AQA GCSE Combined Science - Trilogy | 8464

SPECIFICATION POINT 4.7.2.1

Levels of organisation

Mark schemes and examiner comments

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

Using this booklet

1. Booklet answer numbers match the question booklet.
2. Use the original question number within marking tables.
3. Examiner comments are included where available.

Name: _____ **Date:** _____

Where a precise marking extract is unavailable, the full source document is included in an appendix. Any missing mark scheme is explicitly identified.

4.7.2.1 Levels of organisation

Answer 01 · Mark scheme June 2019 | 8464/B/2H | Original Q5

Question	Answers	Extra information	Mark	AO / Spec. Ref.
05.1	repeat for another ten quadrats		1	AO3 4.7.2.1
	use a random method to place the quadrats		1	
05.2		an answer of 4.8×10^5 scores **5** marks an answer of 481 766.4 **or** 481 766 **or** 480 000 scores **4** marks an answer of 15 744 × 4 × 7.65 scores **3** marks an answer of 15 744 (m^2) scores **2** marks		AO2 4.7.2.1
	(area of field =) 62 × 164 + 164 × 68 ÷ 2 **or** equivalent		1	
	15 744 (m^2)		1	
	15 744 × 4 × 7.65	allow use of incorrect area allow $\frac{7.65}{0.25} \times 15744$	1	
	481 766.4	allow 481 766 **or** 480 000	1	
	4.8×10^5	allow incorrect calculation expressed correctly	1	

4.7.2.1 Levels of organisation

Answer 01 · Mark scheme

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

Question	Answers	Mark	AO/ Spec. Ref
05.3	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO3
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3-4	AO2
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content	0	
	Indicative content • trees over / in field • (which) reduce light for photosynthesis • (so) fewer daisies there • trees over / in field • (which) take water / nitrates / ions from the soil • (so) fewer daisies there • trampling on sports pitches • (will) kill plants • (so) fewer daisies there • competition from plants / grasses on field • (will) use up water / nitrates / ions / space • (so) fewer daisies there • gardener may water / fertilise / mow field • (which provides) more water / nitrates / ions • (so) more / fewer daises grow there • more insects / disease / animals in some areas • (may) eat / kill plants • (so) fewer daisies there • school buildings • (which) reduce light for photosynthesis • (so) fewer daisies near school • pollution / toxins from vehicles on roads • (which will) reduce growth • (so) fewer daisies near roads • wrong pH **or** lack of ions **or** poor drainage **or** poor / wet / dry soil in some areas • (which will) slow growth • (so) fewer daisies there Level 3 answers must refer to several factors in accurate detail		4.7.1.1 4.7.1.2 4.7.1.3 4.4.1.1
Total		**13**	

4.7.2.1 Levels of organisation

Answer 01 · Mark scheme

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



4.7.2.1 Levels of organisation

Answer 02 · Mark scheme

June 2023 | 8464/B/2H | Original Q3

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	measure / string / transect / line at right angles to river (edge)	allow measure / string perpendicular to river (edge) allow shown on **Figure 1** allow measure / string / transect / line straight from the river into the field ignore measure / string / transect / line from the river into the field unqualified	1	AO1
	place quadrat at intervals (along transect)	allow place quadrat at named intervals (of between 1 m and 10 m) allow place quadrats along transect do **not** accept place quadrat at random intervals	1	AO1
	count the (different plant) species (in each quadrat) at each distance	ignore references to counting numbers of plants **or** percentage cover	1	AO1
	repeat for 2 more transects	allow 2 or more repeats (of transect) allow repeat at 2 or more locations (along the river) allow 3 or more correct transect lines shown on **Figure 1**	1	AO1 4.7.2.1 RPA7

4.7.2.1 Levels of organisation

Answer 02 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	the mean value students can be most certain about is 5 metres from the river		1	AO3 4.7.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	moisture levels in the soil		1	AO1 4.7.1.2 4.7.1.1

4.7.2.1 Levels of organisation

Answer 02 · Mark scheme

Question	Answers	Mark	AO / Spec. Ref.
03.4	**Level 3:** Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.	5–6	AO2
	Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.	3–4	AO1
	Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.	1–2	AO1
	No relevant content.	0	
	Indicative content **consequences of increasing number of cows** • fewer plants • due to more trampling • due to more plants being eaten (by cows) • (fewer plants so) less photosynthesis • so more carbon dioxide in the atmosphere • (more) cows will release carbon dioxide • from respiration • (more) cows release methane • deforestation to provide farmland • more (cow) faeces entering river / streams / watercourses **environmental implications** ○ carbon dioxide is a greenhouse gas ○ methane is a greenhouse gas ○ global warming may be greater ○ description of consequence(s) of global warming ○ description of consequence(s) of (cow) faeces entering river / streams / watercourses ○ less land available to grow crops ○ effects of deforestation (eg reduced biodiversity) For **Level 3**, explanations include consequence(s) and linked environmental implication(s).		4.7.1.3 4.7.2.1 4.7.2.2 4.7.3.4 4.7.3.5 4.7.3.2

Total Question 3	**12**

4.7.2.1 Levels of organisation

Answer 03 · Mark scheme

Question 1

Question	Answers	Mark	AO / Spec. Ref.
01.1	alga(e) → limpet(s) → crab(s) direction of arrows must be correct	1	AO2 4.7.2.1

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.2	(50 (cm) × 50 (cm) =) 2500 (cm^2)	allow conversion cm to m (50 ÷ 100 =) 0.5 (m)	1	AO2 4.7.2.1 RPA7
	$(\frac{2500}{100 \times 100}$ =) 0.25 (m^2)	allow ¼ (m^2) allow (0.5 × 0.5 =) 0.25 (m^2) for **2** marks allow (½ × ½ =) ¼ (m^2) for **2** marks	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.3	(1800 × $\frac{2}{100}$ =) 36 (m^2)	allow (1800 × 0.02 =) 36 (m^2)	1	AO2 4.7.2.1 RPA7
	$(\frac{36}{0.25}$ =) 144 (quadrats)	allow (36 × 4 =) 144 (quadrats) allow a correct calculation of number of quadrats with an incorrect calculation of 2% of 1800 allow ecf from question **01.2**	1	

4.7.2.1 Levels of organisation

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.4	(location of sample will be) biased / chosen **or** (location of sample will be) limited by how far students can throw	allow students may aim for limpets allow students may aim to avoid limpets allow students may stand / start near groups of limpets	1	AO1 4.7.2.1 RPA7
	(therefore) results will not be representative (of (actual) abundance)	allow population size will be too high / low	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.5	tape measure along two (perpendicular) sides (of sea shore) **or** allocate co-ordinates (to sea shore) **or** divide area into a grid		1	AO1 4.7.2.1 RPA7
	use random number generator	allow description of generating random number(s) for example pulling numbers from container do **not** accept throwing quadrats	1	

4.7.2.1 Levels of organisation

Answer 03 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.6	any **one** from: • water • tide • rocks • quicksand • named hazardous material on the sea shore eg needles, glass • sewage • animals	allow named example of a hazard allow sea allow waves allow slippery / uneven surfaces allow appropriate named animal for example crab / jellyfish	1	AO3 4.7.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
01.7	any **one** from: • fertiliser • sewage • toxic chemicals	allow named toxic chemical eg herbicide / pesticide / insecticide / DDT / (crude) oil allow (micro)plastics allow (dissolved) carbon dioxide allow heavy metals allow thermal pollution	1	AO2 4.7.3.2

Total Question 1	11

4.7.2.1 Levels of organisation

Answer 04 · Mark scheme

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

Question 3

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.1	distance from the tree	allow distance	1	AO2 4.7.2.1 RPA7

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.2	7 (squares)		1	AO2
	$\frac{7}{25} \times 100$	allow 0.28×100		
		allow correct working shown from an incorrect attempt at counting squares (in the range 6 to 10) covered by buttercups	1	AO3
	28 (%)	allow a correct calculation from an incorrect attempt at counting squares (in the range 6 to 10) covered by buttercups	1	AO2 4.7.2.1 RPA7
		alternative route (percentage cover of one small square) $(\frac{100}{25} =) 4$		
		7×4 allow correct working shown with incorrectly calculated percentage cover of one small square		
		28 (%) allow a correct calculation from an incorrect attempt at counting squares (in the range 6 to 10) covered by buttercups		

4.7.2.1 Levels of organisation

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.3	any **two** from: • whether the sample is representative • the size of the quadrat • the number of students • how many quadrats fit around the tree at 1 m • factors such as buildings **or** other tree(s)	allow the number of quadrats (available) allow size of tree allow if the same (quadrat) area is being sampled repeatedly	2	AO3 4.7.2.1 RPA7

4.7.2.1 Levels of organisation

Answer 04 · Mark scheme

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.4		allow converse if clearly referring to quadrat **A** ignore references to time		AO3 4.7.2.1 RPA7
	(quadrat **B**) samples a larger area	allow (quadrat **B**) is larger / wider	1	
	(because) 0.25 (m^2) rather than 0.0625 (m^2)	allow $\frac{1}{4}$ (m^2) rather than $\frac{1}{16}$ (m^2) allow 2500 cm^2 rather than 625 cm^2 allow by 4 times	1	
	(quadrat **B**) gives more accurate / precise results	allow (quadrat **B**) is more representative allow (quadrat **B**) has greater resolution allow need to use quadrat **A** 4 times (as many times) to have the same accuracy / precision as quadrat **B** ignore (quadrat **B**) is more reliable / valid / repeatable	1	
	(because) to the nearest 1% (of the quadrat) rather than nearest 4%	allow (because) quadrat **B** has 100 (small) squares rather than 25 (small) squares do **not** accept quadrat **B** has smaller squares (within quadrat)	1	

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.5	with a point quadrat, a plant that is smaller than half a square is more likely to be counted		1	AO3 4.7.2.1 RPA7
	with a point quadrat, no judgement of cover is needed		1	

4.7.2.1 Levels of organisation

Question	Answers	Extra information	Mark	AO / Spec. Ref.
03.6	$7 = \frac{n}{30 \times 50} \times 100$	allow $7 = \frac{n}{1500} \times 100$	1	AO2 4.7.2.1
	$n = \frac{7}{100} \times 1500$	allow n = 0.07 × 1500 allow n = 7 × 15 allow a correct rearrangement using 50 pins as total number of pins used allow correct rearrangement with an incorrect calculation of number of pins used	1	
	n = 105	allow a correct calculation using 50 pins as total number of pins used allow correct calculation with an incorrect calculation of number of pins used allow **2** marks for: $(\frac{7}{100} \times 50 =) 3.5$	1	

Total Question 3	15

4.7.2.1 Levels of organisation

Answer 01 · Examiner comments June 2019 | 8464/B/2H | Original Q5

Question 5 (standard, standard/high & high demand)

05.1 Most students were able to identify one way to improve the method given for the RPA of measuring a population of organisms; in this case, daisies in a school field. 57% of students gave both improvements correctly.

05.2 Most students made a good attempt at this tough multistep calculation. A third gained two marks for correctly calculating the area of the school field. A further 12% of students gained a further one mark, most usually for converting the incorrect answer they derived into standard form with two significant figures. 10% correctly calculated the result but failed to express it in the required format, while 7% calculated a totally correct answer.

05.3 This extended response question asking about factors which would affect the distribution of daisy plants on the school field was intended to be challenging. To give answers reaching Level 2 or 3 the student needed to include a high degree of accurate detail to explain each factor. Students who identified only factors, or who discussed only one factor, would be unlikely to get a mark awarded above Level 1. To gain a mark in Level 3 quite a lot of strong linking with accurate detail was needed for several factors and a clear understanding of how each one affected the distribution. It was not required to label each factor as biotic or abiotic but if the student chose to do so it needed to be correct.

11% of students gave enough accurate detail to be awarded five or six marks (Level 3). 57% of students gained three or four marks (Level 2) and 26% achieved one or two marks (Level 1). Very few students gained no credit or did not attempt a response. This question differentiated well throughout the ability range of students.

Answer 02 · Examiner comments June 2023 | 8464/B/2H | Original Q3

Question 3 (Standard, Standard/high and High demand)

03.1 This investigation is part of Required Practical Activity 7. This was a challenging novel context for students to apply their knowledge of practical techniques. Many students assumed this required random sampling of the plant species in the field. which was incorrect. Students were prompted to explain how to use a transect in their method. Many students used the term transect in place of quadrat. In a high proportion of answers there was confusion between a transect and quadrat, eg ‘place a $1m^2$ transect on the ground’ and

4.7.2.1 Levels of organisation

‘count how many plant species there are in each transect’. Some students also referred to ‘using a quadrat (transect)’ which implies that the terms can be used interchangeably. There is clearly confusion amongst students between the words and their meanings, with a key misconception being that a transect is the same as a quadrat.

Where students knew the difference between a transect and quadrat, there were still many examples of students not knowing the name of a quadrat, with terms such as metal grid, transquare, wire panels and even Punnett square being used.

Few students correctly described how to place the transect. Some of the clearest answers drew their transect and locations for quadrats on Figure 1. Marks could be awarded in these cases.

When students understood what a transect was, it was common for them to score marking points 2 and 3. These students could refer to placing quadrats at set intervals and counting the number of species in each quadrat at these intervals. Marking points 1 and 4 were less commonly seen. For marking point 1, this was usually because students gave no indication of the direction the transect should be. Students awarded marking point 1 often added a transect line to the diagram provided or used the word perpendicular, which gained them credit. Marking point 4 was rarely seen. It seems that most students do not think about repeating transects in the same way as other sampling techniques / experiments. Students often failed to get marking point 4 because it wasn't clear if they were talking about repeating the quadrat sampling along the same transect or if they were talking about moving the transect along the river.

Many students attempted to sample randomly, or to throw quadrats from different distances from the river. Throwing quadrats is never an appropriate method.

References to calculating a mean were frequent, but usually in the incorrect context of calculating the mean of the results from all distances along one transect.

Some students did not have a concept of size. This could be seen with wording such as:

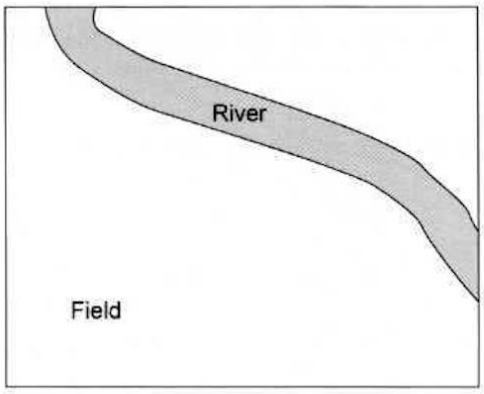
- lay down a transect of 1 m and then place 100 cm quadrats along it
- use a quadrat 10 m × 10 m
- use a 1 cm by 1 cm quadrat
- use a quadrat every 5 cm
- use a 100 m ruler.

4.7.2.1 Levels of organisation

Answer 02 · Examiner comments June 2023 | 8464/B/2H | Original Q3

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.

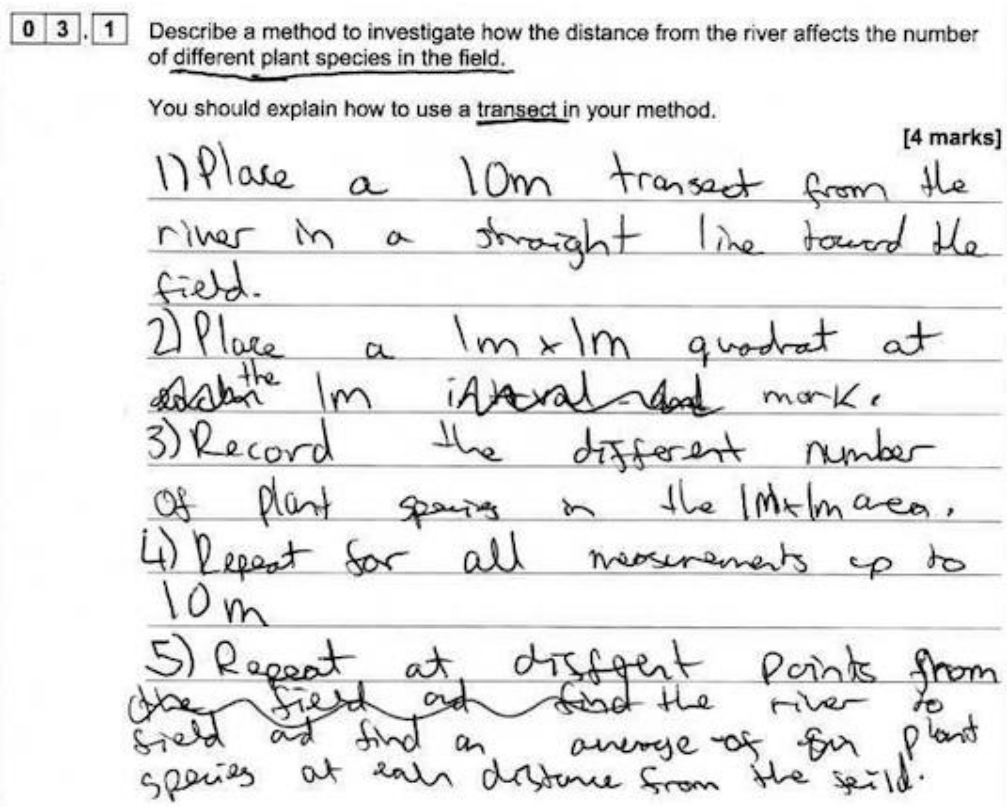
[4 marks]

You should have big net & field with squares with any measurements (like 5cm by 5cm). Then You can count the different plant species within the areas. Also you do need to be a certain distance from the river everytime such 1m, 2m 3m, 4m & 5m

The response above does not describe where to place the transect, therefore no marking point 1. They have not used the term quadrat, therefore cannot access marking point 2 (notice the underlined part of marking point 2 in the mark scheme). They do collect appropriate data at each distance therefore marking point 3 was awarded. There is no appropriate reference to repeating the transect, therefore no marking point 4.

4.7.2.1 Levels of organisation

Answer 02 · Examiner comments June 2023 | 8464/B/2H | Original Q3



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]

1) Place a 10m transect from the river in a straight line toward the field.
2) Place a 1m x 1m quadrat at the 1m mark.
3) Record the different number of plant species in the 1M x 1m area.
4) Repeat for all measurements up to 10m
5) Repeat at different points from the field and find the river to field and find an average of the plant species at each distance from the field.

This response was awarded all 4 marks.

03.2 Approximately one-third of students could identify that the mean value the students can be most certain about is 5 metres from the river. This suggests a lack of understanding of range bars on graphs.

03.3 Approximately-two thirds of students could identify an abiotic factor that could affect the number of different plant species found near the river.

03.4 This was an 'extended response' style of question. Such questions are marked holistically. There are overall generic descriptions for the three levels of response at the top of the scheme, giving a hierarchy of response. Within each level there are 2 marks.

Students were asked to explain the environmental implications of an increasing number of cows being farmed. A mark scheme relating to a question this broad cannot cover all possible valid responses. Examiners used professional judgement with other content. For example, some students discussed rivers becoming polluted with antibiotics used when farming cows, described environmental implications of increased fertiliser use due to growing more crops to feed the higher cow numbers, or described environmental implications of increased machinery or transport use associated with increasing cow numbers. All of these were valid points.

Many students could give one or several aspects of environmental implications of farming more cows. Some students thought this would mean fewer cows and answered accordingly. Some marks could still be awarded in some such instances.

4.7.2.1 Levels of organisation

Answer 02 · Examiner comments

At Level 1, students needed to give some indicative content that might be a consequence or an environmental implication. This could be very simply stated such as ‘cows will release more greenhouse gases’. Crucially, if two or more ideas were given but not a linked consequence and environmental implication, the answer did not meet the criteria for Level 2.

To enter Level 2 the generic descriptor shows that there must be attempts at logical linking. To enter Level 2, therefore, students must link a consequence with an environmental implication and give another piece of indicative content. An example that gained 3 marks would be ‘More cows produce more methane and methane is a greenhouse gas, so global warming will get worse’. To decide if the response is worth 4 marks, the criteria for 3 marks plus some other indicative content must be seen.

For a Level 3 mark, students must strongly link consequence(s) with environmental implication(s), for example by linking one consequence with two associated implications or by linking two associated consequences with their implication as well as giving further indicative content points. An example that meets the Level 3 criteria and gains 5 marks would be ‘There are fewer plants growing as more plants get eaten by cows. Therefore, there are fewer plants photosynthesising and absorbing carbon dioxide from the atmosphere. Carbon dioxide is a greenhouse gas’.

We always look to positively mark, so where errors were seen, such as that cows release methane only when they die or that farming an increasing number of cows will decrease the cow population, a student could still gain credit if indicative content is also seen in the response. Such errors were helpful when deciding where within a level a response sits.

Common misconceptions included:

- confusion between the ozone layer and the greenhouse effect
- cows release methane or carbon dioxide only when they die
- trees release carbon dioxide when they are cut down
- that cows die and form fossil fuels.

4.7.2.1 Levels of organisation

Answer 02 · Examiner comments

June 2023 | 8464/B/2H | Original Q3

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]

Due to the increase of cows being farmed, is causing environmental problems. Cows are heavy and walk around. They are farmed in areas where crops and plants are growing, they are then trampeling over these plants causing them to die and stop progressing. More methane is also being produced and going into the atmosphere.

The response gives bullet points 1, 2 and 8, which are consequences of increasing numbers of cows being farmed. There are no links to environmental implications, therefore the response is in Level 1 and was awarded 2 marks.

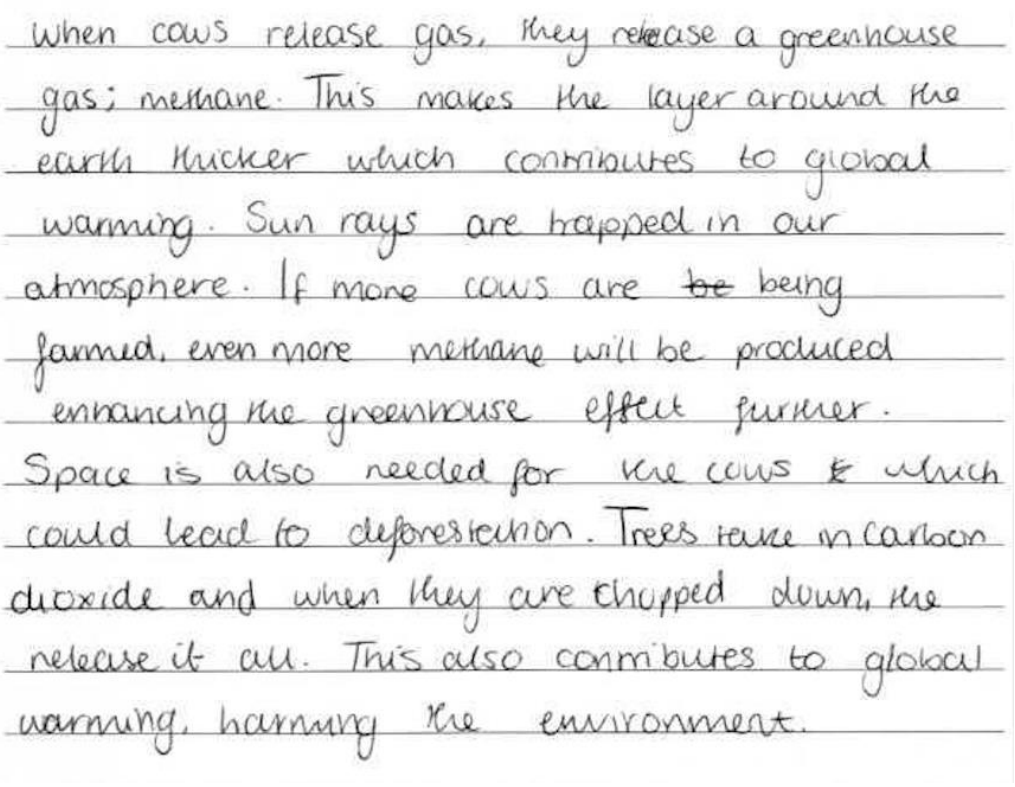
4.7.2.1 Levels of organisation

Answer 02 · Examiner comments June 2023 | 8464/B/2H | Original Q3

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]



When cows release gas, they release a greenhouse gas; methane. This makes the layer around the earth thicker which contributes to global warming. Sun rays are trapped in our atmosphere. If more cows are ~~be~~ being farmed, even more methane will be produced enhancing the greenhouse effect further. Space is also needed for the cows & which could lead to deforestation. Trees take in carbon dioxide and when they are chopped down, the release it all. This also contributes to global warming, harming the environment.

The student links bullet points 8, 12 and 13, then bullet point 9. There is also a correct reference to carbon dioxide contributing to global warming. The statement about carbon dioxide being released when trees are chopped down was a common error. This response is in Level 3 and was awarded 5 marks.

4.7.2.1 Levels of organisation

Answer 03 · Examiner comments

June 2024 | 8464/B/2H | Original Q1

Question 1 (standard demand)

01.1 Many students could give the food chain in the correct order with appropriate arrows showing the flow of energy. Responses that used commas or hyphens, rather than arrows, did not gain the mark. Some students tried to give extra information, such as identifying the producer and primary consumer, but this was not required.

01.2 Some students demonstrated problems converting from centimetres to metres. Responses occasionally stated that 50 cm = 5 m.

Calculation of area was sometimes a challenge, with frequently seen responses such a 50 + 50 + 50 + 50 = 200 indicating confusion between area and perimeter.

Many students gave the incorrect response of 0.5 × 0.5 = 2.5, perhaps suggesting that they are not using their calculator.

01.3 Marks were often awarded for allowing error carried forward from the previous question.

Many students only calculated 2% of the area of the shore and then stopped. Therefore only the first mark was awarded.

Some students who did not gain marks had attempted to calculate 2% of their answer to the previous question, indicating they had not understood the context.

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4.7.2.1 Levels of organisation

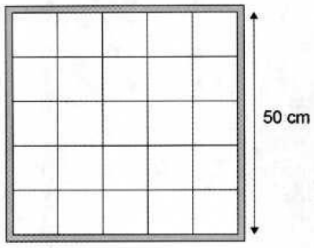
Answer 03 · Examiner comments June 2024 | 8464/B/2H | Original Q1

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]**

50 x 50 = 2500 cm^2

2500 cm^2 = 25 m^2

÷100

Area of quadrat = 25 m^2

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]**

1% = 18 m^2 to capture 36 m^2

2% = 36 m^2 quadrat used 2 times.

25

50

Number of times = 2

For question 01.2, the student gained marking point 1 only.

For question 01.3, the student has calculated 2% of 1800 m^2 then noted that the quadrat would need to be used twice (using their error carried forward) therefore 2 marks were awarded for question 01.3.

01.4 Most students could give a reason for not throwing the quadrat and gain the first mark. Usually, students stated throwing could be biased. Very few could explain why this was a problem. References to the effect it would have on the population estimate were rare.

Some students demonstrated the misconception that throwing quadrats is an appropriate sampling method. Others stated that the issue is that the quadrat could sample the same area twice, which was not correct, because that could also occur with a random method.

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4.7.2.1 Levels of organisation

Answer 03 · Examiner comments June 2024 | 8464/B/2H | Original Q1

01.5 Some students had knowledge of using a random number generator on their calculator or phone and could describe the use of coordinates on the shore.

Many students incorrectly referred to throwing in random directions or being blindfolded. These are never appropriate methods for sampling. Others demonstrated the misconception that choosing locations with the most limpets would be appropriate. Some confusion between quadrats and transects was seen.

01.6 On the Foundation tier, many students gave a risk, such as drowning, rather than a hazard. This was rare on the Higher tier paper. Common incorrect answers referred to the quadrat being washed away, or gave descriptions of ways to reduce risk, such as 'wear sensible shoes'.

01.7 Most students could name one type of pollution that may affect the population of limpets. The most frequently seen answers were plastic and sewage.

Common responses that were not awarded the mark were chemicals, crabs and waste.

Answer 04 · Examiner comments

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

Question 3 (Standard, Standard/High and High demand)

03.1 75% of students could identify the independent variable in the investigation. Some students achieved this mark for describing the marking point, such as 'different distances', 'length between tree and quadrat' or 'how far the quadrat was from the tree'.

A small number of students copied or closely copied information from the question stem 'number of buttercup plants at different distances from a tree' this negated the mark as both the independent variable and dependent variable have been given. Refer to page 4 of the mark scheme for how the list rule applies in instances such as this.

Common incorrect answers related to the size or area of quadrats (a control variable) and number of buttercups (dependent variable) or 'the tree'. Answers such as 'area the quadrat was placed', or 'different places' were insufficient but seen quite frequently. A few students described distances between trees or distance to buttercup plants which were also incorrect.

03.2 Over two thirds of students achieved 3 marks.

Some students missed the instruction to 'count every small square in the quadrat that was **at least half** covered by buttercup plants', despite the emboldening. 10 was the most common incorrect count but within tolerance (as shown on the mark scheme) so was awarded 2 marks if used for the correct calculation. Where students received only one mark it was for correct number of squares, but without a correct calculation. If students used a figure in the range 6 to 10, marking points 2 and 3 could be awarded, even if this figure was not a whole number, such as in the following example.

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]

9x5=25

1+1+1+1+1+1+1=7+1.5= 8.5

8.5/25= 0.34= 34%.

Percentage cover = 34 %

The student has used 8.5 as the number of small squares, therefore marking point 1 could not be awarded, but marking points 2 and 3 were given.

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4.7.2.1 Levels of organisation

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03.3 Marks were most commonly given for size of quadrat and number of quadrats available. Some students misinterpreted 'factors' in the question as biotic or abiotic factors. Many students wrote about avoiding bias and random placement or collecting sufficient data to calculate a mean. Another insufficient answer seen frequently was the idea of placing the same number at each distance.

Responses suggesting throwing quadrats were surprisingly common. As has been included in previous examiner reports, throwing quadrats is never an appropriate method.

Use of a random number generator was not applicable to this question, but many students tried to include this in their answer. Likewise, 'calculate a mean' was a common response that could not be credited.

03.4 Marking points 1 and 2 were the most commonly awarded marks.

Many students missed the prompt that they needed to include calculations which limited their responses and prevented the awarding of marking points 2 and 4. Where students did include calculation of the area of each quadrat, many were giving the unit of area as m or metres rather than m^2.

Students had difficulty calculating the area of the two quadrats or mathematically comparing the area. Many incorrectly stated that 'quadrat B has double the area', and many attempted unit conversions between metres and centimetres incorrectly.

Commonly seen insufficient answers were relating to the time involved e.g. 'B would be quicker to use', responses about 'B being more reliable' and the idea of 'B counting more plants'.

Marking point 4 was often negated by students misunderstanding the 'not to scale' label on the diagram and referring to B having smaller squares. Quite a few realised B had 100 squares so stated that this would be easier to calculate a percentage which was insufficient for marking point 4.

03.5 Approximately half of students gained one mark, and the other half gained both marks.

03.6 More students gave the answer of 3.5 rather than the correct answer of 105. It was clear that students reaching an answer of 3.5 had forgotten to take account of the information in the stem of the question about the class of 30 students putting **all** their results together. Marking points 2 and 3 could be awarded in this instance. From an answer of 3.5, some students rounded up or down (realising a number of pins must be a whole number). Not rounding, rounding up, rounding down or truncating were all acceptable.

Some students made errors when attempting to rearrange the equation, particularly those who tried to make an 'equation triangle' before attempting rearrangement.

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