

DO NOT WRITE IN THIS AREA

3 (a) A scientist wanted to estimate the number of earthworms in a field using a quadrat.

The scientist placed the quadrats at random on the surface of the area being sampled and then watered the area with a very dilute solution of mustard.

This causes the earthworms to come to the surface to be counted.

(i) Give a reason why the quadrats were placed at random.

(1)

Think about how your results would be affected if you chose where to put the quadrats?

(b) A student wants to estimate the number of daisy plants in a 500 m² field.

She uses a 1 m² quadrat to sample the field.

Figure 6 shows the results for the number of daisy plants counted in six areas sampled with the quadrat.

| sample number | number of daisy plants | mean diameter of daisy plants / cm |
|---------------|------------------------|------------------------------------|
| 1 | 5 | 7 |
| 2 | 2 | 2 |
| 3 | 6 | 9 |
| 4 | 3 | 3 |
| 5 | 4 | 5 |
| 6 | 4 | 6 |

Figure 6

(i) Calculate the mean number of daisy plants for the six samples.

$5 + 2 + 6 + 3 + 4 + 4 = 24 \div 6 = 4$

(1)

mean number of daisy plants = 4

(ii) Describe how the student could use this calculated mean to estimate the total number of daisy plants in this field.

(3)

How could you amend how the calculation is written out so that the method is clearer?

You know how many daisies there are, on average, in one quadrat. How could you multiple that up so that you can estimate the number of daisies over the whole field? Clue: look at what it tells you about the field and the quadrat in the question.

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(2)

If you choose to put the quadrats where there were lots of daisies it would be an over-estimate. If it is placed at random, it is more likely to be representative.

$5 + 2 + 6 + 3 + 4 + 4 = 24$
 $24 / 6 = 4$

The field is 500 m², the quadrat is 1 m². This means that the field is 500 times bigger than the quadrat, so to calculate all the daisies in the field you could multiply the number of daisies in a quadrat by 500.

You need to write about the processes that remove and emit carbon dioxide to the atmosphere.

Try writing a sentence about each process that happens in the carbon cycle. Think about what plants and animals do to survive and what happens when we burn fossil fuels.

Sample 2 was taken in an area where there were many overhanging trees.

(iii) Explain how these trees may have affected the distribution of daisy plants growing in this area.

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As distribution of daisy plants are growing in ~~the~~ trees are growing a lots and some trees are not growing a lot (2)

(c) Carbon is a substance that can be recycled in the environment. Describe the processes involved in the carbon cycle. (6)

What has this student done wrong? You need to talk about the affect that the trees have had on the daisies and why. Think about what you would notice if you were under a tree, rather than far away from it.

Lots of students wrongly though this was about recycling because they read the question wrongly.

Think about how carbon dioxide is removed from the atmosphere by plants and then passed through the food chain

Some processes put carbon dioxide into the atmosphere, these are respiration of plants and animals, combustion of fossil fuels and decomposition. Photosynthesis removes carbon dioxide from the atmosphere.

When fossil fuels are burnt, the carbon stored in them combines with oxygen in the air and forms carbon dioxide which is given out.

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(2)

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Describe the processes involved in the carbon cycle.

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They have not talked about the impact the shade of the tree has on the daisies. Students need to explain

This question is asking you to write in detail about the carbon cycle.

Plants photosynthesise which takes carbon out of the atmosphere and stores it as starch in the plant. As animals eat plants the carbon moves up the food chain. When they die they decompose giving carbon dioxide back out.

Answers!

| Question number | Answer | Mark |
|-----------------|--|------|
| 4(a)(i) | To obtain a representative sample of the field (1) | (1) |

| Question number | Answer | Mark |
|-----------------|---------------------------------|------|
| 4(b)(i) | $\frac{5+2+6+3+4+4}{6} = 4$ (1) | (1) |

| Question number | Answer | Mark |
|-----------------|---|------|
| 4(b)(ii) | An answer that combines the following points of understanding to provide a logical description: <ul style="list-style-type: none">• divide the field area by the quadrat size (1)• multiply by the number of daisies (1) | (2) |

| Question number | Answer | Mark |
|-----------------|--|------|
| 4(b)(iii) | An explanation that combines identification - application of knowledge (1 mark) and reasoning/justification - application of understanding (1 mark): <ul style="list-style-type: none">• less daisy plants are likely to be growing in this area (1)• because the trees would cause lower light levels for photosynthesis/lower mineral levels for growth/less water available for photosynthesis (1) | (2) |

| Question Number | | Indicative Content | Mark |
|-----------------|--------------|---|------------|
| QWC | * | An explanation of the processes of the carbon cycle including the following points • carbon found in fossil fuels • CO ₂ removed from the air by photosynthesis • plants convert this CO ₂ into fats, carbohydrates and proteins • plants can be eaten and therefore the carbon passed through the food chain • organisms die and decomposers release CO ₂ during respiration • CO ₂ released by respiring plants • CO ₂ released by respiring animals • combustion / burning of fossil fuels releases CO ₂ into atmosphere | (6) |
| Level | 0 | No rewardable content | |
| 1 | 1 - 2 | <ul style="list-style-type: none"> • limited explanation is provided by the candidate for processes of the carbon cycle • there is some evidence that CO₂ can be released to and removed from the atmosphere but no processes named • the answer communicates ideas using simple language and uses limited scientific terminology • spelling, punctuation and grammar are used with limited accuracy | |
| 2 | 3 - 4 | <ul style="list-style-type: none"> • there is a basic outline of the carbon cycle but the details of the individual processes are lacking, any steps given are sequential but there may be missing information • there is some understanding of the reasoning behind each of the processes. • the answer communicates ideas showing some evidence of clarity and organisation and uses scientific terminology appropriately • spelling, punctuation and grammar are used with some accuracy | |
| 3 | 5 - 6 | <ul style="list-style-type: none"> • most of the processes of the carbon cycle are stated with accurate comment on whether the process removes or releases CO₂. • most stages in the cycle are included and are sequential • the answer communicates ideas clearly and coherently uses a range of scientific terminology accurately • spelling, punctuation and grammar are used with few errors | |

Now try this!

Q1 Long Answer question (6)

Some processes add carbon dioxide to today's atmosphere.
Other processes remove carbon dioxide from the atmosphere.
As a result, the amount of carbon dioxide in the atmosphere can change.
Explain how carbon dioxide is added to and removed from today's atmosphere.

Q2 The concentration of carbon dioxide in the Earth's atmosphere depends on the balance between the processes that remove carbon dioxide from the atmosphere and those that release carbon dioxide into the atmosphere.

(i) Explain how carbon dioxide is removed from the atmosphere. **(2)**

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(ii) Explain how carbon dioxide is released into the atmosphere. **(2)**

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Q1 long answer question as before

| Q2 | Answer | Acceptable answers | Mark |
|------|--|--|------------|
| (i) | <p>Both marks must come from the same pair only, not one from each pair An explanation linking EITHER plants (1) photosynthesis / take in carbon dioxide and release oxygen (1) OR oceans / rain / seas / water (1) dissolve/absorb/take in gas (1)</p> | <p>Allow convert to hydrocarbon (1) iron seeding (1) Reject respiration for photosynthesis Ignore breathe in carbon dioxide Ignore carbon is locked up in rocks</p> | (2) |
| (ii) | <p>Both marks must come from the same pair only, not one from each pair An explanation linking burning/ (complete) combustion(1) (fossil) fuels/wood/rubbish/plastic etc (1) or plants/animals/organisms (1) respiration / gas exhaled / breathing / decaying (1) or volcanic activity/volcanoes (1) eruption (releases gas) (1)</p> | <p>Ignore just 'deforestation' Ignore just 'farming' Allow any type of fuel except hydrogen Allow heating limestone (2)</p> | (2) |