AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.1.3

Biotic factors

Past-paper questions

Tier	**Foundation**
Question groups	**10**
Available paper years	**2018–2025**

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.

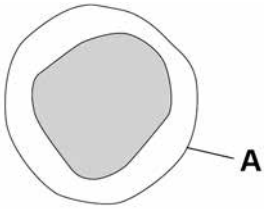
4.7.1.3 Biotic factors

Question 01

June 2018 | 8464/B/1F | Original Q1

0 1 **Figure 1** shows one type of white blood cell.

Figure 1



0 1 . 1 What is structure **A**?

[1 mark]

Tick **one** box.

- Cell membrane ☐
- Cell wall ☐
- Cytoplasm ☐
- Nucleus ☐

0 1 . 2 White blood cells help to defend the body against pathogens.

How do the white blood cells do this?

[3 marks]

Tick **three** boxes.

- Clone pathogens ☐
- Engulf pathogens ☐
- Produce antibiotics ☐
- Produce antibodies ☐
- Produce antitoxins ☐
- Produce toxins ☐

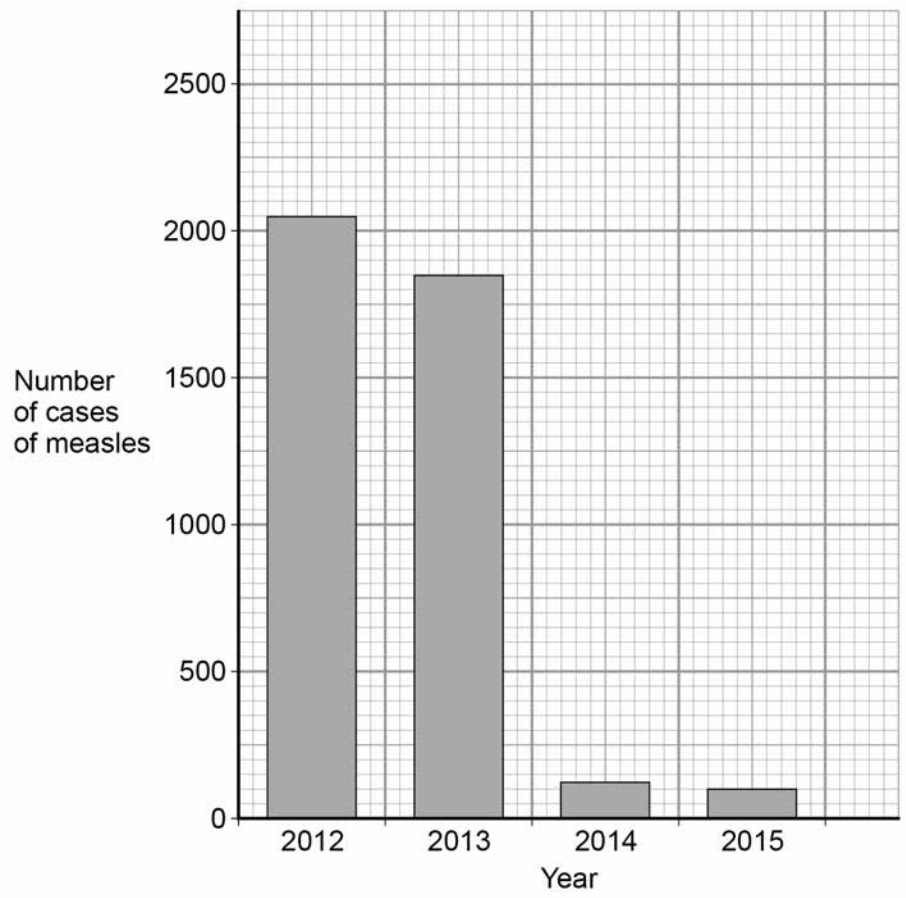
4.7.1.3 Biotic factors

Question 01 · continued

Measles is a serious disease. A person can die from measles.

Figure 2 shows the number of cases of measles in England and Wales between 2012 and 2015

Figure 2



0 1 . 3 Use **Figure 2** to calculate the decrease in the number of cases of measles between 2012 and 2015

[2 marks]

Answer = _____ cases

0 1 . 4 Suggest **one** reason for the decrease in the number of cases of measles between 2012 and 2015

[1 mark]

Question 01 · continued

0 1 . 5 Antibiotics **cannot** be used to treat measles.

Suggest why.

[1 mark]

0 1 . 6 Gonorrhoea is a disease caused by a bacterium.

Gonorrhoea **can** be treated with antibiotics.

Give **one** other way to control the spread of gonorrhoea.

[1 mark]

A scientist investigated how effective different antibiotics were at killing gonorrhoea bacteria.

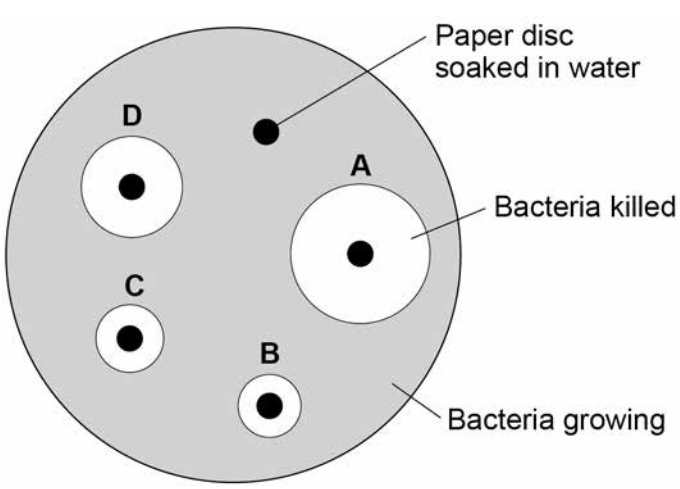
This is the method used.

1. Grow gonorrhoea bacteria on agar in a Petri dish.
2. Place one paper disc soaked in water onto the agar.
3. Place four other paper discs, each soaked in a different antibiotic, **A**, **B**, **C**, and **D**, onto the agar.
4. Use the same sized paper discs and the same concentration of each antibiotic.
5. Incubate the Petri dish for 3 days.

Figure 3 shows the scientist's results.

A clear area around the disc means the antibiotic has killed the bacteria.

Figure 3



4.7.1.3 Biotic factors

Question 01 · continued

June 2018 | 8464/B/1F | Original Q1

0 1 . 7 Give **one** control variable the scientist used.

[1 mark]

0 1 . 8 Suggest why **one** disc was soaked in water.

[1 mark]

0 1 . 9 Which antibiotic in **Figure 3** would be the best to treat gonorrhoea?

Give a reason for your answer.

[2 marks]

Antibiotic

Reason

13

4.7.1.3 Biotic factors

Question 02

0 6 Many biotic and abiotic factors can affect the growth of plants.

0 6 . 1 Are the factors in **Table 6** biotic or abiotic?

[2 marks]

Tick **one** box for each factor.

Table 6

Factor	Biotic	Abiotic
Diseases		
Herbivores		
Temperature		
Water		

Two students investigated the effect of light intensity on the distribution of small plants.

The plants are growing under a tree in a park.

The students made the following hypothesis:

'As you move outwards from a tree there will be more plant growth.'

0 6 . 2 Explain why the students thought their hypothesis would be correct.

[3 marks]

Question 02 · continued

0 6 . 3 The students used two pieces of equipment.

Give the scientific name of each piece of equipment.

[2 marks]

A square frame measuring 0.5 m × 0.5 m _____

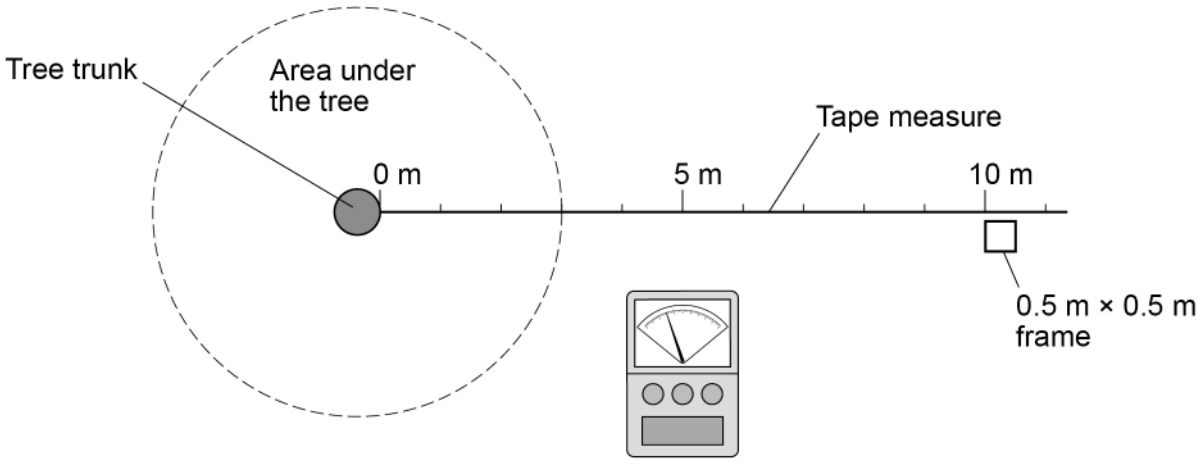
An electronic device to measure light intensity _____

This is the method used.

1. Fix one end of a tape measure at the base of the tree.
2. Fix the other end of the tape measure 11 metres from the tree.
3. At 0 metres put the square frame on the ground.
4. Identify all the plant species growing inside the frame.
5. Estimate and record the percentage cover of each plant species.
6. Measure the light intensity inside the frame.
7. Put the square frame on the ground every 2 metres along the tape to 10 metres.
8. Repeat steps 4 – 6 in every frame.

Figure 9 shows the equipment in this investigation.

Figure 9



0 6 . 4 Calculate the total area sampled.

[1 mark]

_____

_____

Total area sampled = _____ m^2

4.7.1.3 Biotic factors

Question 02 · continued

0 6 . 5 The whole investigation was done as quickly as possible on the same day.

Suggest **one** reason why.

[1 mark]

0 6 . 6 Give **one** way the investigation could be improved.

[1 mark]

Table 7 shows the results.

Table 7

	Distance from tree in metres					
	0	**2**	**4**	**6**	**8**	**10**
Percentage cover of grass	15	50	35	16	15	15
Percentage cover of plantain	0	5	10	40	25	30
Percentage cover of daisy	0	0	0	4	20	10
Percentage cover of clover	1	10	25	40	40	45
Total percentage cover of plants	16	65	70	100	100	100
Light intensity in arbitrary units	37	59	150	175	>200	>200

0 6 . 7 Which plant species in **Table 7** will only grow at high light intensity?

[1 mark]

4.7.1.3 Biotic factors

Question 02 · continued

0 6 . 8 What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?

Use data from **Table 7** in your answer.

[2 marks]

0 6 . 9 Light intensity might **not** be the cause of this pattern of plant distribution.

Suggest **one** different factor that may cause these results.

Give **one** reason for your answer.

[2 marks]

Factor

Reason

15

4.7.1.3 Biotic factors

Question 03

June 2019 | 8464/B/2F | Original Q2

0 2 Some students estimated the population of daisy plants in a field.

This is the method used.

1. Place a quadrat randomly on the field.
2. Count and record the number of daisy plants in the quadrat.
3. Repeat steps 1 and 2 another four times.

0 2 . 1 How could the students have made sure the quadrats were placed randomly?

[1 mark]

0 2 . 2 Describe the piece of equipment called a quadrat.

[1 mark]

Table 1 shows the results.

Table 1

Quadrat number	Number of daisy plants
1	8
2	11
3	4
4	6
5	16
Mean	**X**

0 2 . 3 Calculate mean value **X**.

[1 mark]

X = _____ daisy plants

4.7.1.3 Biotic factors

Question 03 · continued

0 2 . 4 The field is a rectangle 100 m wide and 150 m long.

Calculate the area of the field.

[1 mark]

Area = _____ m^2

0 2 . 5 The quadrat used by the students had an area of 1.0 m^2

Estimate the population of daisy plants in the field.

Use your answers to Question **02.3** and Question **02.4**

[2 marks]

Estimated population = _____ daisy plants

0 2 . 6 More daisy plants grew in some parts of the field compared to other areas of the field.

Give **two** biotic factors that may affect where daisy plants grow in the field.

[2 marks]

1 _____

2 _____

0 2 . 7 The students noticed that the daisy plants growing near a building were smaller.

Explain why smaller daisy plants grew near the building.

[2 marks]

10

4.7.1.3 Biotic factors

Question 04

November 2020 | 8464/B/1F | Original Q4

0 4 Pathogens cause infectious diseases.

0 4 . 1 Draw **one** line from each disease to the type of pathogen that causes the disease.

[2 marks]

Disease	Type of pathogen
	Bacterium
Gonorrhoea	Fungus
Measles	Protist
	Virus

The body defends itself against pathogens in different ways.

0 4 . 2 Give **two** ways that the body prevents pathogens entering the body.

[2 marks]

1 _____

_____

2 _____

_____

4.7.1.3 Biotic factors

Question 04 · continued

0 4 . 3 If pathogens do enter the body the immune system tries to destroy the pathogens.

Describe how the immune system defends the body against disease.

[6 marks]

Question 4 continues on the next page

4.7.1.3 Biotic factors

Question 04 · continued

0 4 . 4 Give **one** reason why antibiotics cannot be used to treat HIV infections.

[1 mark]

0 4 . 5 Give **two** ways to prevent the spread of HIV.

[2 marks]

1

2

0 4 . 6 Some people with a HIV infection develop AIDS.

Some people with AIDS may die from a different type of infection, such as a chest infection.

Why do people with AIDS die from a different type of infection?

[1 mark]

Tick (✓) **one** box.

HIV damages the immune system. ☐

Pathogens enter the body more easily. ☐

People with AIDS are immune to HIV. ☐

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4.7.1.3 Biotic factors

Question 05

November 2021 | 8464/B/2F | Original Q3

0 3 **Figure 2** shows one species of bird on a bird feeder.

Figure 2



The birds use their beaks to reach nuts inside the bird feeder.

Cats sometimes eat the birds.

0 3 . 1 Give the food chain for the birds, cats and nuts.

[2 marks]

0 3 . 2 Which organism in the food chain you gave in Question **03.1** is the primary consumer?

[1 mark]

4.7.1.3 Biotic factors

Question 05 · continued

0 3 . 3 Cats are one biotic factor that affects the size of the bird population.

Which **two** of the following are **biotic** factors?

[2 marks]

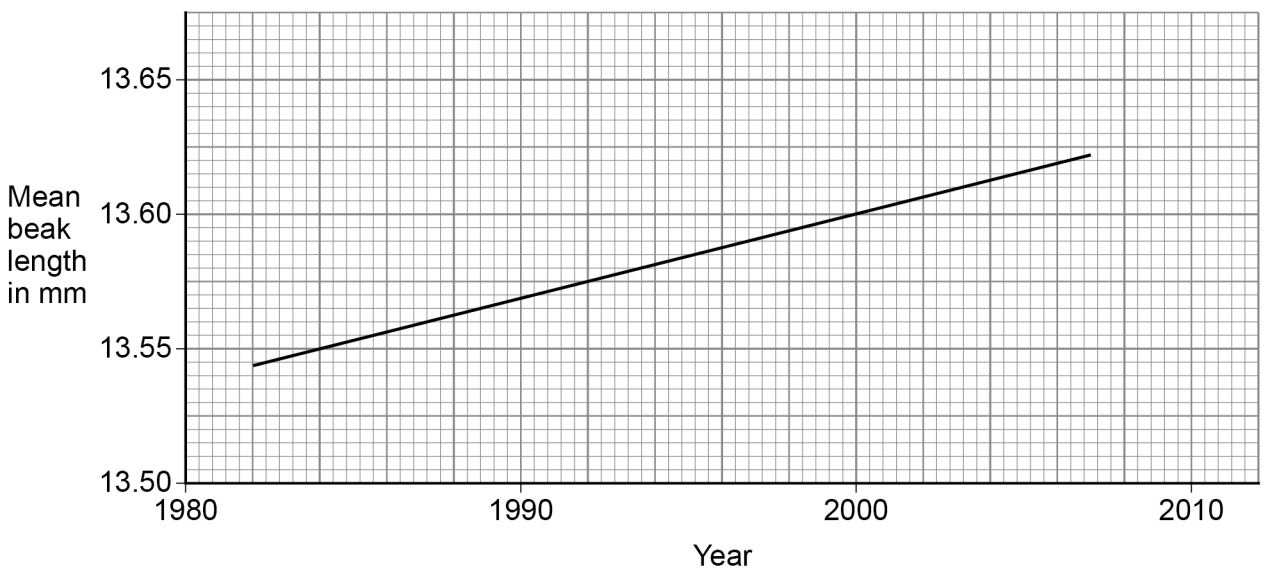
Tick (✓) **two** boxes.

- Food ☐
- Pathogens ☐
- Sunlight ☐
- Temperature ☐
- Water ☐

Question 3 continues on the next page

Figure 3 shows the mean beak length of this species of bird from 1982 to 2007.

Figure 3



0 3 . 4 What was the mean beak length in 2000?

[1 mark]

Mean beak length = _____ mm

0 3 . 5 What type of adaptation is beak length?

[1 mark]

Tick (✓) **one** box.

- Behavioural ☐
- Chemical ☐
- Structural ☐

Figure 3 shows evidence of evolution in this species of bird.

0 3 . 6 Scientists have concluded that beak length in this species of bird is increasing.

Complete the sentences about the evolution of this species of bird.

Choose answers from the box.

[4 marks]

excretion	**generation**	**mutation**
reproduction	**respiration**	**variation**

The difference in beak length in the bird population

is called _____ .

A change in a gene affects the beak length.

Change in a gene is called _____ .

The birds with the longest beaks get more food.

Getting more food improves a bird's chances of

survival and _____ .

This process of evolution takes place over more

than one _____ .

Question 3 continues on the next page

4.7.1.3 Biotic factors

Question 05 · continued

0 3 . 7 Birds of this species:

- live for about 3 years
- produce up to 24 eggs every year.

Why is evolution easier to study in birds than in humans?

[1 mark]

Tick (✓) **one** box.

Birds breed less frequently than humans. ☐

Birds have a shorter life cycle than humans. ☐

Birds have fewer offspring than humans. ☐

0 3 . 8 Bacteria also provide evidence for evolution.

Which statement describes evidence for evolution?

[1 mark]

Tick (✓) **one** box.

Bacteria can become resistant to antibiotics. ☐

Decomposition can be caused by bacteria. ☐

Some bacteria are pathogens. ☐

13

4.7.1.3 Biotic factors

Question 06

June 2022 | 8464/B/1F | Original Q5

0 5 Bacteria can cause a variety of diseases in humans.

0 5 . 1 What are **two** similarities between a bacterial cell and an animal cell?

[2 marks]

Tick (✓) **two** boxes.

- Both have a cell membrane. ☐
- Both have a cell wall. ☐
- Both have a nucleus. ☐
- Both have cytoplasm. ☐
- Both have plasmids. ☐

0 5 . 2 Salmonella food poisoning is caused by bacteria in food.

Give **one** symptom of salmonella food poisoning.

Do **not** refer to vomiting or diarrhoea in your answer.

[1 mark]

_____

_____

Question 5 continues on the next page

Question 06 · continued

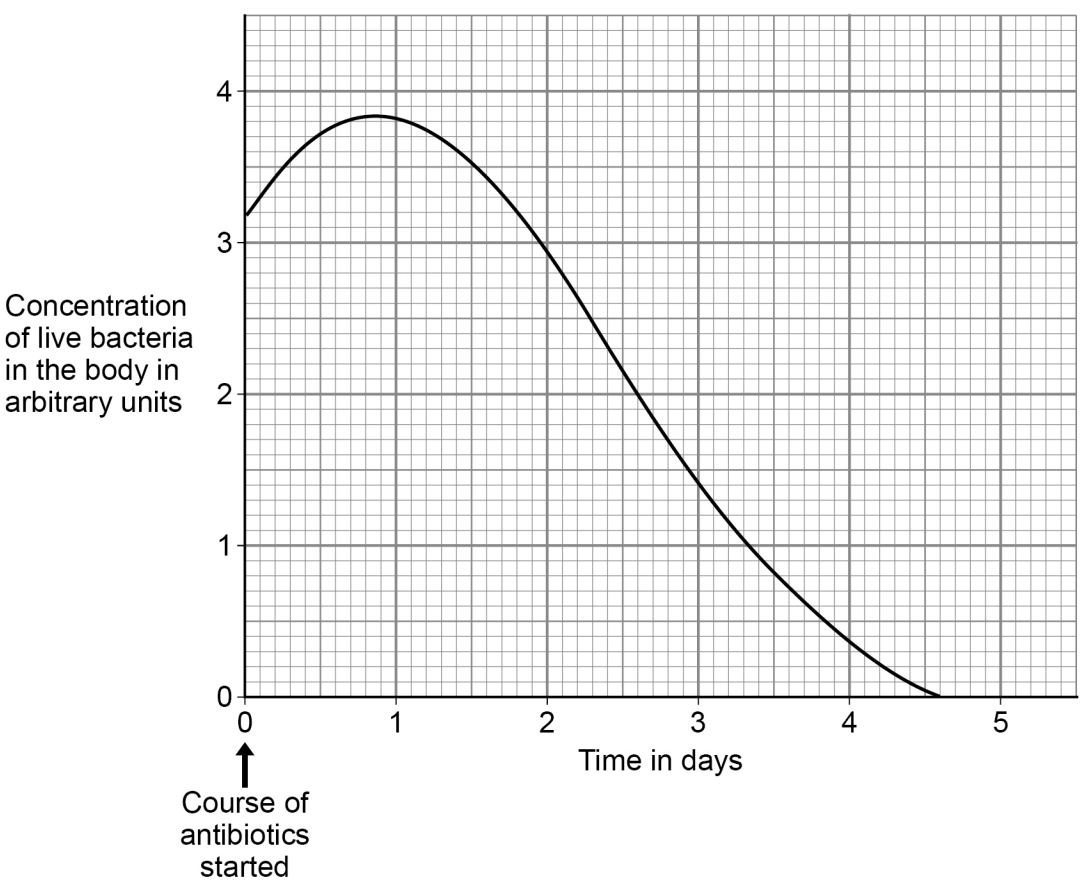
0 5 . 3 What is the name of the first antibiotic developed?

[1 mark]

A child with a severe bacterial infection was given a course of antibiotics.

Figure 7 shows how the concentration of live bacteria in the child's body changed when taking the course of antibiotics.

Figure 7



4.7.1.3 Biotic factors

Question 06 · continued

0 5 . 4 The concentration of live bacteria in the body continued to increase after starting the course of antibiotics.

Suggest **one** reason why.

[1 mark]

0 5 . 5 After 3 days of taking the antibiotic:

- the child felt better
- there were still bacteria in the child's body.

Why did the child feel better?

[1 mark]

Tick (✓) **one** box.

Bacteria had become immune to the antibiotic. ☐

The child had become resistant to the bacteria. ☐

There were fewer toxins in the body than at day 0 ☐

0 5 . 6 Suggest why doctors do **not** give antibiotics to patients with minor infections.

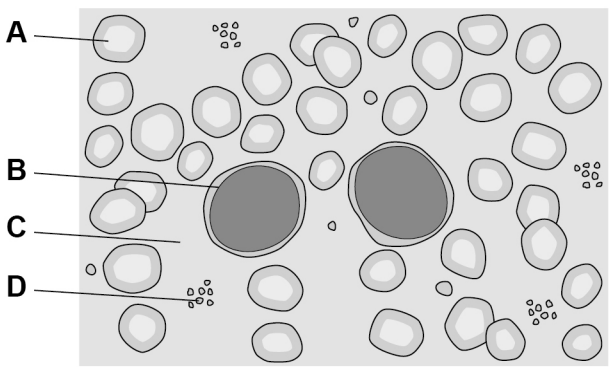
[1 mark]

Question 5 continues on the next page

Question 06 · continued

Figure 8 shows blood viewed using a microscope.

Figure 8



0 5 . 7 A vaccine will stimulate the production of antibodies.

Which part of the blood in **Figure 8** produces antibodies?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 5 . 8 Which part of the blood in **Figure 8** starts the clotting process?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

9

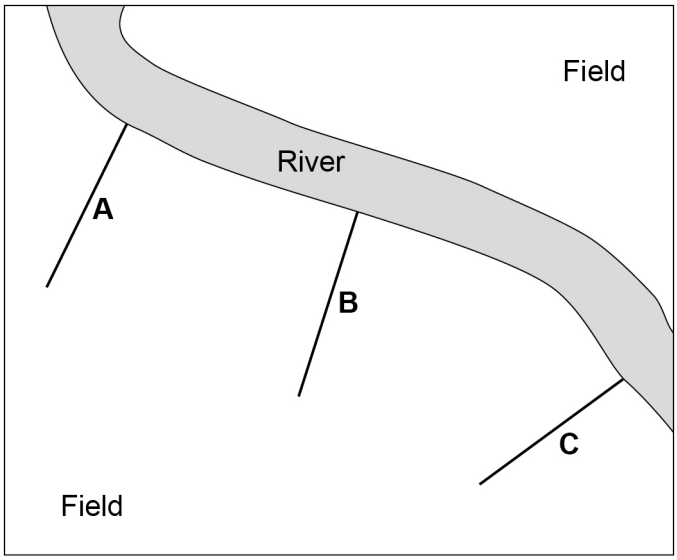
4.7.1.3 Biotic factors

Question 07

0 3 A student investigated how the distance from a river affects the number of different plant species.

Figure 3 shows a river between two fields.

Figure 3



0 3 . 1 **A**, **B** and **C** show the positions of three transects.

Where should the student position another transect for this investigation?

Draw the extra transect line on **Figure 3**.

[1 mark]

4.7.1.3 Biotic factors

Question 07 · continued

0 3 . 2 The student recorded the number of different plant species at 1 m intervals along each transect.

Which piece of equipment should be used at 1 m intervals along the transect?

[1 mark]

Tick (✓) **one** box.

Microscope ☐

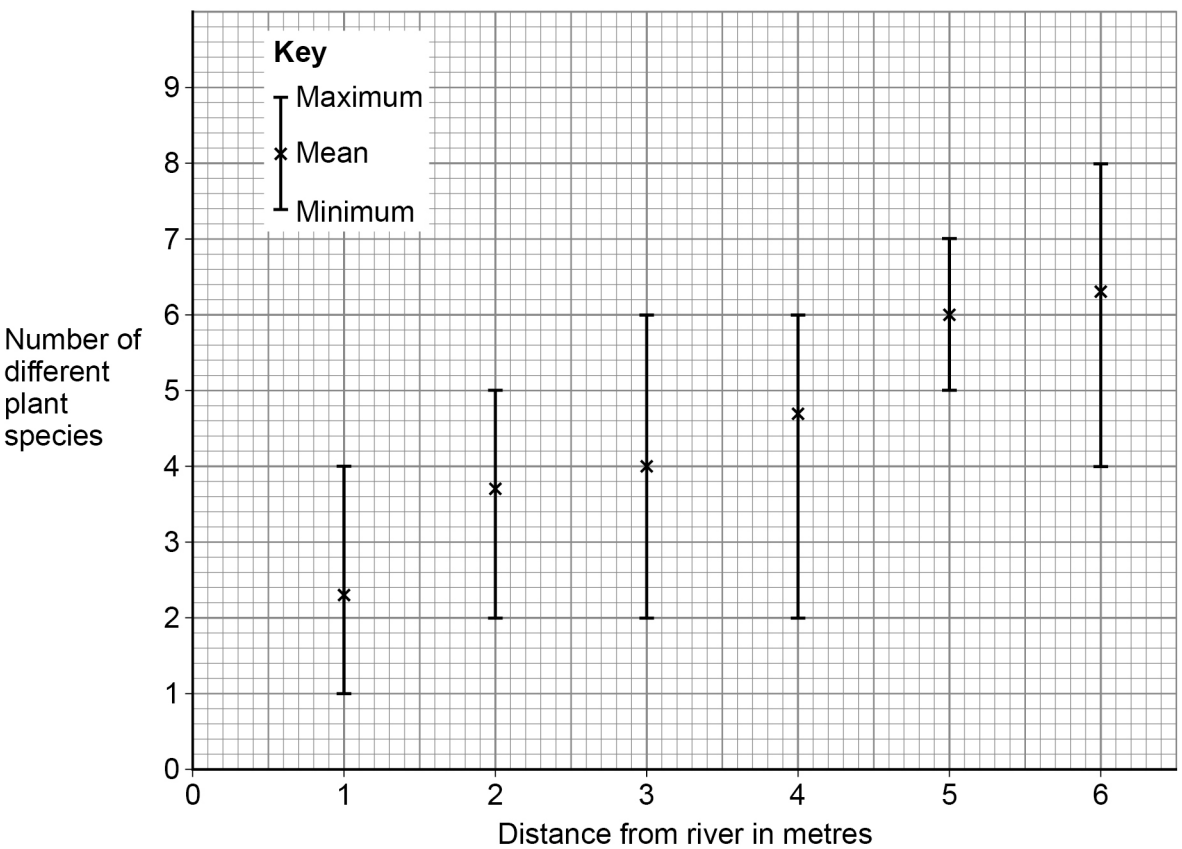
Quadrat ☐

Timer ☐

Question 3 continues on the next page

Figure 4 shows the results.

Figure 4



0 3 . 3 What was the mean number of different plant species 5 m from the river?

[1 mark]

Mean = _____

0 3 . 4 What is the effect of increasing distance from the river on the mean number of different plant species?

[1 mark]

_____

_____

4.7.1.3 Biotic factors

Question 07 · continued

0 3 . 5 The minimum and maximum values on **Figure 4** show the range of results at each distance from the river.

Why is it useful to know the range of results?

[1 mark]

Tick (✓) **one** box.

- To calculate the mean result ☐
- To know the uncertainty of the mean ☐
- To show the mode of the results ☐

0 3 . 6 Cows are kept in the fields.

Fewer plants are found where the cows often walk on the ground.

The number of cows is one **biotic** factor that affects the number of plants.

Which **two** factors are **abiotic** factors?

[2 marks]

Tick (✓) **two** boxes.

- Consumers ☐
- Light intensity ☐
- Moisture levels ☐
- Pathogens ☐
- Predators ☐

Question 3 continues on the next page

4.7.1.3 Biotic factors

Question 07 · continued

0 3 . 7 Explain why a decrease in the number of plants across the world increases global warming.

[2 marks]

9

4.7.1.3 Biotic factors

Question 08

June 2025 | 8464/B/1F | Original Q6

0 6 Chickenpox is an infectious disease that affects young children.

0 6 . 1 One symptom of chickenpox is small blisters on the skin.

Suggest **one** way chickenpox spreads from an infected person to other people.

[1 mark]

0 6 . 2 Chickenpox is caused by a type of pathogen that **cannot** be treated with antibiotics.

Give the reason why chickenpox **cannot** be treated with antibiotics.

[1 mark]

A vaccine that could be used to protect against chickenpox has been produced.

0 6 . 3 What does a vaccine contain that causes a person to become immune to a disease?

[1 mark]

0 6 . 4 Give **three** reasons why a new vaccine must be tested.

[3 marks]

1

2

3

4.7.1.3 Biotic factors

Question 08 · continued

0 6 . 5 Explain how a vaccine for chickenpox gives immunity against the disease.

You should refer to how the body responds to:

- the vaccine
- chickenpox pathogens that enter the body after vaccination.

[6 marks]

Extra Space

12

4.7.1.3 Biotic factors

Question 09

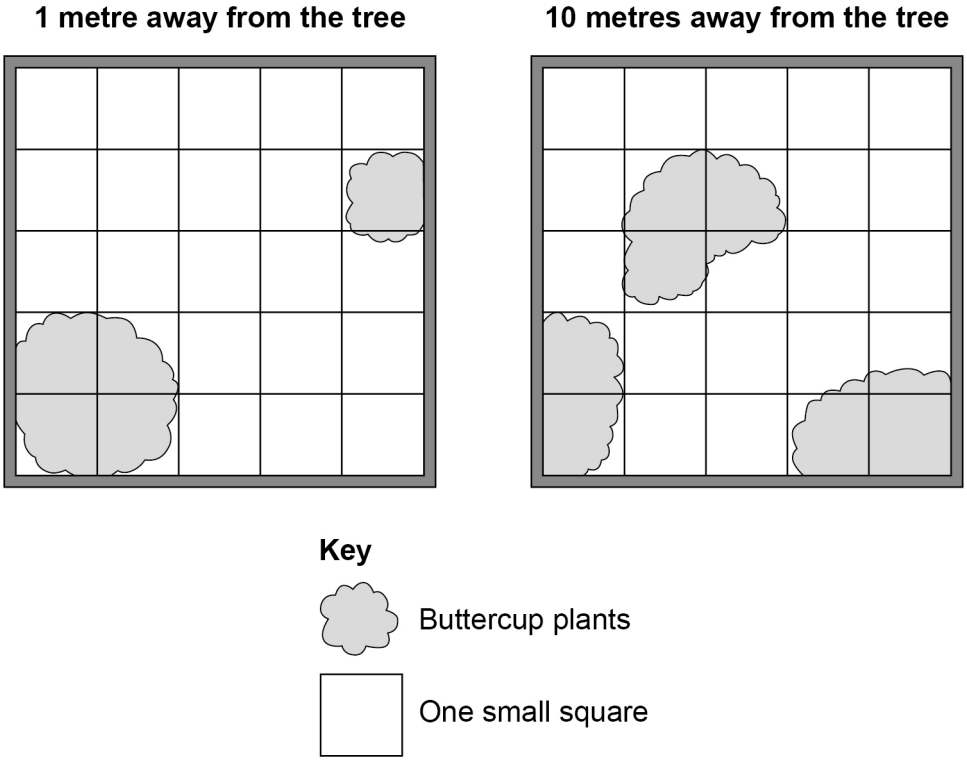
June 2025 | 8464/B/2F | Original Q3

0 3 Buttercups are small plants.

A student investigated the distribution of buttercup plants at different distances from a tree.

Figure 4 shows a piece of equipment being used to sample two areas.

Figure 4



0 3 . 1 What is the scientific name of the equipment shown in **Figure 4**?

[1 mark]

Tick (✓) **one** box.

Grid ☐

Quadrat ☐

Transect ☐

Question 09 · continued

0 3 . 2 Each small square on **Figure 4** represents a percentage cover of 4%.

The student counted every small square that was **at least half** covered by buttercup plants.

At 1 metre away from the tree, buttercup plants had a percentage cover of 20%.

Determine the percentage cover of buttercup plants at **10 metres** away from the tree.

Use **Figure 4**.

[2 marks]

Percentage cover = _____ %

0 3 . 3 What is the independent variable in the investigation?

[1 mark]

Tick (✓) **one** box.

- Distance from the tree ☐
- Number of species ☐
- Time of year ☐

0 3 . 4 What is an advantage of calculating percentage cover instead of counting the number of buttercup plants in an area?

[1 mark]

Tick (✓) **one** box.

- Percentage cover is affected by the number and size of individual plants. ☐
- Percentage cover is always the same for individual plants of any species. ☐
- Percentage cover is larger than the number of individual plants. ☐

Question 09 · continued

The student investigated the percentage cover of buttercup plants around a different tree.

Table 2 shows the results.

Table 2

Distance from the tree in metres	Percentage (%) cover					
	Result 1	Result 2	Result 3	Result 4	Result 5	Mean
1	12	8	4	12	4	**X**
10	24	12	8	28	8	16

0 3 . 5 Calculate mean value **X** in **Table 2**.

[2 marks]

X = _____ %

0 3 . 6 Give **one** conclusion about the effect of distance from the tree on the percentage cover of buttercup plants.

Use **Table 2**.

[1 mark]

4.7.1.3 Biotic factors

Question 09 · continued

0 3 . 7 Give **two** other factors that affect the percentage cover of buttercup plants around the tree.

Do **not** refer to distance from the tree.

[2 marks]

1 _____

_____

2 _____

_____

0 3 . 8 **Table 2** shows the results of the investigation.

Suggest **two** improvements to the investigation.

[2 marks]

1 _____

_____

2 _____

_____

12

4.7.1.3 Biotic factors

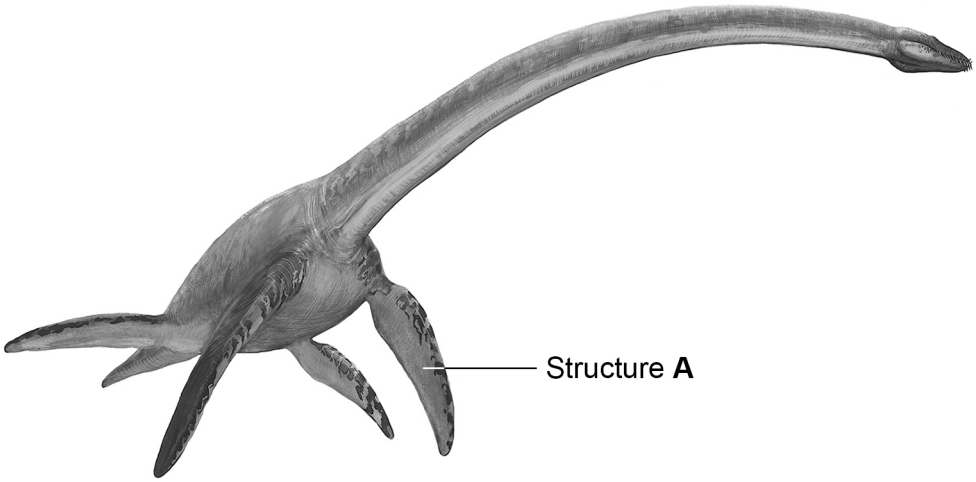
Question 10

June 2025 | 8464/B/2F | Original Q4

0 4 Plesiosaurs are extinct animals that lived in the ocean.

Figure 5 shows what scientists think a living plesiosaur may have looked like.

Figure 5



0 4 . 1 Scientists think that the plesiosaur had smooth skin.

Suggest why the scientists **cannot** be certain what the skin of the plesiosaur was like.

[1 mark]

0 4 . 2 Explain how structure **A** in **Figure 5** helped the plesiosaur survive in the ocean.

[2 marks]

4.7.1.3 Biotic factors

Question 10 · continued

0 4 . 3 Plesiosaurs may have moved rapidly upwards to hold their heads above the water surface to search for prey.

What type of adaptation was the rapid upwards movement?

[1 mark]

Tick (✓) **one** box.

Behavioural ☐

Chemical ☐

Structural ☐

Question 4 continues on the next page

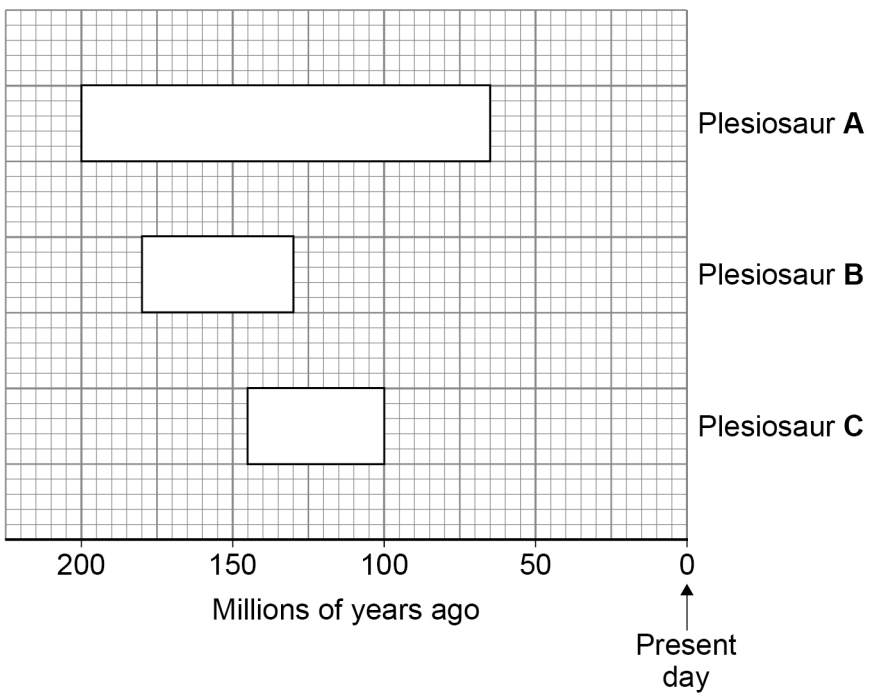
4.7.1.3 Biotic factors

Question 10 · continued

Scientists use fossils to estimate when different types of plesiosaur existed.

Figure 6 shows when three types of plesiosaur existed.

Figure 6



0 4 . 4 When did plesiosaur **A** first evolve?

Use **Figure 6**.

[1 mark]

_____ million years ago

0 4 . 5 Determine how many million years plesiosaur **B** existed for.

Use **Figure 6**.

[2 marks]

_____

_____

_____

Time = _____ million years

0 4 . 6 The exact year of extinction of all plesiosaur species can only be estimated.

Which are **two** reasons why?

[2 marks]

Tick (✓) **two** boxes.

- All plesiosaurs will have formed fossils. ☐
- Not all plesiosaur fossils have been discovered. ☐
- Plesiosaur bones do not decay. ☐
- Plesiosaurs had many predators. ☐
- Some plesiosaur fossils will have been destroyed. ☐

0 4 . 7 What evidence from **Figure 6** shows that plesiosaur **C** might have evolved from plesiosaur **B**?

[1 mark]

Tick (✓) **one** box.

- Plesiosaur **B** and plesiosaur **C** did not exist at the same time. ☐
- Plesiosaur **B** existed before plesiosaur **C**. ☐
- Plesiosaur **B** became extinct more recently than plesiosaur **C**. ☐

Question 4 continues on the next page

4.7.1.3 Biotic factors

Question 10 · continued

0 4 . 8 Evolution can be studied using evidence from:

- fossils
- antibiotic-resistant bacteria.

Suggest **two** reasons why it is easier to study evolution in bacteria than to study evolution using fossils.

[2 marks]

1 _____

_____

2 _____

_____

0 4 . 9 Give **one** reason why doctors are concerned about antibiotic-resistant bacteria.

[1 mark]

_____

_____

13