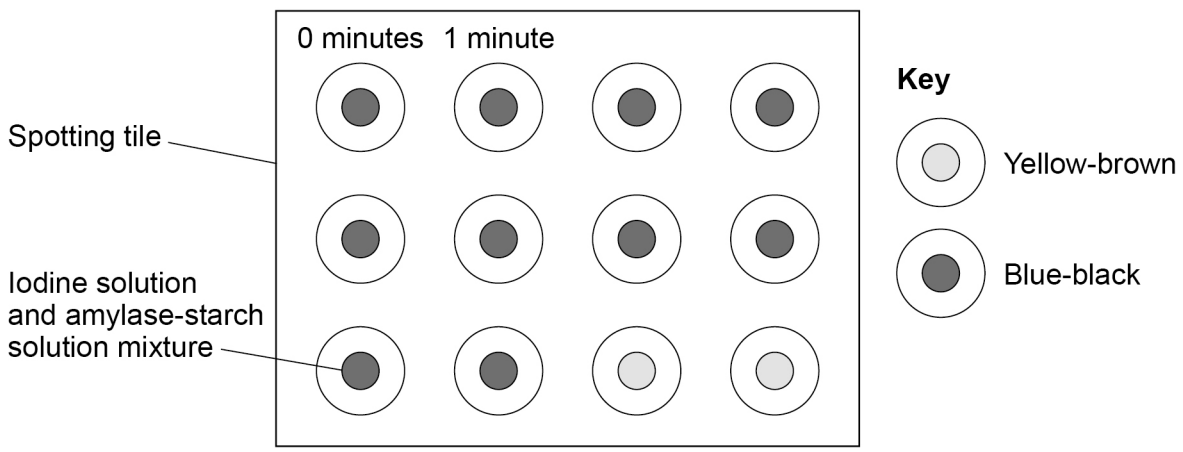
- So that both solutions could reach 10 °C ☐
- So that the student could calculate a mean ☐
- So that the student could repeat the investigation ☐
- So that the student had time to draw a table of results ☐

Question 4 continues on the next page

Question 43 · continued

Figure 8 shows the results.

Figure 8



0 4 . 5 How many minutes did it take until the iodine solution and amylase-starch solution mixture was yellow-brown?

Use **Figure 8**.

[1 mark]

_____ minutes

0 4 . 6 How could a more accurate time be obtained?

[1 mark]

Tick (✓) **one** box.

Add more iodine solution to the spotting tile. ☐

Test the mixture with iodine solution every 30 seconds. ☐

Test the mixture with iodine solution for more time. ☐

Use two drops of amylase-starch solution mixture in each test. ☐

Question 43 · continued

The student repeated the investigation at five different temperatures.

Table 2 shows the results.

Table 2

Temperature in °C	Time taken until iodine solution and mixture was yellow-brown in minutes
20	5
35	2
50	7
65	12
80	Remained blue-black

0 4 . 7 Which temperature did the enzyme work quickest at?

[1 mark]

Tick (✓) **one** box.

20 °C ☐

35 °C ☐

50 °C ☐

65 °C ☐

0 4 . 8 Explain why the iodine solution remained blue-black in the investigation at 80 °C.

[2 marks]

9

4.7.3.3 Land use

Question 44

November 2021 | 8461/2F | Original Q6

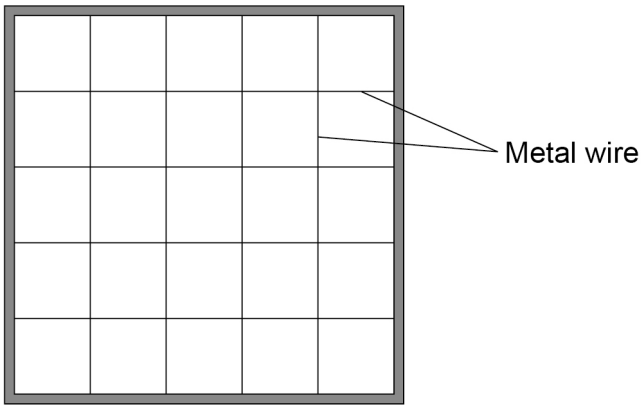
0 6 A student estimated the percentage cover of buttercup plants in a field.

The student used a quadrat.

The quadrat was divided into 25 equal squares.

Figure 10 shows the quadrat.

Figure 10



This is the method used.

1. Place the quadrat on the ground.
2. Record how many squares in the quadrat contain buttercup plants.
3. Place the quadrat in a new position in the field.
4. Record how many squares in the quadrat contain buttercup plants.
5. Repeat steps 3 and 4 another three times.

Question 44 · continued

0 6 . 1 What method should the student have used for placing the quadrat?

[1 mark]

Tick (✓) **one** box.

Place the quadrat where there are many buttercup plants. ☐

Place the quadrat only where there are no trees. ☐

Place the quadrat using random coordinates. ☐

Use the same person to place all the quadrats. ☐

The student calculated the percentage cover of buttercup plants for each quadrat.

Table 1 shows the student's results.

Table 1

Quadrat number	Number of squares containing buttercup plants	Percentage cover of buttercup plants
1	10	40
2	13	52
3	22	88
4	20	80
5	10	40
	Mean	**X**

0 6 . 2 Calculate mean value **X** in **Table 1**.

[2 marks]

X = _____ %

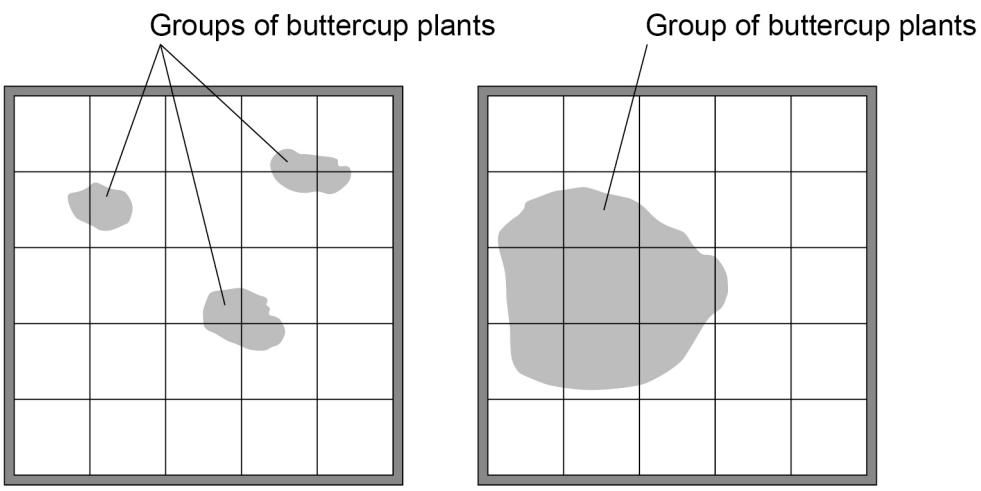
Question 6 continues on the next page

Question 44 · continued

Table 1 shows that quadrat **1** and quadrat **5** each had 40% cover of buttercup plants.

Figure 11 shows the results for quadrat **1** and quadrat **5**.

Figure 11



0 6 . 3 The student's method of estimating the percentage cover of buttercup plants is **not** accurate.

How does **Figure 11** show this?

[1 mark]

Tick (✓) **one** box.

Quadrat 1 has more groups of buttercup plants. ☐

The area of buttercup plants in quadrat 5 is much larger. ☐

The buttercup plants are in ten squares in both quadrats. ☐

4.7.3.3 Land use

Question 44 · continued

0 6 . 4 The student wanted to get a more valid estimate of the percentage cover of buttercup plants in the field.

Suggest **two** improvements to the method to make the results more valid.

[2 marks]

1 _____

_____

2 _____

_____

0 6 . 5 Give **three** environmental factors that would affect the growth of buttercup plants in a field.

[3 marks]

1 _____

2 _____

3 _____

9

4.7.3.3 Land use

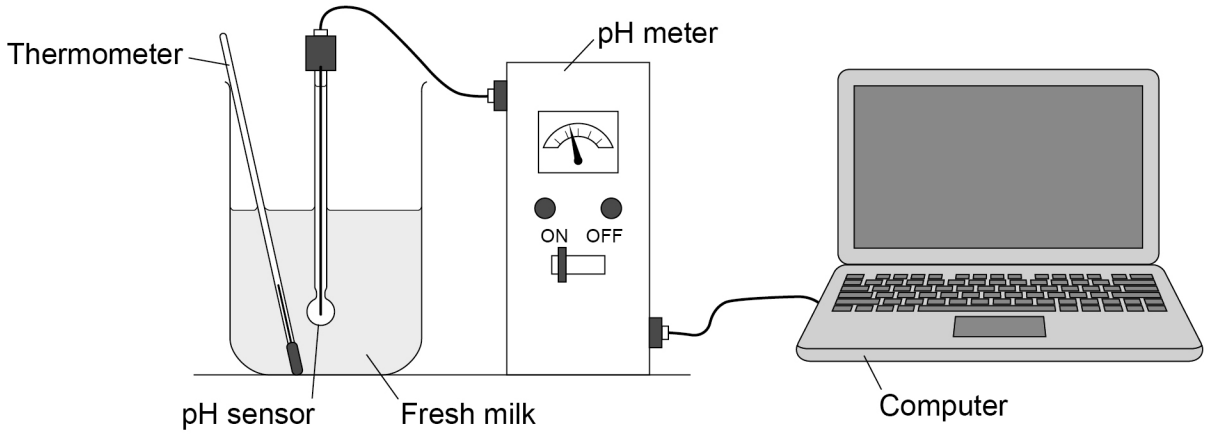
Question 45

November 2021 | 8461/2F | Original Q9

0 9 A student investigated the effect of temperature on the decay of milk.

Figure 15 shows the apparatus the student used.

Figure 15



This is the method used.

1. Set up the apparatus as shown in **Figure 15** with the milk at 20 °C.
2. Record the pH over 5 days using the computer.
3. Repeat with another batch of fresh milk at 25 °C.

0 9 . 1 How could the student keep the milk at a constant temperature for 5 days?

[1 mark]

0 9 . 2 Give **one** variable the student should keep constant.

Do **not** refer to temperature in your answer.

[1 mark]

Question 9 continues on the next page

Question 45 · continued

Table 2 shows the student's results for the milk at 20 °C.

Table 2

Time in days	0	1	2	3	4	5
pH	6.7	6.7	6.3	5.3	4.6	4.4

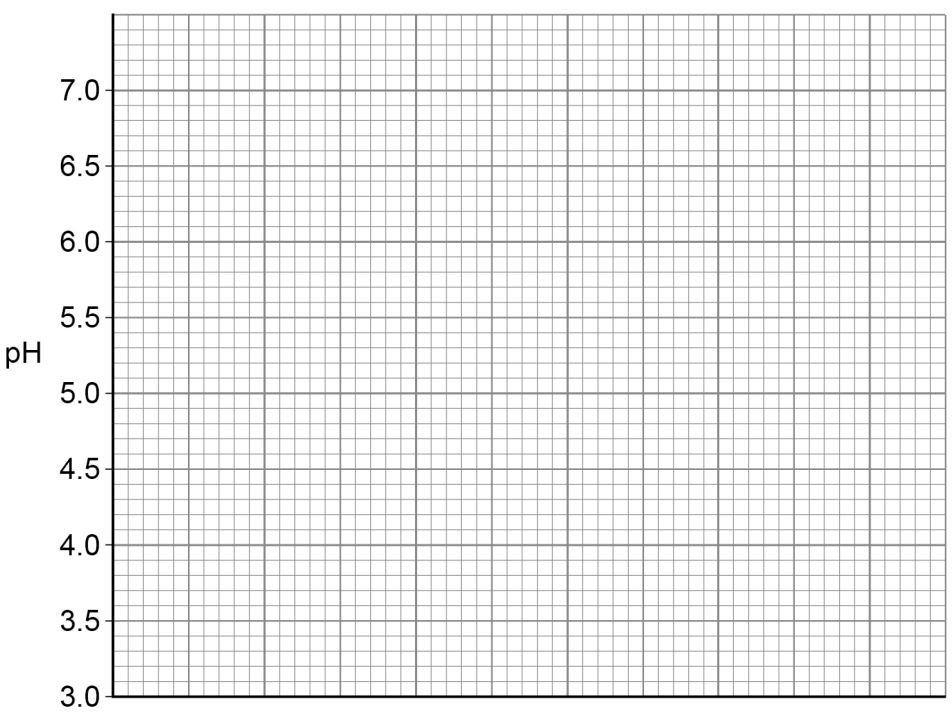
0 9 . 3 Complete **Figure 16**.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 2**
- draw a line of best fit.

Figure 16



0 9 . 4 The data you plotted in Question **09.3** were obtained at 20 °C.

Sketch a line on **Figure 16** to show the results you would expect at 25 °C.

Label this line '25 °C'.

[2 marks]

8

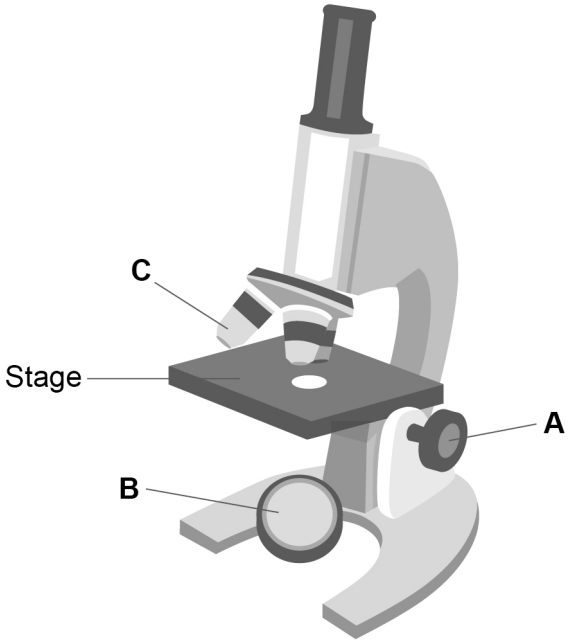
4.7.3.3 Land use

Question 46

June 2022 | 8461/1F | Original Q4

0 4 **Figure 3** shows a microscope.

Figure 3



0 4 . 1 Draw **one** line from each part of the microscope to the function of the part.

[3 marks]

Part of the microscope	Function
	To adjust the focus of the microscope
A	To direct light into the viewer's eye
B	To hold a slide in place
	To magnify the image of a specimen
C	To support the microscope

4.7.3.3 Land use

Question 46 · continued

A student prepared some onion cells.

The student viewed the onion cells using a microscope.

This is the method used.

1. Cut an onion into pieces using a sharp knife.
2. Peel off a thin layer of cells from one piece.
3. Place the layer of cells onto a microscope slide.
4. Add three drops of iodine solution to the layer of cells.
5. Cover with a cover slip.
6. Place the slide on the stage of the microscope.

0 4 . 2 Why was iodine solution added to the layer of onion cells?

[1 mark]

Tick (✓) **one** box.

To dry the cells ☐

To separate the cells ☐

To stain the cells ☐

0 4 . 3 Why was a **thin** layer of onion cells used?

[1 mark]

Tick (✓) **one** box.

To allow light to pass through the cells ☐

To allow oxygen to pass through the cells ☐

To allow water to pass through the cells ☐

Question 4 continues on the next page

0 4 . 4 The student was worried about using a sharp knife to cut the onion.

The student wrote a risk assessment for using a knife.

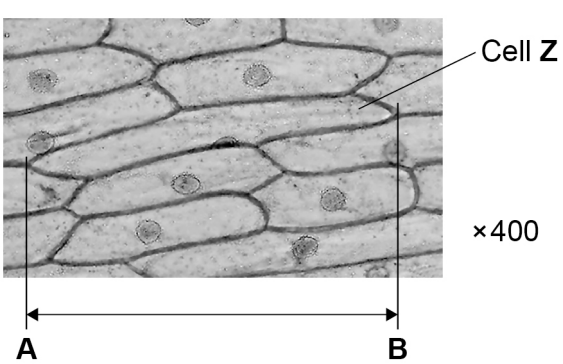
Draw **one** line from each part of the risk assessment to the description of the part.

[2 marks]

Part of risk assessment	Description
Hazard	Call a first aider
	Cut the onion on a chopping board
Plan to minimise risk	The onion is cut into pieces
	The knife is sharp

Figure 4 shows what the student saw using the microscope at a magnification of ×400.

Figure 4



Question 46 · continued

0 4 . 5 Line **A**–**B** in **Figure 4** shows the length of cell **Z**.

Calculate the real length of cell **Z**.

Complete the following steps.

[4 marks]

Measure the length of line **A**–**B** in millimetres (mm).

Length of line **A**–**B** = _____ mm

Give your measurement of the length of line **A**–**B** in micrometres (μm).

1 mm = 1 000 μm

Length of line **A**–**B** = _____ μm

Calculate the real length of cell **Z**.

Use the equation:

$$\text{real length of cell } \mathbf{Z} \text{ (in μm)} = \frac{\text{length of line } \mathbf{A}\text{–}\mathbf{B} \text{ (in μm)}}{\text{magnification}}$$

Real length of cell **Z** = _____ μm

Question 4 continues on the next page

Question 46 · continued

0 4 . 6 How would onion cells look different if they were seen using an electron microscope?

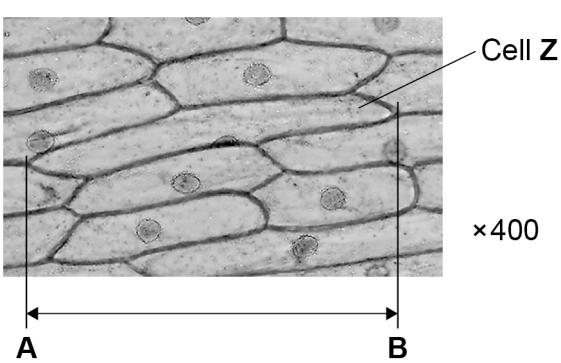
[2 marks]

Tick (✓) **two** boxes.

- The cells would be coloured. ☐
- The cells would have no nuclei. ☐
- The cells would look larger. ☐
- The cells would look more blurred. ☐
- The cells would show more internal structures. ☐

0 4 . 7 **Figure 4** is repeated below.

Figure 4

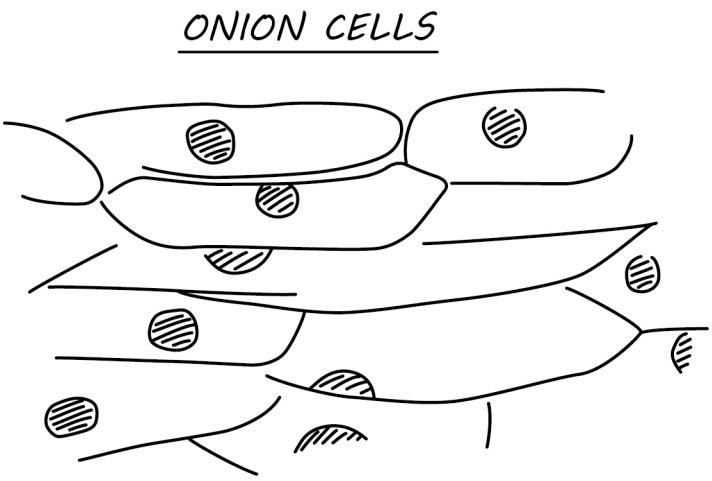


4.7.3.3 Land use

Question 46 · continued

Figure 5 shows the student's drawing of **Figure 4**.

Figure 5



What **two** improvements could the student make to the drawing in **Figure 5**?

[2 marks]

Tick (✓) **two** boxes.

Add colour to the cells. ☐

Complete the cell walls. ☐

Draw each cell on a separate piece of paper. ☐

Include the magnification. ☐

Use a ruler to draw the cells. ☐

15

4.7.3.3 Land use

Question 47

June 2022 | 8461/1F | Original Q7

0 7 This question is about cells and transport.

0 7 . 1 Complete **Table 5**.

[3 marks]

Table 5

Name of cell part	Function of cell part
	Contains genetic information
Mitochondria	
	Controls the movement of substances into and out of the cell

Cells in potatoes are plant cells.

Cells in potatoes do **not** contain chloroplasts.

0 7 . 2 What is the function of chloroplasts?

[1 mark]

0 7 . 3 Name **one** type of cell in a potato plant that does **not** contain chloroplasts.

[1 mark]

Question 7 continues on the next page

4.7.3.3 Land use

Question 47 · continued

A student investigated the effect of salt concentration on pieces of potato.

This is the method used.

1. Cut three pieces of potato of the same size.
2. Record the mass of each potato piece.
3. Add 150 cm^3 of 0.4 mol/dm^3 salt solution to a beaker.
4. Place each potato piece into the beaker.
5. After 30 minutes, remove each potato piece and dry the surface with a paper towel.
6. Record the mass of each potato piece.
7. Repeat steps 1 to 6 using different concentrations of salt solution.

0 7 . 4 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Concentration of salt solution ☐
- Mass of potato piece ☐
- Time potato is left in salt solution ☐
- Volume of salt solution ☐

0 7 . 5 Why did the student dry the surface of each potato piece with a paper towel in step **5**?

[1 mark]

4.7.3.3 Land use

Question 47 · continued

The student calculated the percentage change in mass of each potato piece.

0 7 . 6 For one potato piece:

- the starting mass was 2.5 g
- the end mass was 2.7 g.

Calculate the percentage increase in mass of the potato piece.

[2 marks]

Use the equation:

$$\text{percentage increase in mass} = \frac{\text{increase in mass}}{\text{starting mass}} \times 100$$

Percentage increase in mass = _____ %

Question 7 continues on the next page

Question 47 · continued

The student used the results from each potato piece to calculate the mean percentage change in mass at each concentration.

Table 6 shows the results.

Table 6

Concentration of salt solution in mol/dm^3	Mean percentage (%) change in mass
0.0	9.8
0.1	9.5
0.2	7.0
0.3	0.4
0.4	−1.4

0 7 . 7 Complete **Figure 9**.

You should:

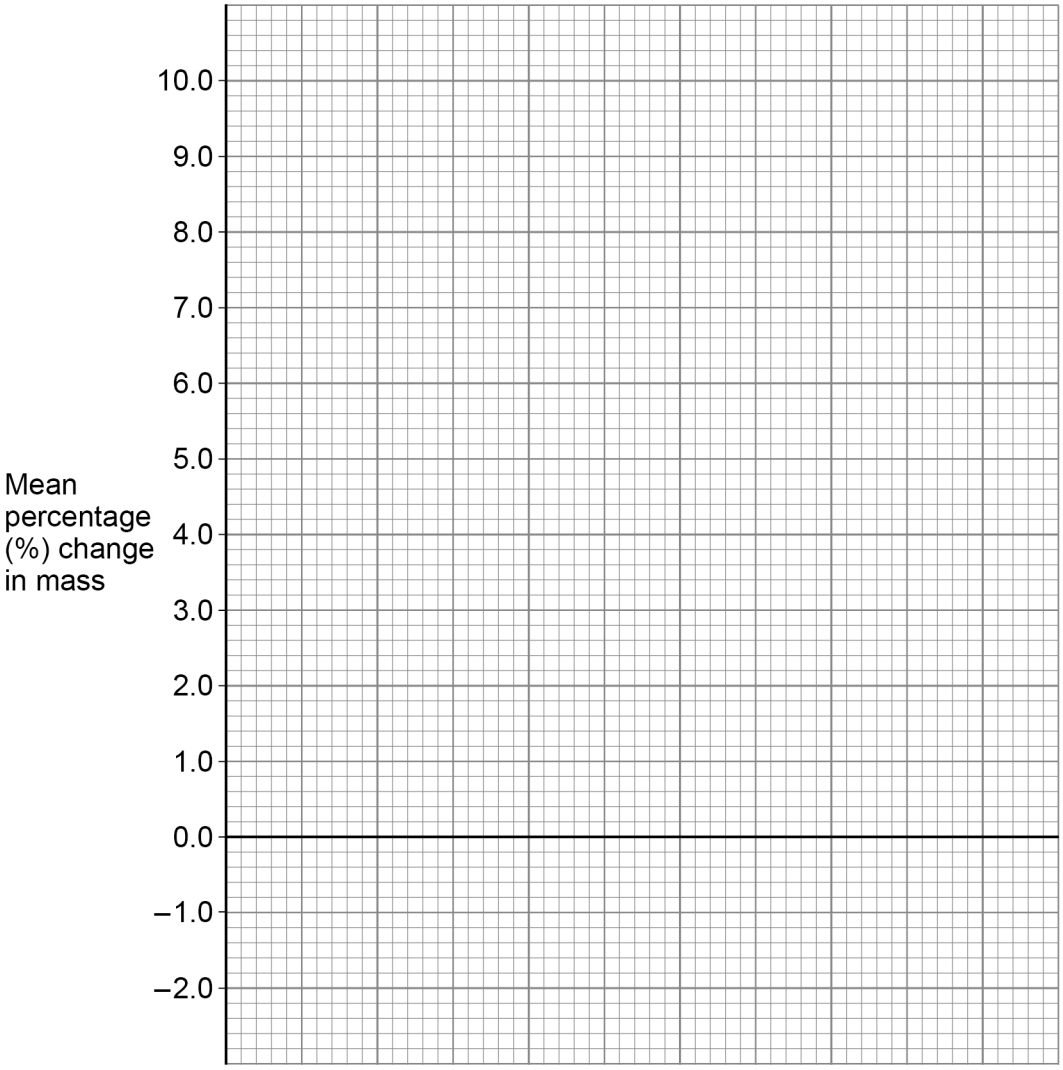
- label the x-axis
- use a suitable scale for the x-axis
- plot the data from **Table 6**
- draw a line of best fit.

[4 marks]

4.7.3.3 Land use

Question 47 · continued

Figure 9



0 7 . 8 What concentration of salt solution was equal to the concentration of the solution inside the potato pieces?

Use **Figure 9**.

[1 mark]

Concentration = _____ mol/dm^3

Question 7 continues on the next page

4.7.3.3 Land use

Question 47 · continued

0 7 . 9 Explain why the potato pieces in the 0.4 mol/dm^3 salt solution decreased in mass.

[3 marks]

17

4.7.3.3 Land use

Question 48

June 2022 | 8461/2F | Original Q2

0 2 Many human actions are reflexes.

0 2 . 1 Which statement describes a reflex action?

[1 mark]

Tick (✓) **one** box.

A reflex action does not need a sense organ. ☐

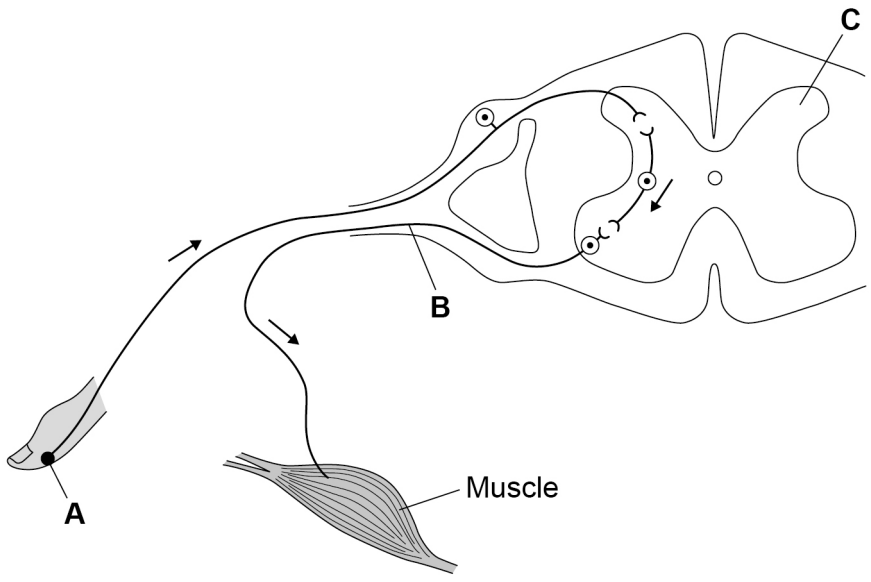
A reflex action is a slow action. ☐

A reflex action is automatic. ☐

Figure 3 shows the nerve pathway for a reflex action.

The arrows show the direction of the nerve impulse.

Figure 3



Question 48 · continued

0 2 . 2 Draw **one** line from each part of the nerve pathway to the name of that part.

Use **Figure 3**.

[3 marks]

Part of nerve pathway	Name of part
	Motor neurone
A	
	Receptor
B	
	Relay neurone
C	
	Spinal cord

0 2 . 3 Which **two** human actions are reflexes?

[2 marks]

Tick (✓) **two** boxes.

- Blinking when an insect flies into the eye ☐
- Catching a ball in a playground game ☐
- Playing a musical instrument ☐
- Removing the hand from a hot object ☐
- Writing a message to a friend ☐

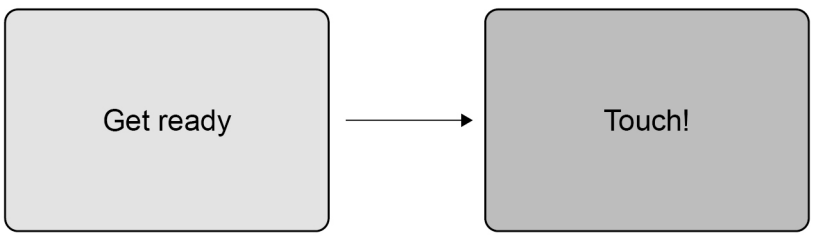
Question 2 continues on the next page

Question 48 · continued

Students investigated their reaction times using a computer program.

Figure 4 shows a sequence of two screens in the computer program.

Figure 4



Red screen **Green screen**

This is the method used.

1. Open the reaction time program.
2. When the screen turns from red to green, touch the screen as quickly as possible.
3. Record the reaction time shown on the screen.
4. Re-set to the red screen.
5. Repeat steps 2 to 4 four more times.
6. Repeat steps 1 to 5 for each student.

Table 1 shows the results.

Table 1

Test	Reaction time in milliseconds			
	Student P	Student Q	Student R	Student S
1	317	310	367	320
2	309	293	352	304
3	290	312	350	315
4	333	307	359	308
5	328	312	635	313
Mean	315	307	357	**X**

4.7.3.3 Land use

Question 48 · continued

0 2 . 4 Calculate mean value **X** in **Table 1**.

[2 marks]

X = _____ milliseconds

0 2 . 5 There is an anomalous result for student **R**.

Draw a ring around the anomalous result in **Table 1**.

[1 mark]

0 2 . 6 Give **two** factors that might affect a person's reaction time.

[2 marks]

1 _____

2 _____

11

4.7.3.3 Land use

Question 49

0 3 A plant shoot responds to the stimulus of light shining on it from one side.

0 3 . 1 What name is given to the type of response shown by the plant shoot?

[1 mark]

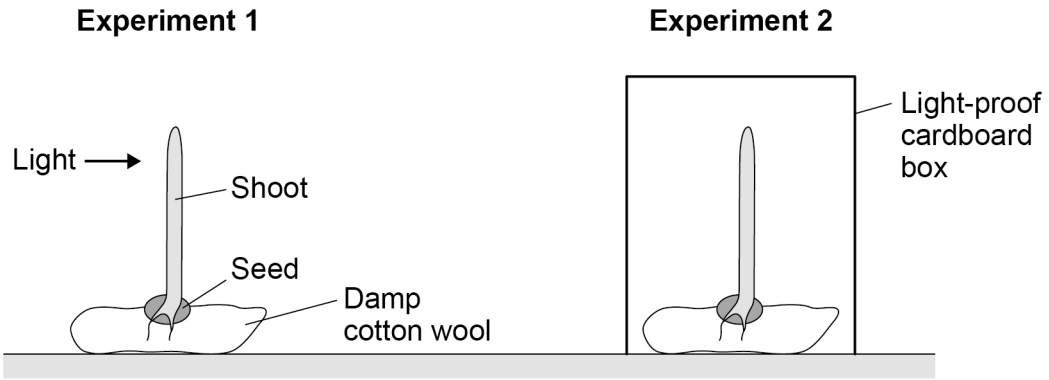
Tick (✓) **one** box.

- Adaptation ☐
- Homeostasis ☐
- Tropism ☐

A student investigated the effect of one-sided light on the growth of plant seedlings.

Figure 5 shows how the student set up the investigation.

Figure 5

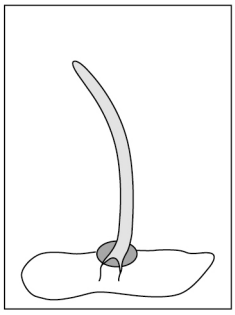
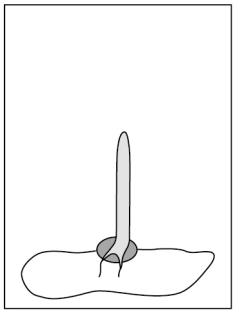
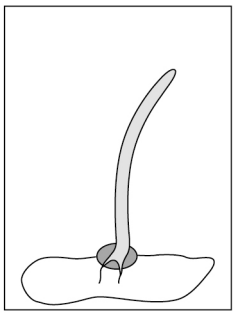
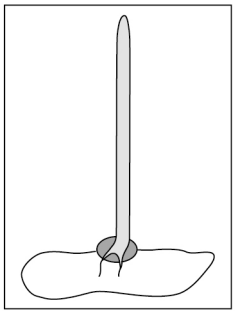


4.7.3.3 Land use

Question 49 · continued

0 3 . 2 Draw **one** line from each experiment to what the seedling would look like after 12 hours.

[2 marks]

Experiment	What the seedling would look like
	
1	
2	
	

0 3 . 3 Why did the student set up experiment **2** in this investigation?

[1 mark]

Question 49 · continued

0 3 . 4 The student wanted to make the investigation of the effect of one-sided light more valid.

The student decided to set up a third experiment.

How should the student set up the third experiment?

[1 mark]

Tick (✓) **one** box.

Give no water to the third seedling. ☐

Shine light from all sides on the third seedling. ☐

Turn the third seedling so it is upside-down. ☐

0 3 . 5 What is a suitable control variable for the investigation?

[1 mark]

Tick (✓) **one** box.

Keep each seedling at the same temperature. ☐

Keep each seedling the same height above the floor. ☐

Use the same size cardboard box for each seedling. ☐

0 3 . 6 Give **one** stimulus a plant **root** responds to.

Do **not** refer to light in your answer.

[1 mark]

4.7.3.3 Land use

Question 49 · continued

0 3 . 7 Scientists often repeat investigations several times.

Give **two** reasons why.

[2 marks]

1 _____

_____

2 _____

_____

9

Turn over for the next question

4.7.3.3 Land use

Question 50

June 2023 | 8461/2F | Original Q5

0 5 Bacteria are one type of organism that cause decay.

0 5 . 1 Which other type of organism causes decay?

[1 mark]

Tick (✓) **one** box.

Fungi ☐

Plants ☐

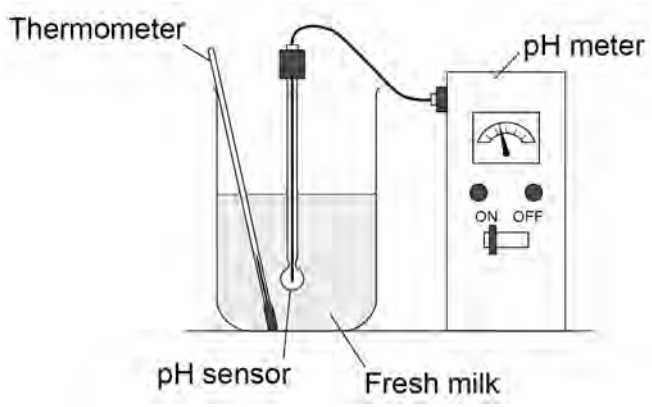
Viruses ☐

Students investigated the effect of temperature on the decay of milk.

The decay was caused by bacteria in the milk.

Figure 8 shows the apparatus used.

Figure 8



This is the method used.

1. Set up the apparatus as shown in **Figure 8** with the milk at 20 °C.
2. Record the pH each day for 7 days.
3. Repeat with more samples of milk at 5 °C and at 30 °C.

Question 50 · continued

June 2023 | 8461/2F | Original Q5

0 5 . 2 What was the dependent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- The pH of the milk ☐
- The type of milk ☐
- The volume of the milk ☐

0 5 . 3 How could the students keep the milk at 30 °C for 7 days?

[1 mark]

Tick (✓) **one** box.

- Put a lid on the beaker. ☐
- Put the beaker in a water bath. ☐
- Stir the milk continuously. ☐
- Wrap cloth around the beaker. ☐

0 5 . 4 As the milk decays, the bacteria digest fats in the milk.

What type of acid is produced by digestion of fats in the milk?

[1 mark]

Tick (✓) **one** box.

- Amino acid ☐
- Fatty acid ☐
- Hydrochloric acid ☐

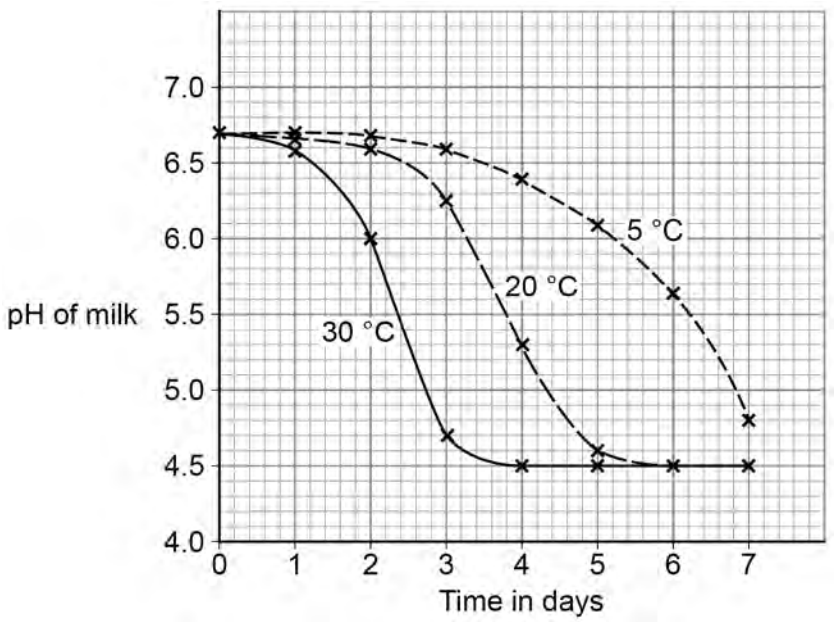
Question 5 continues on the next page

4.7.3.3 Land use

Question 50 · continued

Figure 9 shows the results.

Figure 9



0 5 . 5 Why did the pH **not** fall below pH 4.5 at 20 °C?

[1 mark]

Tick (✓) **one** box.

All the fat had been digested. ☐

The reaction was too fast. ☐

The temperature was too low. ☐

4.7.3.3 Land use

Question 50 · continued

The digestion of fat was fastest at 30 °C and slowest at 5 °C.

0 5 . 6 Give **one** reason why the rate of digestion was faster at 30 °C than at 5 °C.

[1 mark]

0 5 . 7 Calculate the rate of digestion at 30 °C from day 2 to day 3.

Complete the following calculation.

Use data from **Figure 9**.

[2 marks]

At 30 °C, the pH at day 2 = _____

At 30 °C, the pH at day 3 = _____

Therefore the fall in pH at 30 °C from day 2 to day 3 = _____ pH units/day

0 5 . 8 The rate of digestion at 5°C from day 2 to day 3 is 0.1 pH units/day.

How many times faster is the rate of digestion at 30°C than the rate of digestion at 5°C from day 2 to day 3?

[2 marks]

Use your answer to Question **05.7**.

Rate at 30 °C is _____ times faster

10

4.7.3.3 Land use

Question 51

0 2 Pathogens cause disease.

0 2 . 1 How does the skin defend the human body against pathogens?

[1 mark]

The stomach contains acid to kill pathogens.

A scientist investigated the effect of acid on the survival of bacteria.

This is the method used.

1. Prepare four test tubes each with 10 cm^3 of culture solution.
2. Use acid to adjust the pH of the solutions to be pH1, pH2, pH3 and pH5
3. Add 1 cm^3 of bacteria mixture to each test tube.
4. Take a 0.1 cm^3 sample from each test tube and record the number of live bacteria.
5. Keep the test tubes at 37 °C for 24 hours.
6. Repeat step 4.

Table 1 shows some of the results.

Table 1

Time in hours	Number of live bacteria			
	pH1	pH2	pH3	pH5
0	210	210	210	216
24	23	**X**	63	185

Question 51 · continued

0 2 . 2 What fraction of the bacteria present at 0 hours for **pH3** survived for 24 hours?

Give your answer in its simplest form.

[2 marks]

Fraction surviving = _____

0 2 . 3 How many more bacteria were killed at pH1 than at pH5 in 24 hours?

Complete the following steps.

[3 marks]

Calculate the number of bacteria killed at pH1 _____

Calculate the number of bacteria killed at pH5 _____

Calculate how many more bacteria were killed at pH1 than at pH5 _____

Number = _____

0 2 . 4 A student calculated value **X** in **Table 1** to be 43

Suggest how the student calculated this value.

[2 marks]

8

4.7.3.3 Land use

Question 52

June 2024 | 8461/1F | Original Q4

0 4 Starch and sugar are two types of carbohydrate.

0 4 . 1 Describe the chemical tests that a student could use to show if bread contains:

- starch
- sugar.

You should include the results of a positive test **and** a negative test for each type of carbohydrate.

[4 marks]

Question 4 continues on the next page

Question 52 · continued

A student investigated three types of bread.

For each type of bread, the student:

- put a square piece of bread into their mouth
- did **not** chew the bread
- recorded the time taken for the bread to taste sweet.

Table 2 shows the results.

Table 2

Type of bread	Time taken for bread to taste sweet in seconds
Brown	43
White	35
Wholemeal	57

0 4 . 2 Complete the sentences.

Choose answers from the box.

[2 marks]

amylase	fat	lipase	protease	sugar

The starch in the bread was broken down by the

enzyme _____.

The enzyme broke down the starch into _____.

4.7.3.3 Land use

Question 52 · continued

0 4 . 3 What was the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- The size of the piece of bread ☐
- The temperature of the mouth ☐
- The type of bread ☐

0 4 . 4 Give **two** conclusions that can be made from the results in **Table 2**.

[2 marks]

1 _____

_____

2 _____

_____

Question 4 continues on the next page

Table 2 is repeated below.

Table 2

Type of bread	Time taken for bread to taste sweet in seconds
Brown	43
White	35
Wholemeal	57

The student improved the investigation.

Table 3 shows the results.

Table 3

Type of bread	Time taken for bread to taste sweet in seconds			
	Test 1	Test 2	Test 3	Mean
Brown	38	43	45	42
White	35	31	39	35
Wholemeal	58	55	61	**X**

0 4 . 5 What did the student do to improve the investigation?

Use **Table 2** and **Table 3**.

[2 marks]

4.7.3.3 Land use

Question 52 · continued

0 4 . 6 Calculate value **X** in **Table 3**.

[2 marks]

X = _____ seconds

0 4 . 7 Why should the student do the investigation with more people?

[1 mark]

Tick (✓) **one** box.

Each person's sense of taste is different. ☐

More people would make the investigation safer. ☐

There are many different types of bread. ☐

14

4.7.3.3 Land use

Question 53

0 6 A student investigated the effect of different concentrations of salt solution on the mass of uncooked pieces of potato.

This is the method used.

1. Cut four pieces of a potato to the same size.
2. Record the mass of each piece of potato.
3. Put one of the pieces of potato into a beaker containing 100 cm^3 of 0.1 mol/dm^3 salt solution.
4. Repeat step 3 using the other pieces of potato, each in a different concentration of salt solution.
5. After 20 minutes, remove the pieces of potato from the solutions.
6. Record the mass of each piece of potato.

0 6 . 1 Give **two** control variables the student used in the investigation.

[2 marks]

1 _____

_____

2 _____

_____

4.7.3.3 Land use

Question 53 · continued

0 6 . 2 The student needed to be sure the measurements were as accurate as possible.

What should be done to each piece of potato after removing from the solution and before measuring the mass?

[1 mark]

0 6 . 3 Name the piece of apparatus the student could use to measure the mass of the pieces of potato.

[1 mark]

Question 6 continues on the next page

Question 53 · continued

Table 4 shows the results.

Table 4

Piece of potato	Concentration of salt solution in mol/dm^3	Mass of piece of potato in grams			Percentage (%) change in mass of piece of potato
		At start	After 20 minutes	Change	
A	0.1	6.2	6.5	+ 0.3	+ 4.8
B	0.3	6.8	6.5	− 0.3	− 4.4
C	0.5	6.5	5.8	− 0.7	− 10.8
D	0.7	6.0	4.9	− 1.1	**X**

0 6 . 4 What was the resolution of the apparatus used for measuring mass?

Use **Table 4**.

[1 mark]

Tick (✓) **one** box.

0.01 g ☐ 0.1 g ☐ 1.0 g ☐ 1.1 g ☐

0 6 . 5 Which piece of potato had the greatest change in mass in the investigation?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

4.7.3.3 Land use

Question 53 · continued

0 6 . 6 Calculate value **X** in **Table 4**.

Use the equation:

$$\text{percentage change in mass} = \frac{\text{change in mass in grams}}{\text{mass at start in grams}} \times 100$$

Give your answer to 1 decimal place.

[3 marks]

X (1 decimal place) = _____ %

0 6 . 7 What is the best way to present the data in **Table 4**?

[1 mark]

Tick (✓) **one** box.

- Bar chart ☐
- Line graph ☐
- Pie chart ☐

Question 6 continues on the next page

Question 53 · continued

0 6 . 8 Complete the sentences.

[3 marks]

Some of the pieces of potato decreased in mass because the potato cells lost _____.

The decrease in mass was due to a process called _____.

The structure surrounding each cell in a piece of potato is partially _____.

0 6 . 9 **Table 4** is repeated below.

Table 4

Piece of potato	Concentration of salt solution in mol/dm^3	Mass of piece of potato in grams			Percentage (%) change in mass of piece of potato
		At start	After 20 minutes	Change	
A	0.1	6.2	6.5	+ 0.3	+ 4.8
B	0.3	6.8	6.5	− 0.3	− 4.4
C	0.5	6.5	5.8	− 0.7	− 10.8
D	0.7	6.0	4.9	− 1.1	**X**

Estimate the concentration of salt solution that would **not** cause a change in mass of these pieces of potato.

[1 mark]

Concentration = _____ mol/dm^3

14

4.7.3.3 Land use

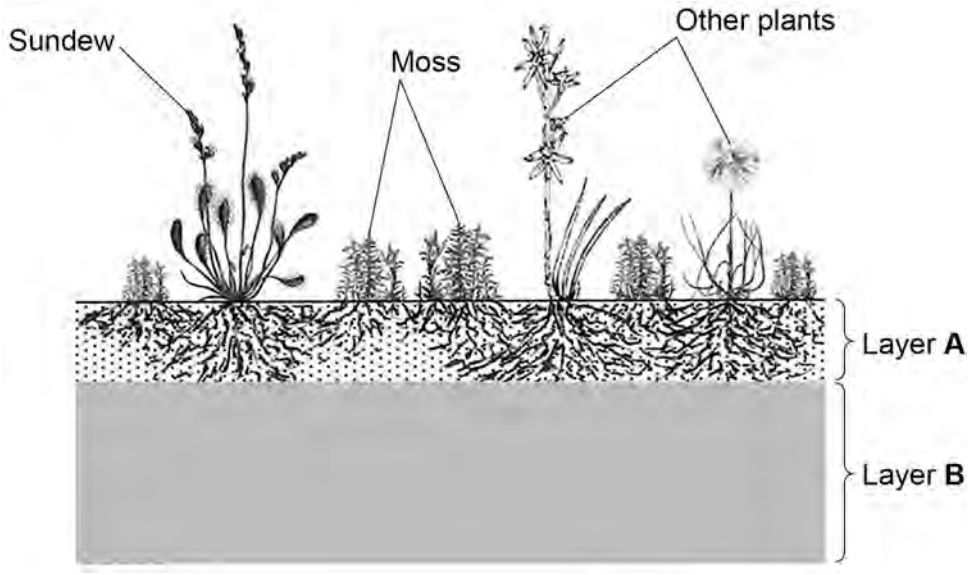
Question 54

1 0

Peat bogs are estimated to contain twice as much carbon as all the world's forests.

Figure 13 shows a section through part of a peat bog.

Figure 13



Layer **A** contains a lot of air.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

4.7.3.3 Land use

Question 54 · continued

10.1 Explain why most of the dead remains of plants in layer **B** do **not** decay.

[3 marks]

10.2 The peat bog in **Figure 13** is a stable community.

The moss produces biomass at a rate of 340 g/m^2/year.

What is the approximate biomass of the moss that becomes biomass in primary consumers?

[1 mark]

Tick (✓) **one** box.

- 0.34 g/m^2/year ☐
- 3.4 g/m^2/year ☐
- 34 g/m^2/year ☐
- 340 g/m^2/year ☐

Question 10 continues on the next page

4.7.3.3 Land use

Question 54 · continued

The sundew plant shown in **Figure 13** on page 38 has leaves with sticky hairs that trap and digest insects.

Digestion of the insects releases phosphates and simple compounds of nitrogen that are used by the sundew plant.

10.3 What substance can the sundew plant make using the **phosphates**?

[1 mark]

Tick (✓) **one** box.

- Cellulose ☐
- DNA ☐
- Glycerol ☐
- Starch ☐

10.4 What substance can the sundew plant make using the **nitrogen**?

[1 mark]

Tick (✓) **one** box.

- Fatty acid ☐
- Glucose ☐
- Lactic acid ☐
- Protein ☐

4.7.3.3 Land use

Question 54 · continued

1 0 . 5 Humans have destroyed large areas of peat bog to collect peat.

The peat provides fuel and provides compost for gardeners to use.

The peat comes from layer **B** in **Figure 13** on page 38.

Layer **B**:

- contains the dead remains of plants
- has a low pH
- contains very little oxygen
- contains carbon dioxide and methane.

Figure 14 shows the removal of peat from a peat bog.

Figure 14



Explain how the destruction of peat bogs and the use of peat affects the temperature of the Earth's atmosphere.

[4 marks]

10

4.7.3.3 Land use

Question 55

June 2024 | 8461/2F | Original Q11

1 1 Frogs are animals that lay their eggs in water. The eggs hatch as tadpoles.

Students investigated the number of tadpoles in a pond for 8 weeks.

This is the method used.

1. Collect 10 dm^3 of pond water in a bucket.
2. Count the number of tadpoles collected.
3. Put the tadpoles back into the pond.
4. Repeat steps 1 to 3 another three times in different parts of the pond.
5. Repeat steps 1 to 4 at intervals for 8 weeks.

1 1 . 1 Suggest **one** improvement to the method.

[1 mark]

Question 11 continues on the next page

4.7.3.3 Land use

Question 55 · continued

Table 1 shows the results.

Table 1

Sample number	Number of tadpoles in each sample					
	0 weeks	1 week	2 weeks	3 weeks	5 weeks	8 weeks
1	11	17	8	9	5	0
2	15	11	12	7	0	5
3	23	16	14	10	7	3
4	11	14	16	**X**	4	4
Totals	60	58	50	32	16	12

1 1 . 2 Value **X** is the number of tadpoles in sample 4, at 3 weeks.

Calculate value **X**.

[1 mark]

Value **X** = _____

4.7.3.3 Land use

Question 55 · continued

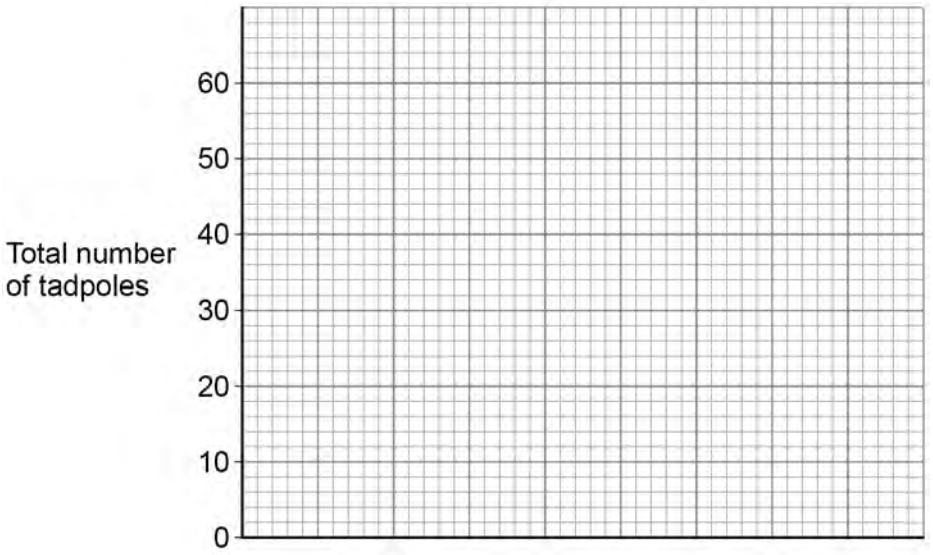
1 1 . 3 Complete **Figure 15** to show how the **total** number of tadpoles changed over the 8 weeks.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data for the **total** numbers of tadpoles from **Table 1**
- draw a line of best fit.

Figure 15



1 1 . 4 After 0 weeks, no more tadpoles hatched in the pond.

Calculate the percentage of the tadpoles that would still be found in the pond at 4 weeks compared with 0 weeks.

Use information from **Figure 15**.

[3 marks]

Percentage of tadpoles found at 4 weeks = _____ %

4.7.3.3 Land use

Question 55 · continued

1 1 . 5 After 4 weeks many of the tadpoles had died.

Suggest **two** reasons why the tadpoles died.

[2 marks]

1 _____

_____

2 _____

_____

11

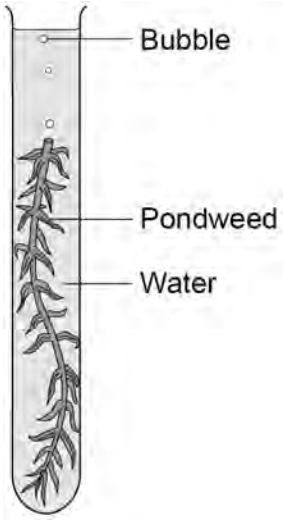
4.7.3.3 Land use

Question 56

0 2 A student investigated the effect of temperature on the rate of photosynthesis in pondweed.

Figure 2 shows how the student set up the apparatus.

Figure 2



This is the method used.

1. Prepare six tubes of pondweed as shown in **Figure 2**.
2. Place one tube into each of six water baths set at different temperatures.
3. Wait two minutes.
4. Measure the time taken for each piece of pondweed to release 10 bubbles.

0 2 . 1 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

Length of pondweed ☐

Temperature of pondweed ☐

Volume of water ☐

Question 2 continues on the next page

Question 56 · continued

Table 2 shows the results.

Table 2

Temperature in °C	Time taken for pondweed to release 10 bubbles in seconds
10	84
20	43
30	27
40	25
50	33
60	77

0 2 . 2 Complete the sentences.

Choose answers from the box.

[2 marks]

cellulose	**chlorophyll**	**nitrogen**	**oxygen**	**water**

Photosynthesis by the pondweed releases bubbles of _____.

The green substance needed for photosynthesis is called _____.

0 2 . 3 Describe the effect of increasing temperature on the time taken for the pondweed to release 10 bubbles.

[2 marks]

_____

_____

_____

_____

Question 56 · continued

0 2 . 4 Calculate the rate of photosynthesis at **50 °C**.

Use the equation:

$$\text{rate of photosynthesis in bubbles per second} = \frac{10}{\text{time taken to release 10 bubbles in seconds}}$$

Use **Table 2**.

Give your answer to 1 decimal place.

[3 marks]

Rate of photosynthesis (1 decimal place) = _____ bubbles per second

0 2 . 5 Which temperature had the fastest rate of photosynthesis?

[1 mark]

Tick (✓) **one** box.

- 20 °C ☐
- 30 °C ☐
- 40 °C ☐
- 50 °C ☐

Question 2 continues on the next page

Question 56 · continued

Table 2 is repeated below.

Table 2

Temperature in °C	Time taken for pondweed to release 10 bubbles in seconds
10	84
20	43
30	27
40	25
50	33
60	77

0 2 . 6 The student repeated the investigation at 80 °C.

What would be the time taken for the pondweed to release 10 bubbles at 80 °C?

[1 mark]

Tick (✓) **one** box.

Less than 77 seconds ☐

Exactly 77 seconds ☐

More than 77 seconds ☐

4.7.3.3 Land use

Question 56 · continued

0 2 . 7 Which **two** factors could affect the rate of photosynthesis in this investigation?

[2 marks]

Tick (✓) **two** boxes.

- Concentration of carbon dioxide ☐
- Light intensity ☐
- Size of boiling tube ☐
- Size of bubbles ☐
- Type of stopwatch ☐

12

Turn over for the next question

4.7.3.3 Land use

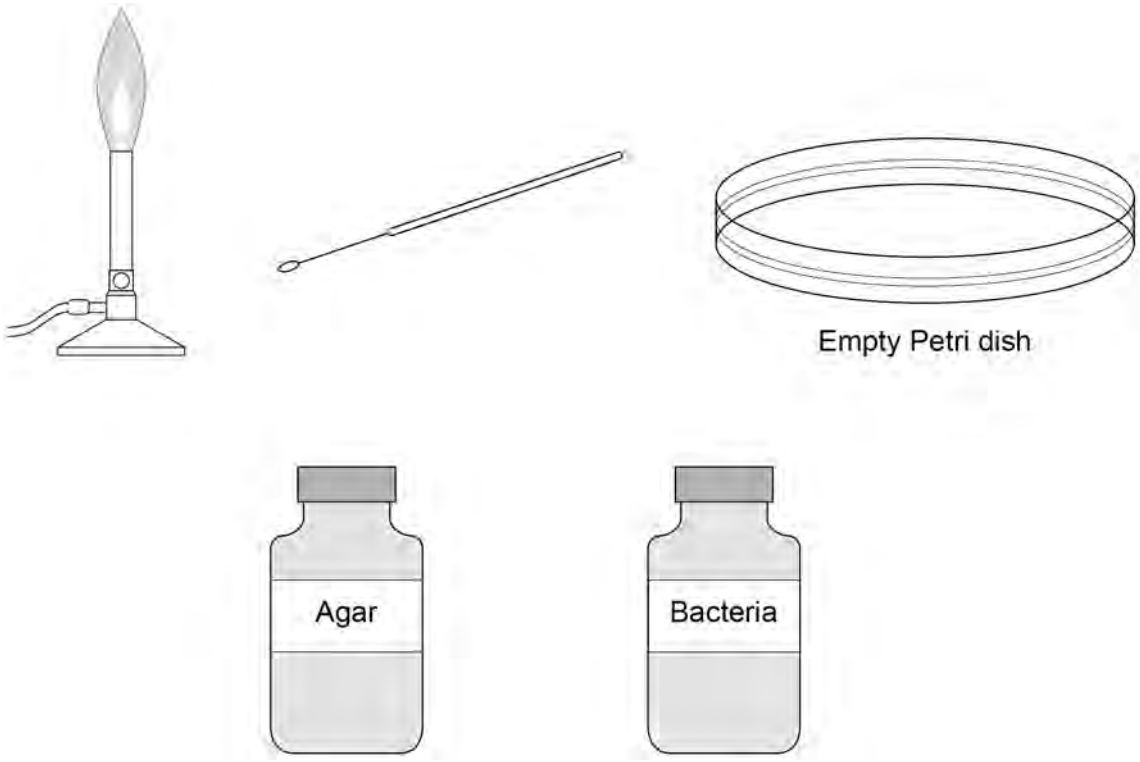
Question 57

0 4 A student investigated the effect of antibiotics on the growth of bacteria.

The student prepared an agar gel plate.

Figure 5 shows some of the equipment the student used.

Figure 5



0 4 . 1 Describe a method the student could use to:

- prepare a sterile agar gel plate
- grow an uncontaminated sample of bacteria on the agar gel plate.

Use the equipment in **Figure 5** in your answer.

[6 marks]

4.7.3.3 Land use

Question 57 · continued

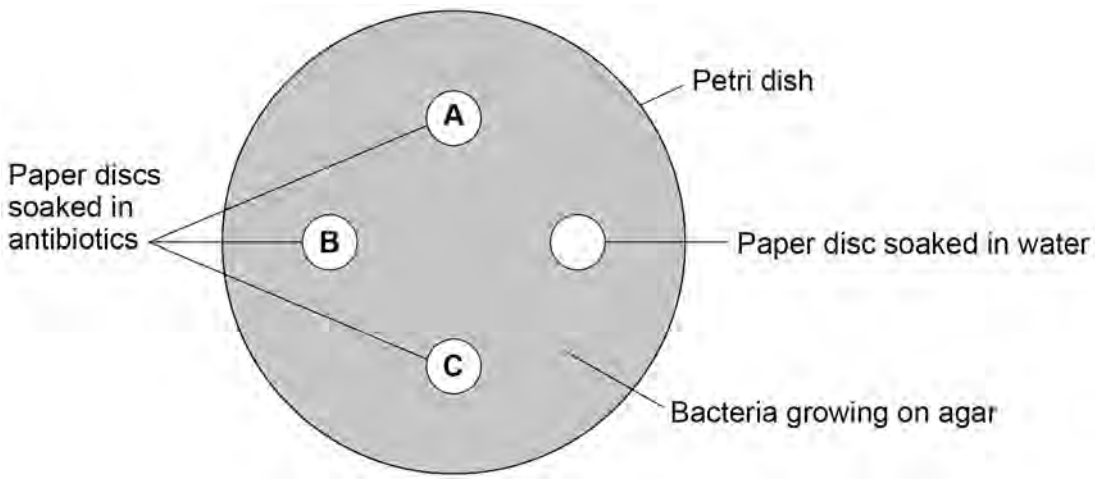
Question 4 continues on the next page

Question 57 · continued

The student used an agar gel plate to test three antibiotics, **A**, **B** and **C**.

Figure 6 shows how the agar gel plate was set up.

Figure 6



0 4 . 2 The student incubated the agar gel plate at 25 °C.

Why should the temperature **not** be higher than 25 °C?

[1 mark]

0 4 . 3 What was the purpose of the paper disc soaked in water?

[1 mark]

Tick (✓) **one** box.

To check the bacteria were uncontaminated. ☐

To make the investigation more accurate. ☐

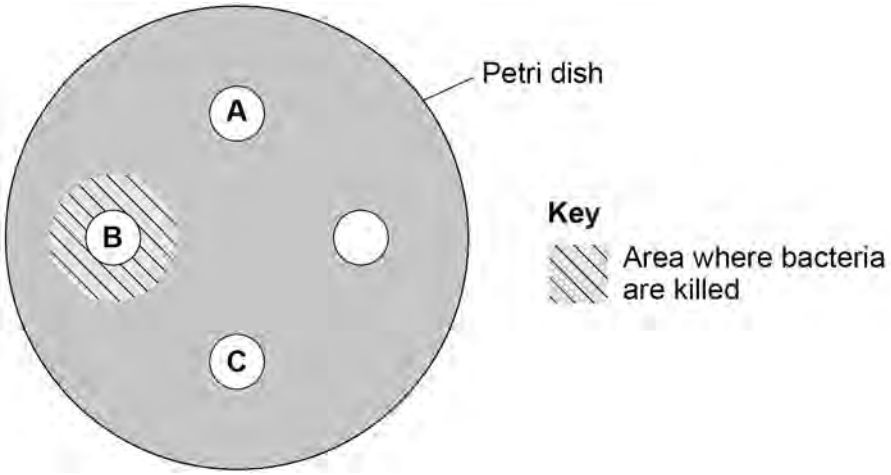
To show the effect of no antibiotics. ☐

0 4 . 4 The student removed the agar gel plate from the incubator after 48 hours.

Antibiotic **A** was the **most** effective at killing the bacteria.
Antibiotic **C** was the **least** effective at killing the bacteria.

Figure 7 shows the results for the disc soaked in antibiotic **B**.

Figure 7



Complete **Figure 7** to show the results you would expect.

You should:

- draw a ring around the disc soaked in antibiotic **A**
- draw a ring around the disc soaked in antibiotic **C**.

[2 marks]

0 4 . 5 The student repeated the investigation with antibiotic **D**.

The bacteria were resistant to antibiotic **D**.

What effect would antibiotic **D** have had on the bacteria?

[1 mark]

Tick (✓) **one** box.

All of the bacteria would have been killed. ☐

Some of the bacteria would have been killed. ☐

None of the bacteria would have been killed. ☐

11

4.7.3.3 Land use

Question 58

June 2025 | 8461/1F | Original Q8

0 8 A student investigated osmosis in pieces of potato.

This is the method used.

1. Cut a piece of potato into a cube.
2. Record the mass of the cube.
3. Place the cube into a beaker containing 0.4 mol/dm^3 salt solution.
4. After some time, remove the cube and record the mass.
5. Calculate the change in the mass of the cube.
6. Repeat steps 1 to 5 using two more different concentrations of salt solution.

0 8 . 1 Evaluate the student's method.

You should include how the student could improve the validity of their results.

[6 marks]

4.7.3.3 Land use

Question 58 · continued

0 8 . 2 Why would a potato cube placed into distilled water increase in mass?

[1 mark]

Tick (✓) **one** box.

- The solution in the potato cells was less concentrated than the distilled water. ☐
- The solution in the potato cells was more concentrated than the distilled water. ☐
- The volume of water in the potato cells was greater than the volume of distilled water. ☐
- The volume of water in the potato cells was less than the volume of distilled water. ☐

0 8 . 3 Active transport is another process used by potato cells.

Give **one** way active transport is different from osmosis.

[1 mark]

_____

_____

8

4.7.3.3 Land use

Question 59

June 2025 | 8461/2F | Original Q9

0 9

Students investigated how many daisy plants were growing in a field at different distances from a tree.

This is the method used.

1. Place a 20-metre tape measure on the ground, with the tree at 0 metres.

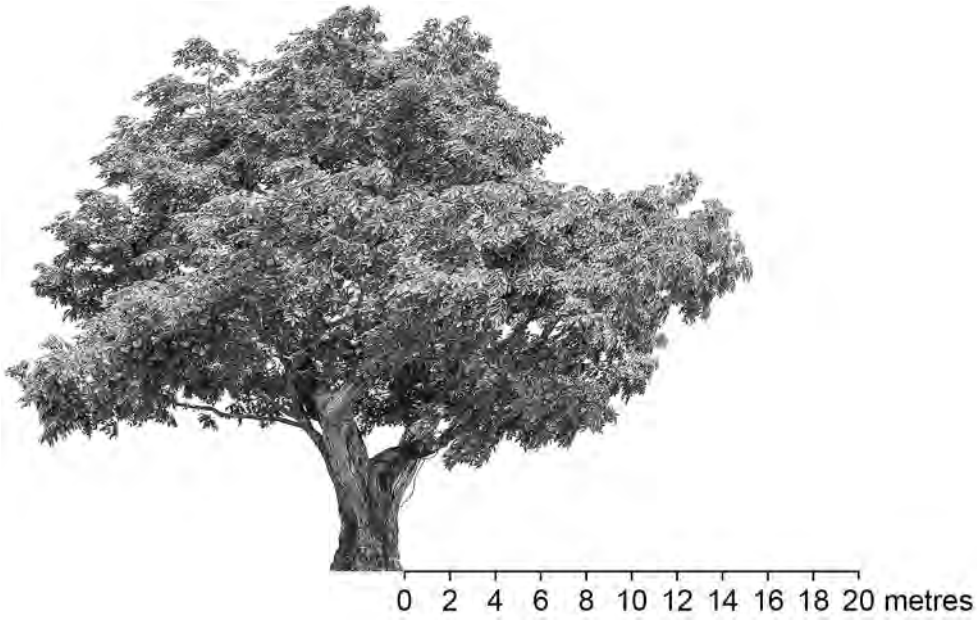
2. Place a 1 m^2 quadrat on the ground every 4 metres along the tape measure.

3. Count the number of daisy plants in each quadrat.

4. Take a soil sample from each quadrat to find the percentage of water in the soil.

Figure 14 shows the tree and the tape measure.

Figure 14



This is the method used for finding the percentage of water in each soil sample (step 4):

5. Weigh an empty container.

6. Place the soil sample in the container and weigh again.

7. Heat the container of soil in an oven at 100 °C for several hours.

8. Allow the container of soil to cool and weigh again.

9. Repeat steps 7 and 8 until there is no further change in mass.

4.7.3.3 Land use

Question 59 · continued

0 9 . 1 Suggest why the students repeated steps **7** and **8** until there was no further change in mass.

[1 mark]

Question 9 continues on the next page

Question 59 · continued

Table 6 shows the results.

Table 6

	Distance from the tree in metres				
	4	**8**	**12**	**16**	**20**
Mass of fresh soil in grams	250	266	260	248	252
Mass of dried soil in grams	225	234	209	184	181
Mass of water lost from soil in grams	25	32	51	64	71
Percentage of water in soil	10	12	20	26	**X**
Number of daisies per m^2	0	7	15	28	32

0 9 . 2 Calculate percentage **X** in **Table 6**.

Give your answer to the nearest whole number.

[3 marks]

Percentage **X** (nearest whole number) = _____ %

0 9 . 3 Describe the effect of distance from the tree on the percentage of water in the soil between 4 metres and 16 metres.

Use **Table 6**.

[1 mark]

4.7.3.3 Land use

Question 59 · continued

0 9 . 4 A student concluded:

‘As the water content of the soil increases, so does the number of daisy plants.’

Describe **two** changes to the investigation that would increase the validity of the student’s conclusion.

[2 marks]

1 _____

_____

2 _____

_____

0 9 . 5 The percentage of water in the soil is an abiotic factor.

Suggest **three** other **abiotic** factors that might have caused more daisy plants to grow further away from the tree.

Do **not** refer to water in your answer.

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

10