AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.2.1

Levels of organisation

Past-paper questions

Tier	**Higher**
Question groups	**4**
Available paper years	**2019–2025**

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.

4.7.2.1 Levels of organisation

Question 01

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

4.7.2.1 Levels of organisation

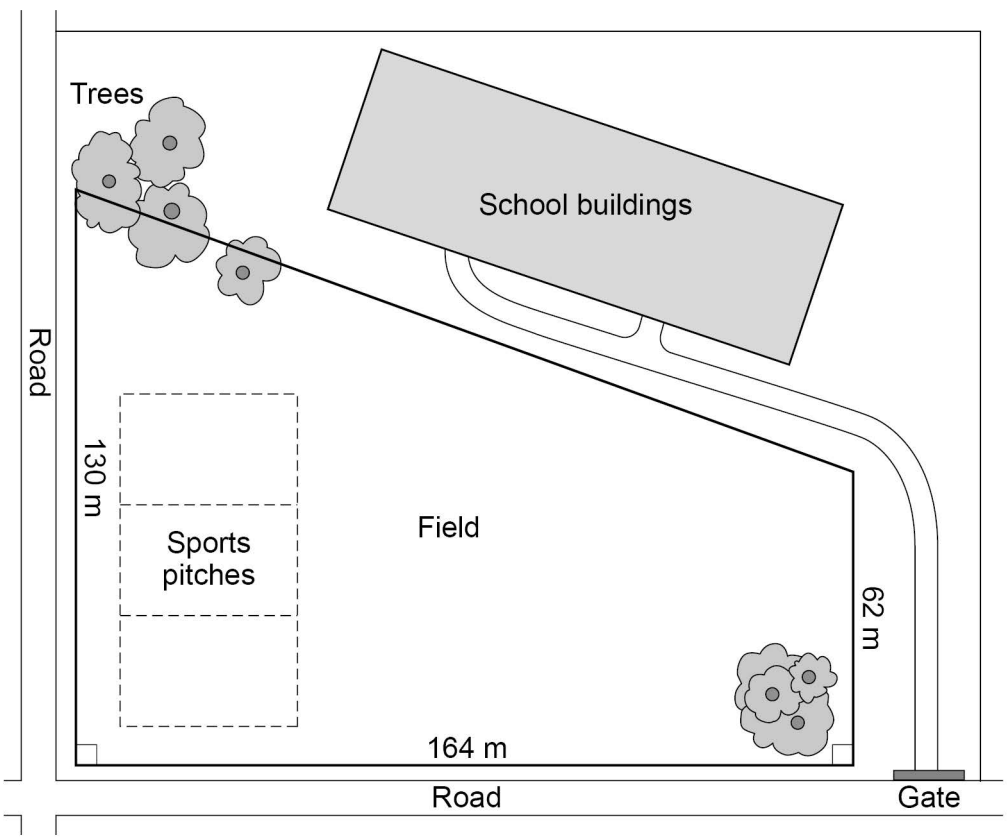
Question 01 · continued

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



4.7.2.1 Levels of organisation

Question 01 · 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

4.7.2.1 Levels of organisation

Question 01 · 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]

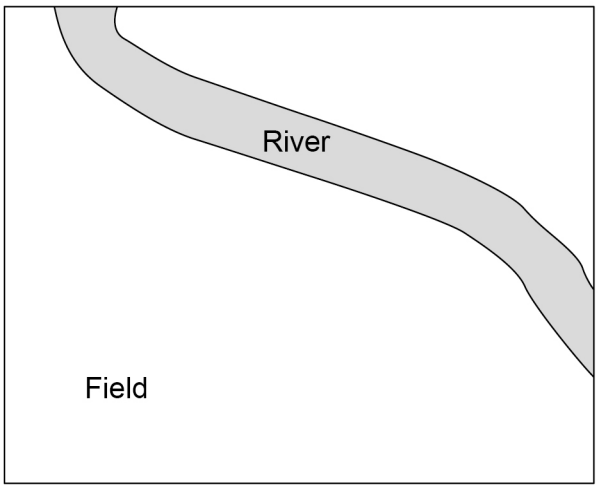
13

4.7.2.1 Levels of organisation

Question 02

0 3 **Figure 1** shows a river next to a field.

Figure 1



0 3 . 1 Describe a method to investigate how the distance from the river affects the number of different plant species in the field.

You should explain how to use a transect in your method.

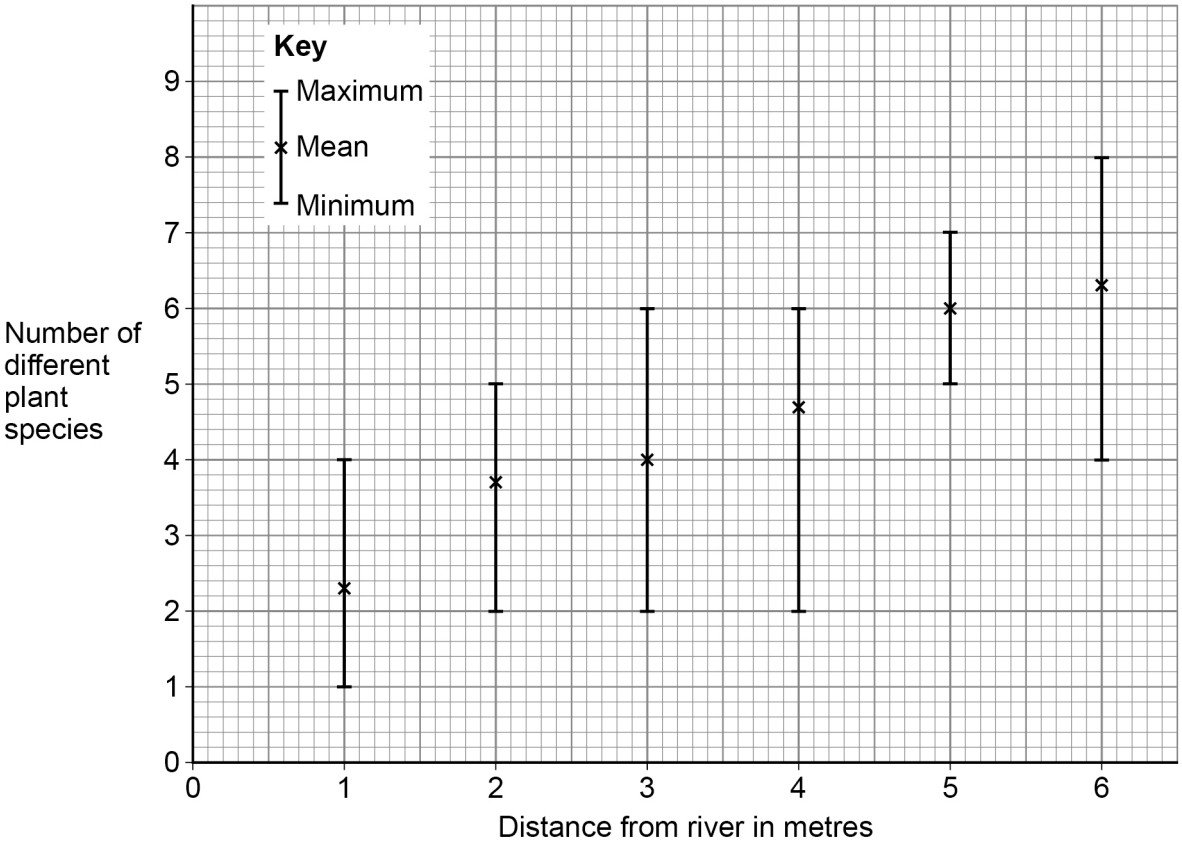
[4 marks]

Question 02 · continued

0 3 . 2 Students used a valid method to investigate how the distance from the river affects the number of different plant species in the field.

Figure 2 shows the results.

Figure 2



What is shown by the data in **Figure 2**?

[1 mark]

Tick (✓) **one** box.

Fewer different species are always recorded nearer to the river. ☐

The mean value students can be most certain about is 5 metres from the river. ☐

The number of species recorded 6 metres from the river is anomalous. ☐

Question 3 continues on the next page

4.7.2.1 Levels of organisation

Cows walk on the ground near the river more than they walk on the ground further from the river.

0 3 . 3 Which is an **abiotic** factor that could affect the number of different plant species found near the river?

[1 mark]

Tick (✓) **one** box.

- Microorganisms near the roots ☐
- Moisture levels in the soil ☐
- Oxygen concentration in the air ☐
- Primary consumers in the field ☐

4.7.2.1 Levels of organisation

Question 02 · continued

0 3 . 4 Increasing numbers of cows are being farmed across the world.

Explain the environmental implications of increasing numbers of cows being farmed.

[6 marks]

12

4.7.2.1 Levels of organisation

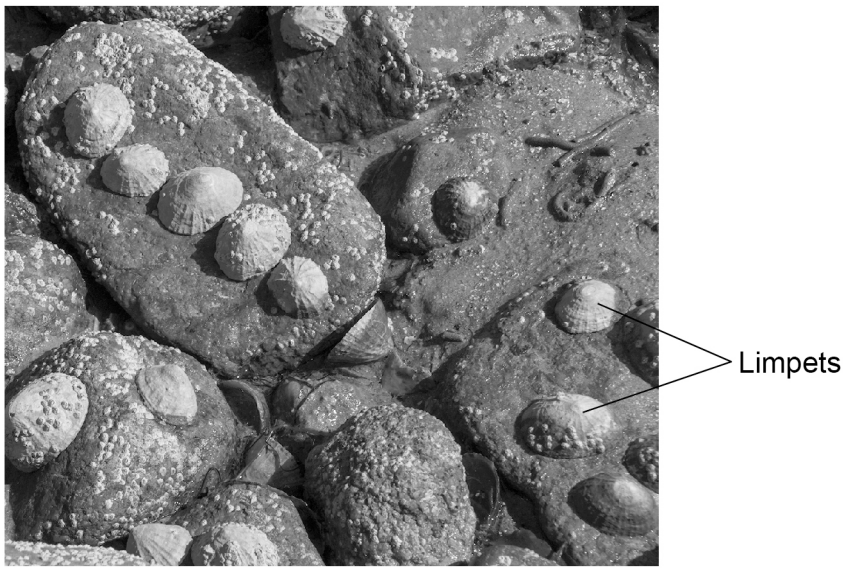
Question 03

0 1 Limpets are small animals with shells.

Limpets attach to rocks on sea shores.

Figure 1 shows limpets on rocks.

Figure 1



0 1 . 1 Limpets eat algae.

Limpets are prey for crabs.

Give the food chain for algae, crabs and limpets.

[1 mark]

Question 1 continues on the next page

4.7.2.1 Levels of organisation

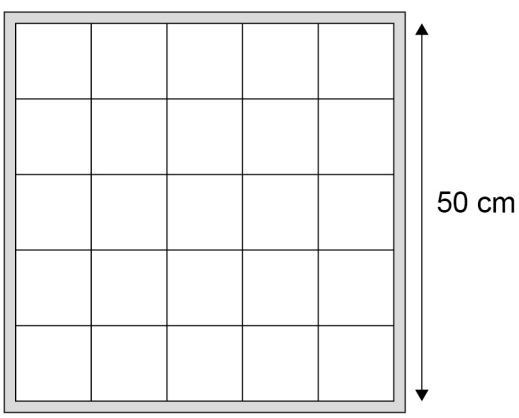
Question 03 · continued

Students estimated the population of limpets on a sea shore.

The students were given a square quadrat.

Figure 2 shows the quadrat.

Figure 2



0 1 . 2 Calculate the area of the quadrat in m^2.

[2 marks]

Area of quadrat = _____ m^2

4.7.2.1 Levels of organisation

Question 03 · continued

0 1 . 3 The total area of the sea shore was 1800 m^2.

The students sampled 2% of the total area of the sea shore.

Calculate the number of times the students needed to use the quadrat for the 2% sample.

Use your answer from Question **01.2**

[2 marks]

Number of times = _____

0 1 . 4 Explain why throwing a quadrat is **not** a random method to estimate population size.

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

[2 marks]

Question 1 continues on the next page

4.7.2.1 Levels of organisation

Question 03 · continued

0 1 . 5 Describe **one** method the students could use to plan where the quadrat should be randomly placed each time.

[2 marks]

0 1 . 6 Suggest **one** hazard the students should be aware of when collecting data on the sea shore.

Do **not** refer to throwing quadrats in your answer.

[1 mark]

0 1 . 7 Populations of limpets are monitored to assess the impact of pollution in water.

Suggest **one** type of pollution in water that may affect the population of limpets.

[1 mark]

11

4.7.2.1 Levels of organisation

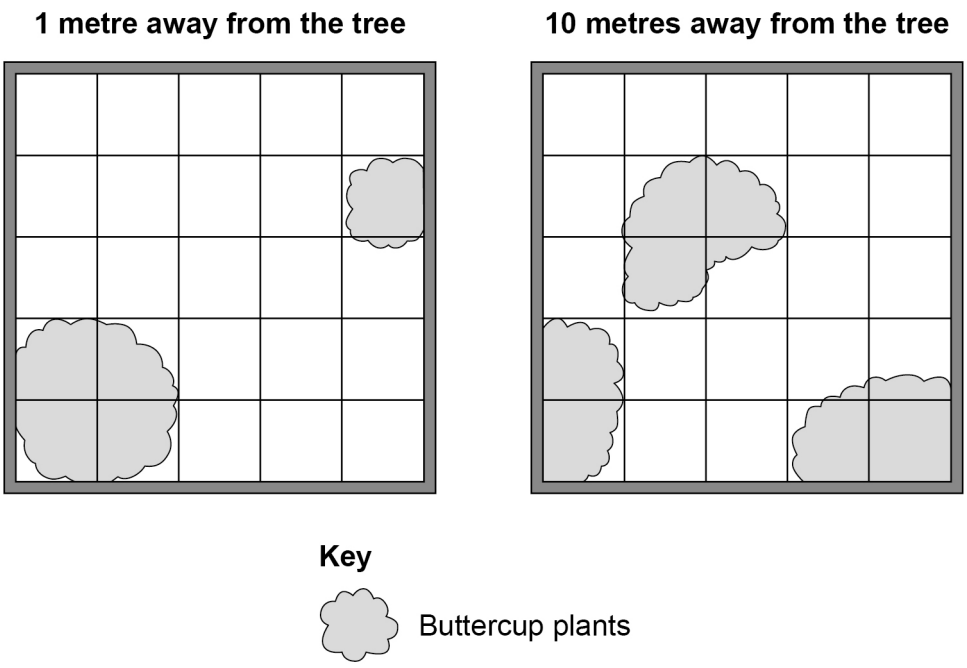
Question 04

0 3 Buttercups are small plants.

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

Figure 2 shows quadrats being used to sample two areas.

Figure 2



0 3 . 1 What was the independent variable in this investigation?

[1 mark]

4.7.2.1 Levels of organisation

Question 04 · continued

0 3 . 2 Students counted every small square in the quadrat that was **at least half** covered by buttercup plants.

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

Use **Figure 2**.

[3 marks]

Percentage cover = _____ %

0 3 . 3 The students placed:

- several quadrats 1 metre away from the tree
- several quadrats 10 metres away from the tree.

Give **two** factors the students should consider when deciding how many times to place a quadrat at each distance.

Do **not** refer to time available.

[2 marks]

1 _____

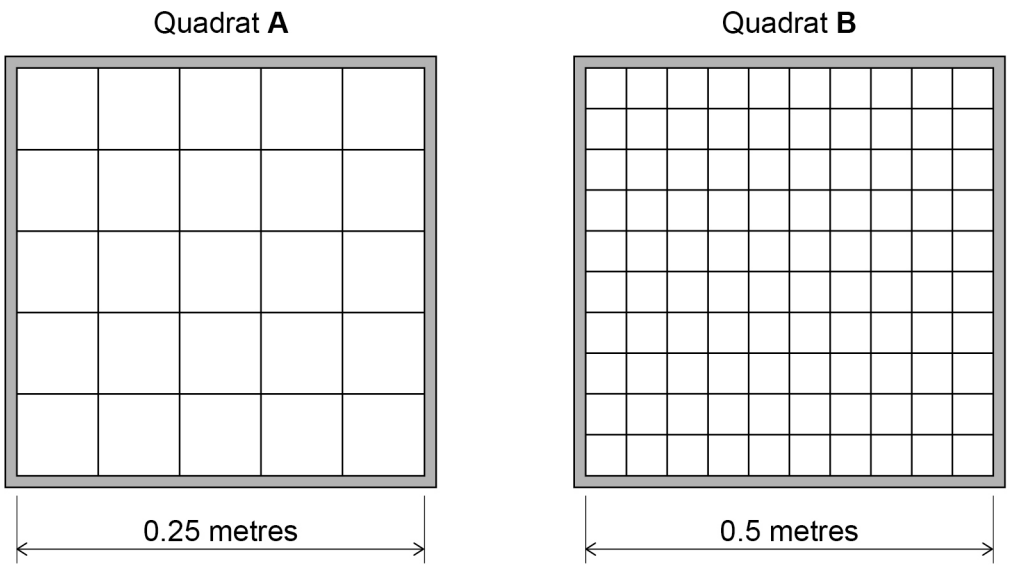
2 _____

Question 3 continues on the next page

4.7.2.1 Levels of organisation

0 3 . 4 **Figure 3** shows two different quadrats.

Figure 3



Not to scale

Explain **two** advantages of using quadrat **B** instead of quadrat **A** in the investigation.

You should include calculations in your answer.

[4 marks]

1

2

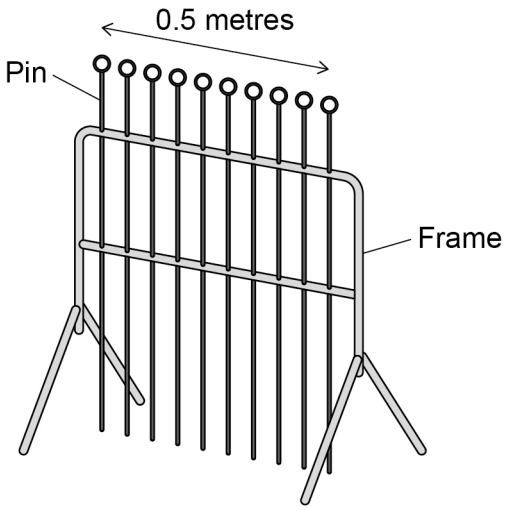
4.7.2.1 Levels of organisation

Question 04 · continued

A point quadrat can also be used to estimate the percentage cover of plants in an area.

Figure 4 shows a point quadrat.

Figure 4



When using a point quadrat, the pins are pushed down to the soil.

The number of pins that touch a buttercup plant is counted.

0 3 . 5 What are **two** advantages of using a point quadrat compared with using a square quadrat?

[2 marks]

Tick (✓) **two** boxes.

With a point quadrat, a plant that is smaller than half a square is more likely to be counted. ☐

With a point quadrat, each species of plant is easier to identify. ☐

With a point quadrat, no judgement of cover is needed. ☐

With a square quadrat, a buttercup plant covering other plants cannot be counted. ☐

With a square quadrat, the results are less likely to be biased. ☐

4.7.2.1 Levels of organisation

Question 04 · continued

0 3 . 6 The percentage cover of buttercup plants can be estimated using the equation:

$$\text{percentage cover} = \frac{\text{number of times a pin touched a buttercup plant}}{\text{total number of pins used}} \times 100$$

30 students each collected results from 50 pins.

The students then put **all** their results together.

Buttercup plants had a percentage cover of 7%.

Calculate the number of times a pin touched a buttercup plant.

[3 marks]

Number of times a pin touched a buttercup plant = _____

15