AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.1.3

Biotic factors

Past-paper questions

Tier	**Higher**
Question groups	**8**
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/2H | Original Q1

0 1 Many biotic and abiotic factors can affect the growth of plants.

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

[2 marks]

Tick **one** box for each factor.

Table 1

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 1 . 2 Explain why the students thought their hypothesis would be correct.

[3 marks]

Question 01 · continued

0 1 . 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 _____

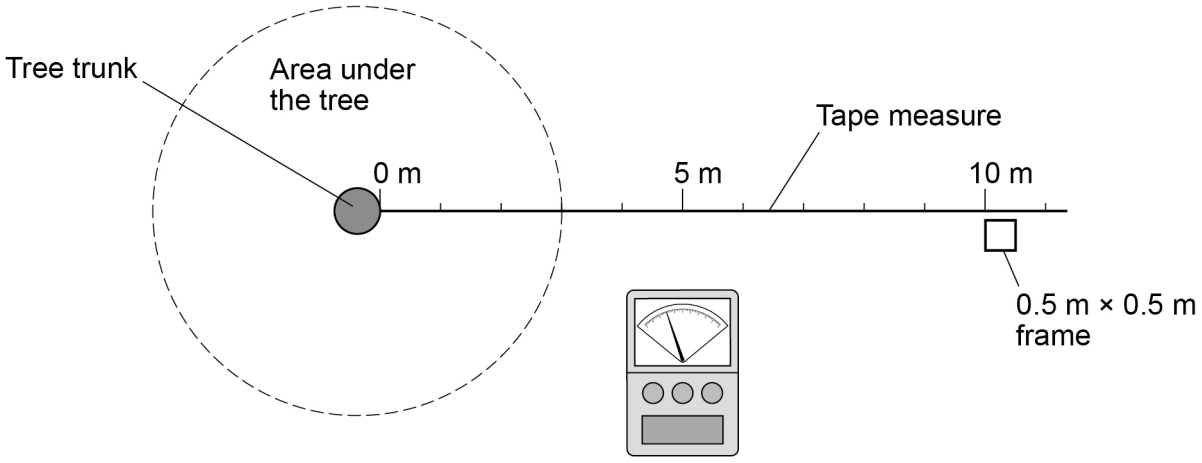
An electronic device to measure light intensity _____

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 1 shows the equipment in this investigation.

Figure 1



0 1 . 4 Calculate the total area sampled.

[1 mark]

_____

_____

Total area sampled = _____ m^2

4.7.1.3 Biotic factors

Question 01 · continued

0 1 . 5 The whole investigation was done as quickly as possible on the same day.

Suggest **one** reason why.

[1 mark]

0 1 . 6 Give **one** way the investigation could be improved.

[1 mark]

Table 2 shows the results.

Table 2

	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 1 . 7 Which plant species in **Table 2** will only grow at high light intensity?

[1 mark]

4.7.1.3 Biotic factors

Question 01 · continued

0 1 . 8 What conclusion can be made about the relationship between light intensity and the total percentage cover of plants?

Use data from **Table 2** in your answer.

[2 marks]

0 1 . 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 02

June 2019 | 8464/B/2H | Original Q5

0 5 Some students estimated the population of daisies in a school field.

This is the method used.

1. Find a place where some daisies are growing.
2. Put the quadrat down.
3. Count and record the number of daisies in the quadrat.
4. Repeat steps 1–3 at four different places in the field.
5. Calculate the mean number of daisies per quadrat.
6. Use the data to estimate the total number of daisies in the field.

0 5 . 1 Which **two** improvements would increase the validity of this method?

[2 marks]

Tick (✓) **two** boxes.

- Do not put any quadrats near trees. ☐
- Repeat for another ten quadrats. ☐
- Use a long tape measure. ☐
- Use a random method to place the quadrats. ☐
- Use the same person to place all the quadrats. ☐

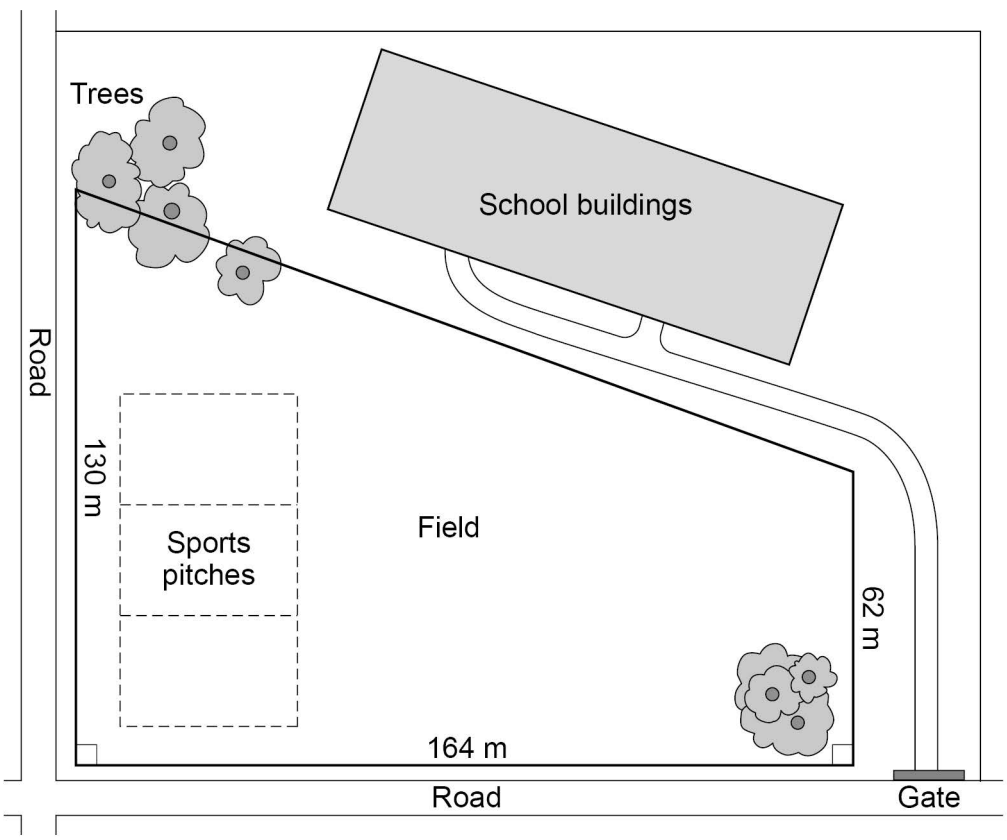
Question 5 continues on the next page

0 5 . 2 With an improved method the students calculated the mean number of daisy plants to be 7.65 per quadrat.

The students used a quadrat measuring 50 cm × 50 cm

Figure 3 shows the school site and the dimensions of the school field.

Figure 3



4.7.1.3 Biotic factors

Question 02 · continued

Calculate the population of daisy plants on the school field.

Give your answer in standard form to 2 significant figures.

[5 marks]

Population of daisy plants = _____

Question 5 continues on the next page

4.7.1.3 Biotic factors

Question 02 · continued

0 5 . 3 The students noticed a very uneven distribution of daisy plants in the field.

Explain how different biotic factors **and** abiotic factors could have caused an uneven distribution of daisy plants.

Use **Figure 3** on page 20.

[6 marks]

13

4.7.1.3 Biotic factors

Question 03

November 2020 | 8464/B/2H | Original Q3

0 3 There is a need to grow enough food for all the people in the world.

Growing enough food affects habitats and biodiversity.

0 3 . 1 What is meant by the term biodiversity?

[1 mark]

Peat bogs are being destroyed because peat is used by humans.

Destroying peat bogs also reduces biodiversity.

0 3 . 2 Give **one** use of peat taken from peat bogs.

[1 mark]

0 3 . 3 Explain why the use of peat is harmful to the environment.

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

[2 marks]

4.7.1.3 Biotic factors

Question 03 · continued

0 3 . 4 Intensive farming, where a single crop is grown on a large area of land year after year, is more cost effective for farmers.

It is efficient to use fertilisers and to burn the waste so the land is ready to use the next year.

Planting a single crop reduces biodiversity.

Suggest **two** ways that this type of farming can damage the environment.

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

[2 marks]

1 _____

_____

2 _____

_____

0 3 . 5 Most of the world's production of antibiotics is used in farming.

Antibiotics are given to animals to prevent the spread of disease.

Explain how the widespread use of antibiotics in farming is a threat to human life.

[4 marks]

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

10

4.7.1.3 Biotic factors

Question 04

June 2022 | 8464/B/1H | Original Q1

0 1 Bacteria can cause a variety of diseases in humans.

0 1 . 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 1 . 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 1 continues on the next page

4.7.1.3 Biotic factors

Question 04 · continued

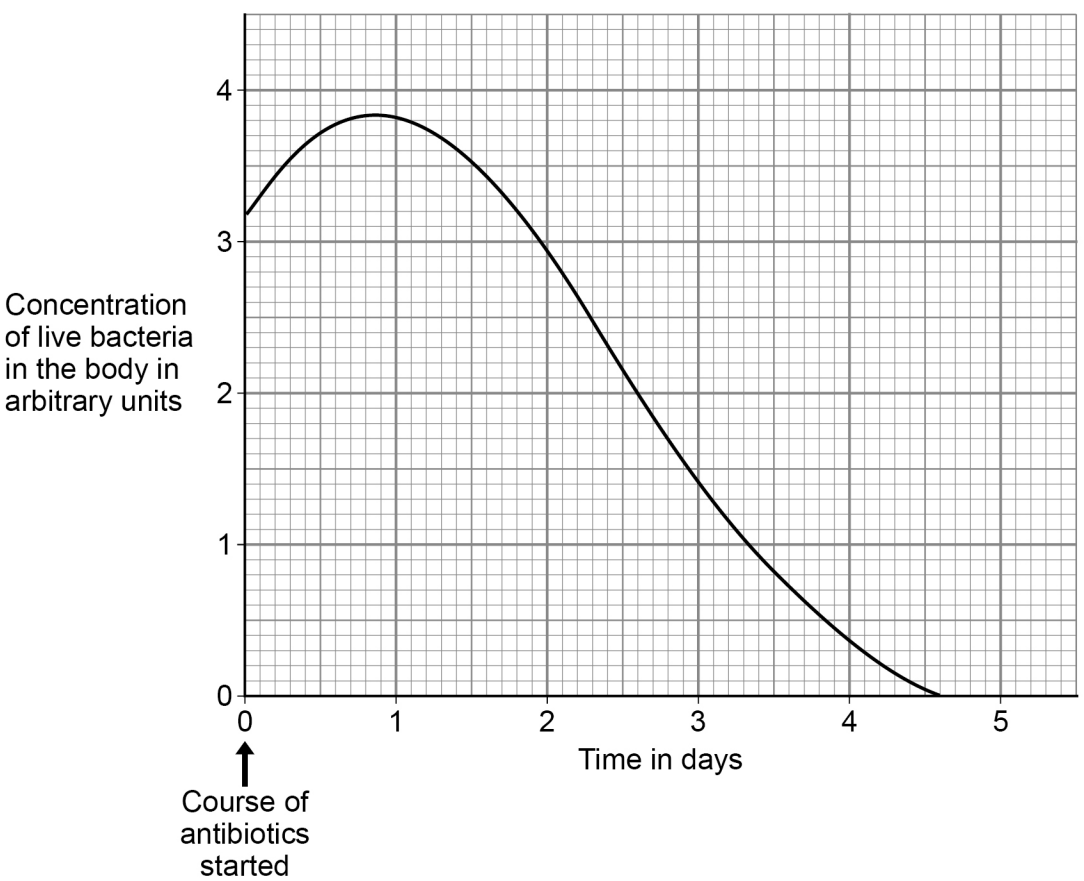
0 1 . 3 What is the name of the first antibiotic developed?

[1 mark]

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

Figure 1 shows how the concentration of live bacteria in the child's body changed when taking the course of antibiotics.

Figure 1



4.7.1.3 Biotic factors

Question 04 · continued

0 1 . 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 1 . 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 ☐

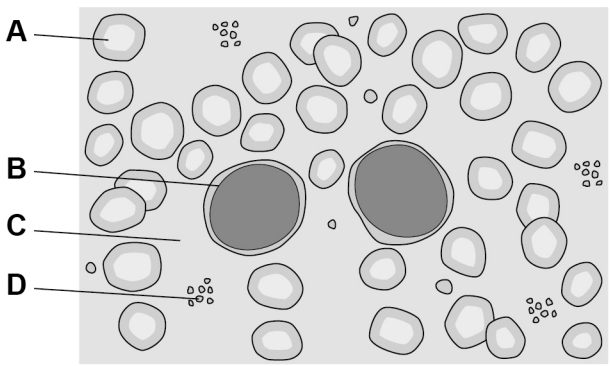
0 1 . 6 Suggest why doctors do **not** give antibiotics to patients with minor infections.

[1 mark]

Question 1 continues on the next page

Figure 2 shows blood viewed using a microscope.

Figure 2



0 1 . 7 A vaccine will stimulate the production of antibodies.

Which part of the blood in **Figure 2** produces antibodies?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

0 1 . 8 Which part of the blood in **Figure 2** starts the clotting process?

[1 mark]

Tick (✓) **one** box.

A ☐ **B** ☐ **C** ☐ **D** ☐

9

4.7.1.3 Biotic factors

Question 05

June 2022 | 8464/B/2H | Original Q3

0 3 On a school field:

- one area of the soil was usually wet
- another area of the soil was usually dry.

Students investigated the effect of water in the soil on the number of buttercup plants growing in each area.

0 3 . 1 Water is an abiotic factor.

Name **one biotic** factor which may affect the number of buttercups growing on the field.

[1 mark]

0 3 . 2 Describe a method to investigate if the amount of water in the soil affects the number of buttercups in the field.

[6 marks]

7

4.7.1.3 Biotic factors

Question 06

0 4 Rat populations can increase rapidly.

When rat populations are large there is competition between rats.

0 4 . 1 When rats compete, the basal metabolic rate of the rats increases.

Basal metabolic rate is controlled in the same way in humans and in rats.

Describe how basal metabolic rate is increased.

[2 marks]

Question 4 continues on the next page

0 4 . 2 The size of a rat population can increase quickly.

One female rat and one male rat can produce 20 offspring every 2 months.

Warfarin is a poison that has been used to control rat populations.

Rat populations can become resistant to warfarin by the process of evolution.

A population of rats was given warfarin for 4 months.

Table 1 shows information about resistance to warfarin in the rat population for a year after warfarin was first given.

Table 1

Number of months since warfarin was first given	Was warfarin being given?	Percentage (%) of rat population resistant to warfarin
0	Yes	1
2	Yes	24
4	Yes	81
6	No	99
8	No	92
10	No	85
12	No	70

4.7.1.3 Biotic factors

Question 06 · continued

Rats with resistance to warfarin have a smaller mean mass than rats that are **not** resistant to warfarin.

Smaller rats are often at a disadvantage when competing against larger rats.

Explain the trends in the data when warfarin was being given and when warfarin was no longer given.

Use **Table 1**.

[6 marks]

8

4.7.1.3 Biotic factors

Question 07

0 2 Chickenpox is an infectious disease that affects young children.

0 2 . 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 2 . 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 2 . 3 What does a vaccine contain that causes a person to become immune to a disease?

[1 mark]

0 2 . 4 Give **three** reasons why a new vaccine must be tested.

[3 marks]

1

2

3

4.7.1.3 Biotic factors

Question 07 · continued

0 2 . 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

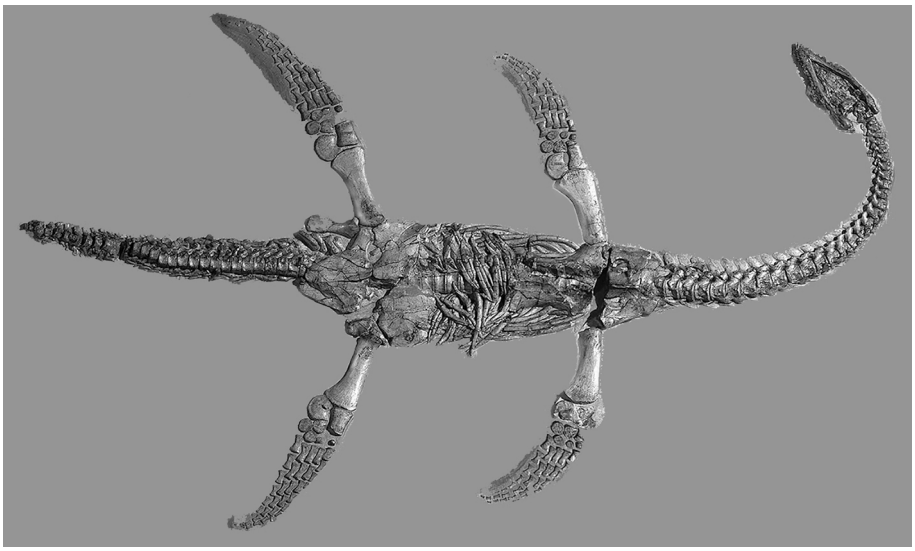
Question 08

June 2025 | 8464/B/2H | Original Q5

0 5 Plesiosaurs are extinct reptiles that lived in the ocean.

Figure 5 shows a fossil of a plesiosaur.

Figure 5



0 5 . 1 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]

0 5 . 2 Give **two biotic** factors that may have caused the extinction of plesiosaurs.

[2 marks]

1

2

4.7.1.3 Biotic factors

Question 08 · continued

0 5 . 3 Describe how the plesiosaur fossil in **Figure 5** could have been formed.

[3 marks]

0 5 . 4 Scientists use fossils to study evolution.

Suggest **two** reasons why scientists **cannot** study the mutations involved in the evolution of plesiosaurs.

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

[2 marks]

1

2

4.7.1.3 Biotic factors

Question 08 · continued

0 5 . 5 **Table 1** shows part of the classification of a plesiosaur.

Complete **Table 1**.

[2 marks]

Table 1

Classification group	Name
Domain	
Kingdom	Animalia
	Chordata
Class	Reptilia
	Plesiosaur
	Cryptoclididae
Genus	Cryptoclidus
Species	eurymerus

0 5 . 6 Give the binomial name of the plesiosaur in **Table 1**.

[1 mark]

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