AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.1.2

# Abiotic factors

## Past-paper questions

| | |
|---|---|
| Tier | **Foundation** |
| Question groups | **4** |
| 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.

### 4.7.1.2 Abiotic factors

**Question 01**

June 2018 | 8464/B/2F | Original Q6

**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 01 · 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 _____

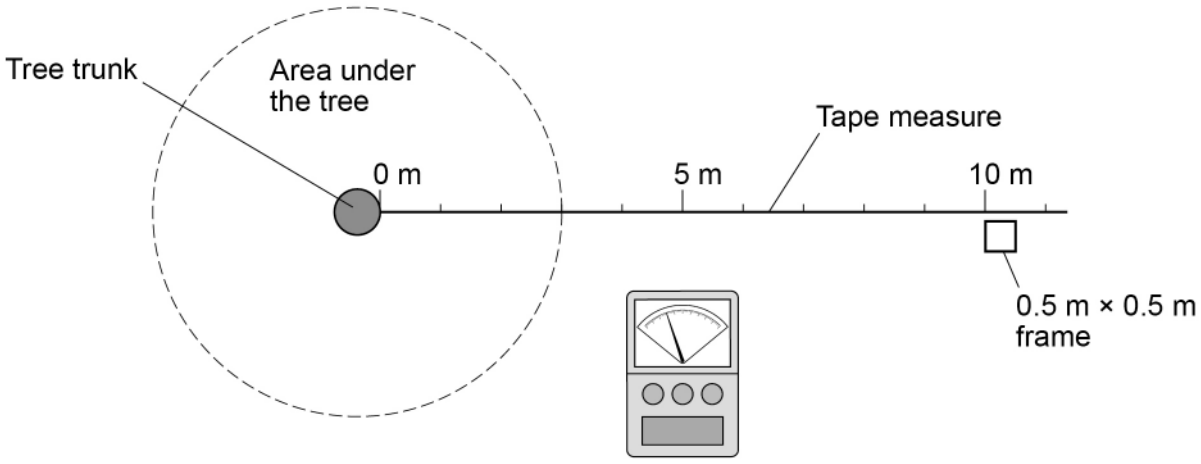
An electronic device to measure light intensity _____

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 = _____ $m^2$

Question 01 · 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]**

4.7.1.2 Abiotic factors

Question 01 · 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

4.7.1.2 Abiotic factors

Question 02

June 2022 | 8464/B/2F | Original Q2

**0 2** 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.

On the field the students marked out:

- an area of 10 m by 10 m on the wet soil
- an area of 10 m by 10 m on the dry soil.

**0 2 . 1** Describe how a quadrat can be used to measure the size of the buttercup population on the wet soil area.

**[4 marks]**

4.7.1.2 Abiotic factors

Question 02 · continued



**0 2 . 2** What type of factor is water in the soil?

**[1 mark]**

Tick (✓) **one** box.

A biotic factor ☐

A control factor ☐

An abiotic factor ☐

**0 2 . 3** Give **two** factors which might affect the number of buttercups growing on the school field.

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

**[2 marks]**

1 _____

2 _____

**0 2 . 4** Complete the sentence.

Choose the answer from the box.

**[1 mark]**

| | | |
|---|---|---|
| **a control** | **the dependent** | **the independent** |

In this investigation the number of buttercups in each quadrat was

_____ variable.

**Question 2 continues on the next page**

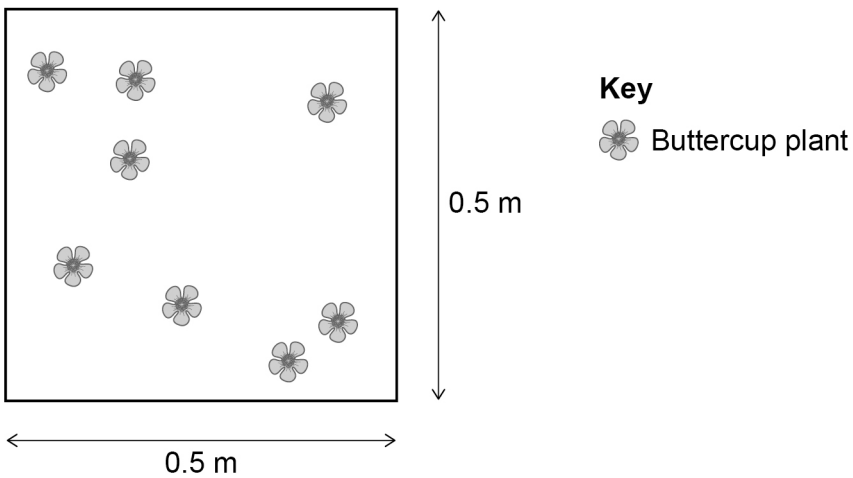
4.7.1.2 Abiotic factors

Question 02 · continued



**Figure 2** shows a quadrat on an area of the school field.

**Figure 2**




**0 2 . 5** Calculate the area of the quadrat.

**[1 mark]**

Area of the quadrat = _____ $m^2$

**0 2 . 6** The mean number of buttercups in one quadrat was 8

Calculate the number of buttercups per $m^2$

Use your answer from Question **02.5**

**[2 marks]**

Number of buttercups = _____ per $m^2$

4.7.1.2 Abiotic factors

Question 02 · continued



In a laboratory another group of students investigated the effect of soil acidity on the growth of beans.

This is the method used.

1. Put soil with a neutral pH in two large boxes.

2. Add acid to the soil in one box.

3. Plant some bean seeds in each box.

4. Water the seeds over 3 weeks.

5. After 3 weeks, measure the height of the bean plants in each box.

6. Calculate the mean height of bean plants in each box.

**0 2 . 7** Give **two** improvements the students could make to the method to give more valid results.

**[2 marks]**

1 _____

_____

2 _____

_____

The students then carried out a valid investigation.

**Table 1** shows the students' results.

**Table 1**

| | Height of bean plants in cm | |
|---|---|---|
| **Bean plant** | **Acid soil** | **Neutral soil** |
| 1 | 8 | 11 |
| 2 | 6 | 12 |
| 3 | 4 | 11 |
| 4 | 10 | 17 |
| 5 | 7 | 19 |
| **Mean** | 7 | **X** |

**0 2 . 8** Calculate mean value **X** in **Table 1**.

**[2 marks]**

**X** = _____ cm

**0 2 . 9** What conclusion can the students make about the effect of acid soil on the growth of bean plants?

**[1 mark]**

_____

_____

**16**

4.7.1.2 Abiotic factors

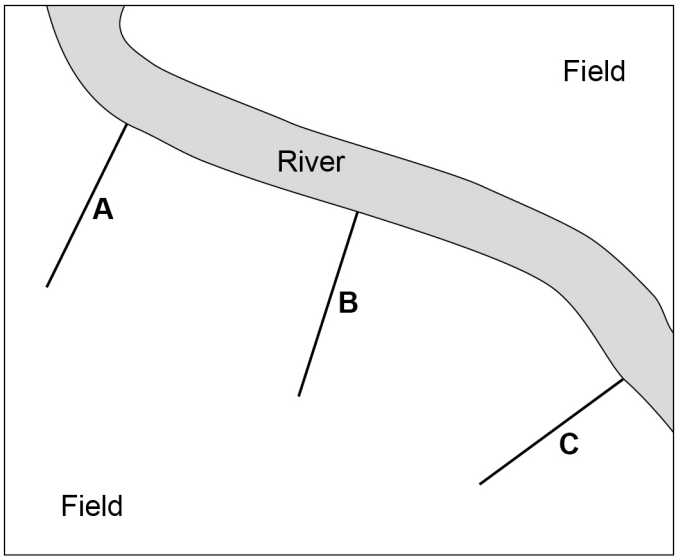
Question 03



**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]**

4.7.1.2 Abiotic factors

Question 03 · 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**

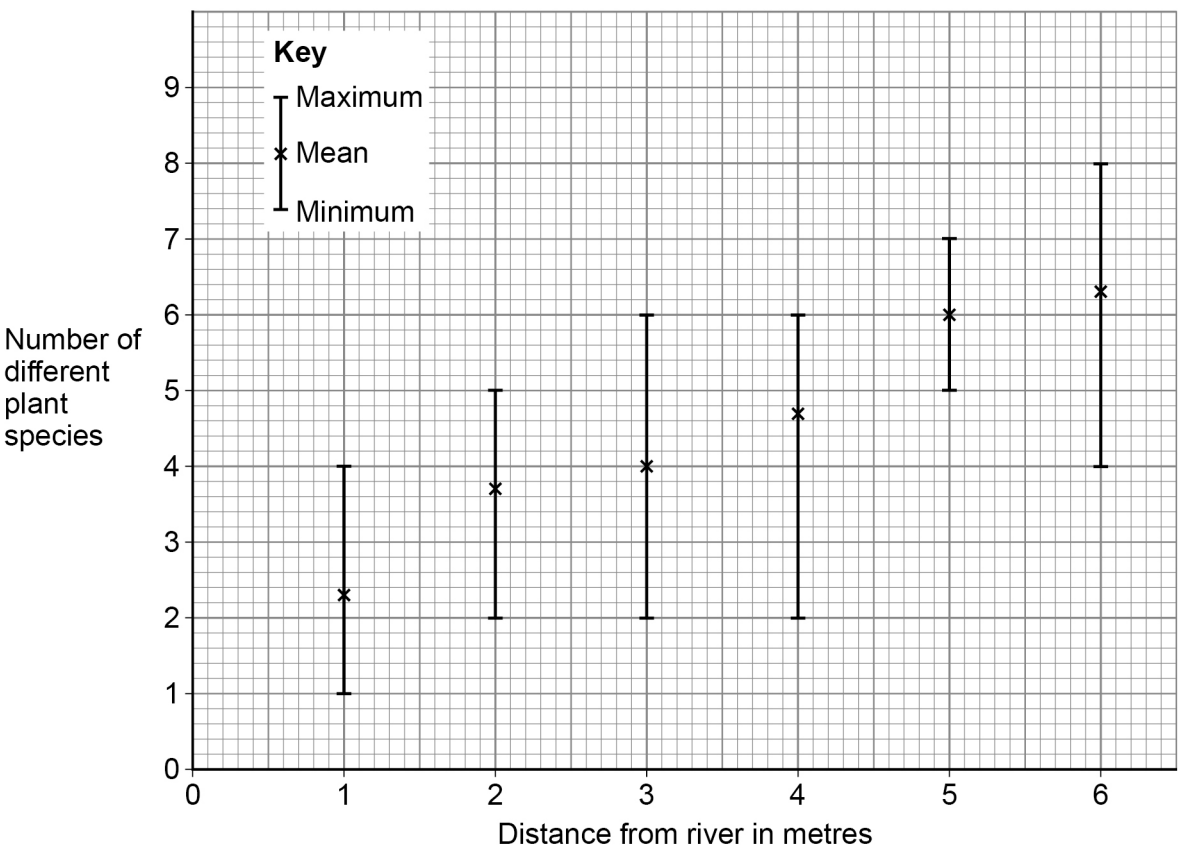
4.7.1.2 Abiotic factors

Question 03 · continued



**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]**

_____

_____

Question 03 · 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**

4.7.1.2 Abiotic factors

Question 03 · continued



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

**[2 marks]**

9

4.7.1.2 Abiotic factors

Question 04

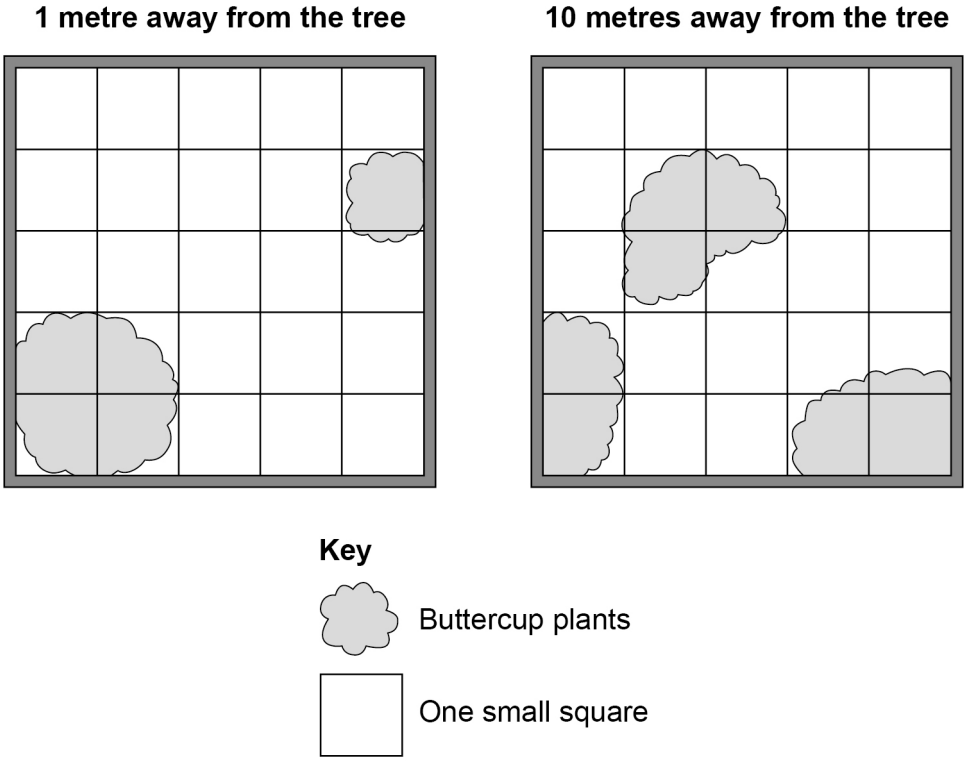
June 2025 | 8464/B/2F | Original Q3

**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 04 · 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. ☐

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]**

4.7.1.2 Abiotic factors

Question 04 · 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