AQA GCSE Biology | 8461

SPECIFICATION POINT 4.7.2.1

Levels of organisation

Past-paper questions

Tier	**Higher**
Question groups	**21**
Available paper years	**2007–2025**

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

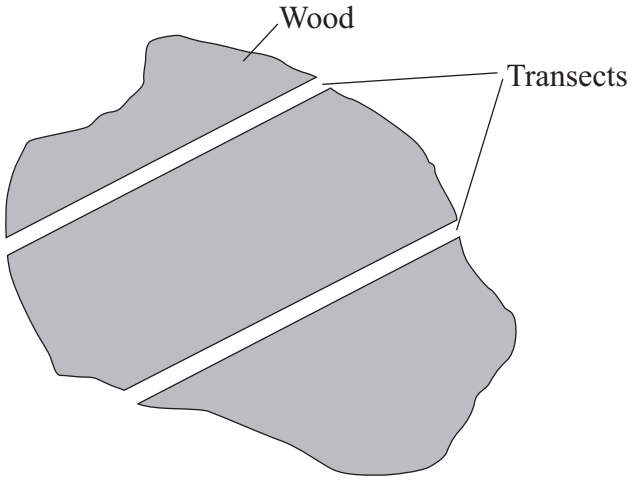
Question 01

1 Red squirrels live in trees. They eat seeds from the cones of conifer trees. Squirrels store cones in 'larders' on the ground. These larders provide food through the winter. Each red squirrel makes and defends one larder.

Scientists monitor squirrel numbers to find the best habitats for the squirrel's survival. In one investigation, scientists estimated the numbers of squirrels in different types of woodland. Each woodland contains a different species of conifer tree.

Here is their method.

- Ten woods of each type of woodland were surveyed.
- In each wood scientists measured out two transects (strips), each 600 m long and 10 m wide.
- A scientist walked slowly down the centre of each transect, recording the number of squirrel larders he could see.



(a) (i) How many transects altogether did the scientists survey in each **type** of woodland?

Number of transects .....

(1 mark)

(ii) What was the total area surveyed in **one** wood?

.....

Area ..... m^2

(1 mark)

4.7.2.1 Levels of organisation

Question 01 · continued

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(b) Name **one** variable that was controlled in this investigation.

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(1 mark)

(c) (i) The scientists recorded the number of larders instead of the number of squirrels they saw.

Explain how this could have increased the accuracy of the investigation.

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(1 mark)

(ii) This method of counting the number of larders could have led to an inaccurate estimate of the number of squirrels.

Explain how.

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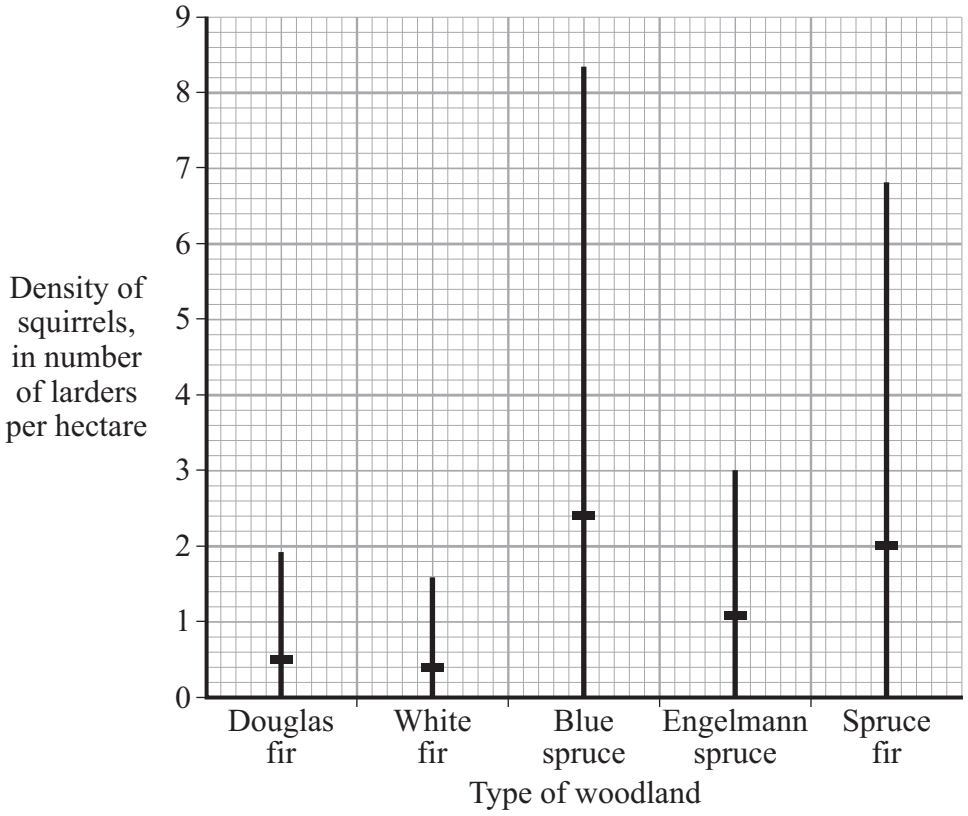
(2 marks)

Question 1 continues on the next page

Question 01 · continued

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(d) The results of the investigation are shown in the graph.



The horizontal mark on each bar represents the mean number of larders per hectare of woodland.

The range of the number of larders observed for Douglas fir woodland was 0 to 1.9 per hectare.

(i) What was the range of the number of larders per hectare in the Spruce fir woodland?

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(1 mark)

(ii) The highest mean number of larders per hectare was found in Blue spruce woodland.

Suggest **one** explanation for this.

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(1 mark)

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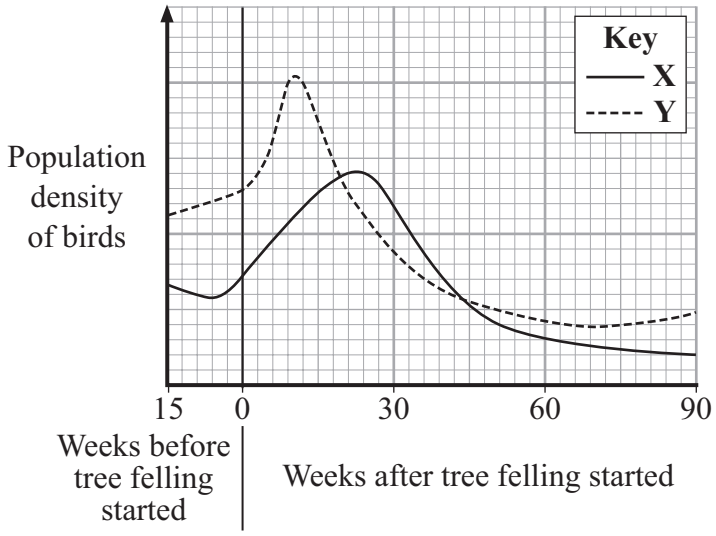
4.7.2.1 Levels of organisation

Question 02

June 2007 | BLY1B | Original Q9 | Legacy

QUESTION NINE

The graph shows the results of a survey into the effect of tree felling on the population density of two different species of bird, **X** and **Y**.



9A Which one of the following statements suggests that species **X** might be a predator of species **Y**?

1 The population density of species **X** is always lower than that of species **Y**.

2 The maximum population density of species **Y** reaches a peak 20 weeks before the population density of species **X** begins to fall.

3 The maximum population density of species **X** occurs as the population density of species **Y** is falling.

4 A fall in the population density of species **X** causes an increase in the population density of species **Y**.

9B The survey team concluded that tree felling caused a reduction in the population density of the birds.

What evidence in the graph supports this conclusion?

1 48 weeks after the start of tree felling, the population density of both species of bird was less than before the tree felling started.

2 72 weeks after the start of tree felling, the population density of species **Y** was less than half of its lowest population density before tree felling started.

3 The fall in the population density of species **Y** occurs before that of species **X**.

4 The fall in the population density of species **Y** was faster than that of species **X**.

4.7.2.1 Levels of organisation

Question 02 · continued

9C How might the data about the population density of the two species of bird have been collected in the area where the trees were being felled?

1 Every six weeks, count all the birds of both species for 24 hours over all the area where the trees are being felled.

2 Every six weeks, count all the nests of the birds of both species over all the area where the trees are being felled.

3 Put a numbered ring on all the birds of both species and record how many of these birds are caught and released every six weeks.

4 Mark out several smaller areas and count the number of birds of both species that are seen during a 24-hour period every six weeks.

9D What other evidence might be used to confirm the conclusions of the survey?

1 data from other surveys on the effects of tree felling on bird population densities

2 data from other surveys on the effects of tree felling on the plant population where the birds live

3 data from other surveys on the availability of the birds' food resources

4 data from other surveys on the breeding habits of birds

END OF TEST

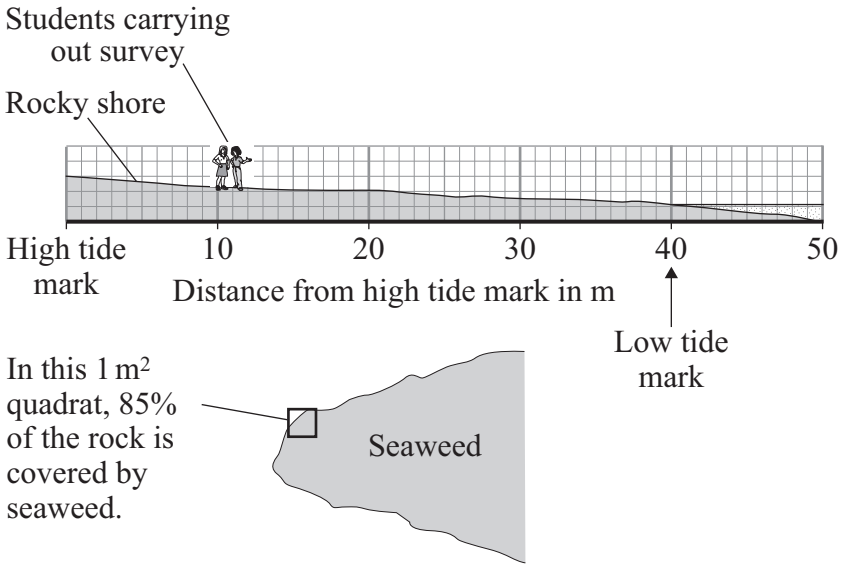
4.7.2.1 Levels of organisation

Question 03

November 2009 | BLY1BP | Original Q4 | Legacy

QUESTION FOUR

A group of students carried out a survey on a rocky sea shore. The students were measuring the distribution of four different seaweeds down the whole shore. They used 1 metre square quadrats. In each quadrat, they measured the percentage abundance of each seaweed.



4A Which of the following sampling methods would provide the most reliable results?

1 sampling every 5 metres from the low tide mark to the high tide mark

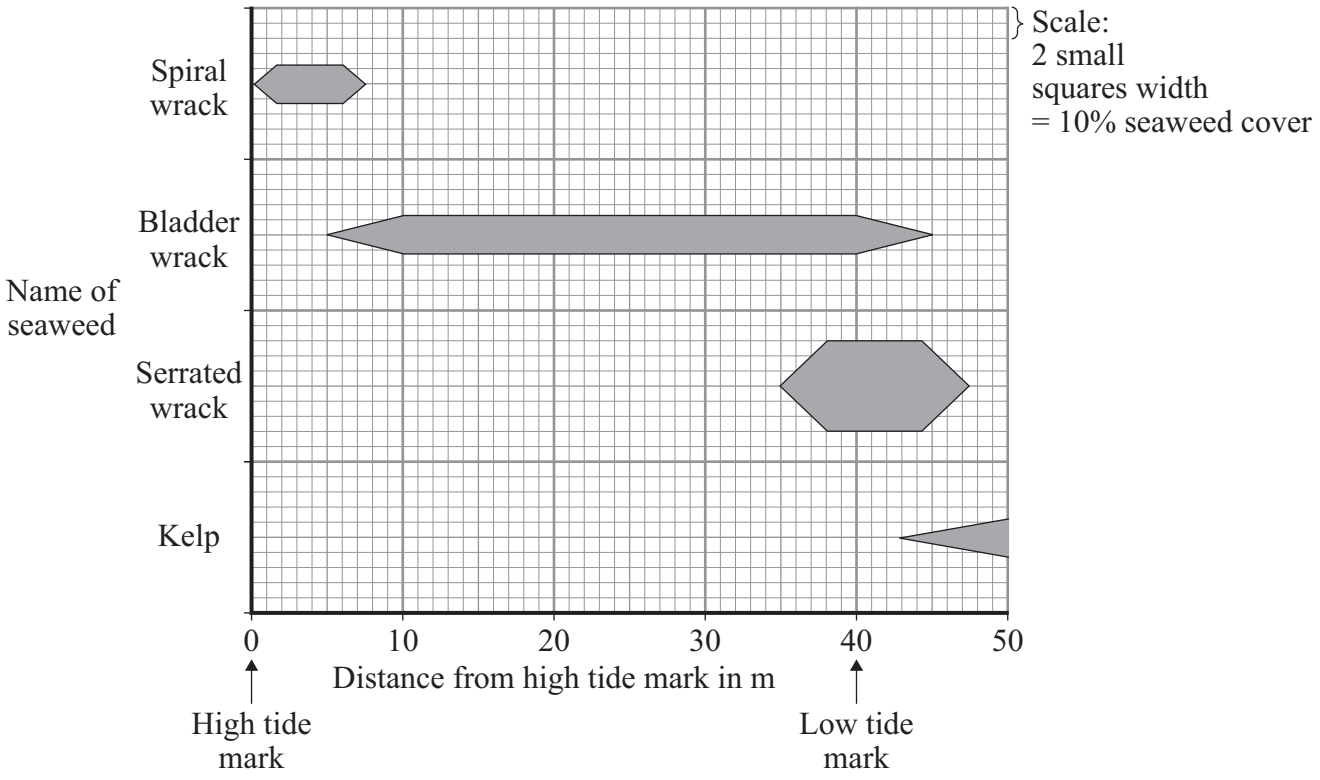
2 sampling every 1 metre from the low tide mark to the high tide mark

3 sampling every 1 metre from the high tide mark for 20 metres down the rocky shore

4 sampling every 5 metres from the low tide mark for 20 metres up the rocky shore

Question 03 · continued

The diagram shows the students' results.



4B What is the distribution range of bladder wrack on the rocky shore?

1 0 to 8 metres

2 5 to 45 metres

3 35 to 48 metres

4 43 to 50 metres

4C What is the percentage cover of serrated wrack at the low tide mark?

1 20

2 30

3 50

4 60

4D Which seaweed is likely to be able to survive the driest conditions?

1 Spiral wrack

2 Bladder wrack

3 Serrated wrack

4 Kelp

4.7.2.1 Levels of organisation

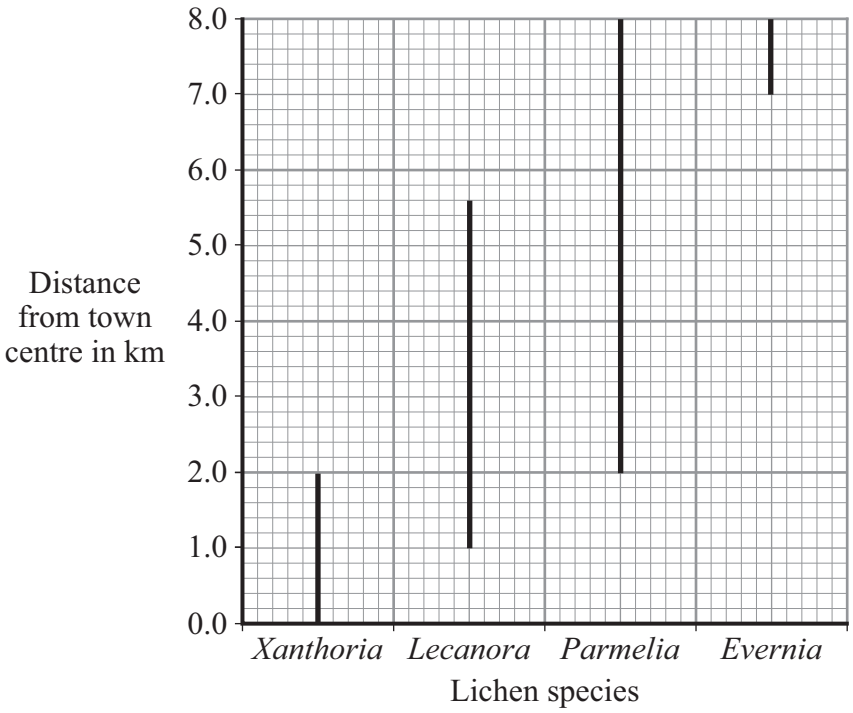
Question 04

3 Lichens are sensitive to the amount of sulfur dioxide in the atmosphere. They are used as indicator species for the amount of air pollution. Air pollution is generally higher in town centres than in the countryside.

Students investigated the relationship between lichen species and distance from a town centre.

- On a map, they drew a transect (line) from the centre of the town to the countryside.
- They examined sites every 200 metres along the transect (line).
- At each site, they recorded the lichen species growing on trees and walls up to a height of 2 metres.

The graph shows their results.
The lines on the graph indicate the range of each lichen species.



3 (a) Give **one** way in which the students could have obtained more accurate results.

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(1 mark)

4.7.2.1 Levels of organisation

Question 04 · continued

for mark

3 (b) (i) Which lichen species was found over the greatest range?

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(1 mark)

3 (b) (ii) Which lichen species grows only in the least polluted air?

.....

(1 mark)

3 (c) One student concluded 'You can tell how much sulfur dioxide there is in the air by the amount of *Lecanora* growing'.

Give **two** reasons why this is **not** a valid conclusion.

1 .....

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2 .....

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(2 marks)

5

4.7.2.1 Levels of organisation

Question 05

2 A group of students investigated a food chain in a garden.

The table shows the estimates of the population and biomass of some of the organisms the students found.

Organism	Number in the garden	Mean mass of each one in g	Biomass of population in g
Hedgehog	1	200	200
Slug	600	2	1200
Lettuce	20	300	

2 (a) (i) Calculate the biomass of the lettuce population.

Show clearly how you work out your answer.

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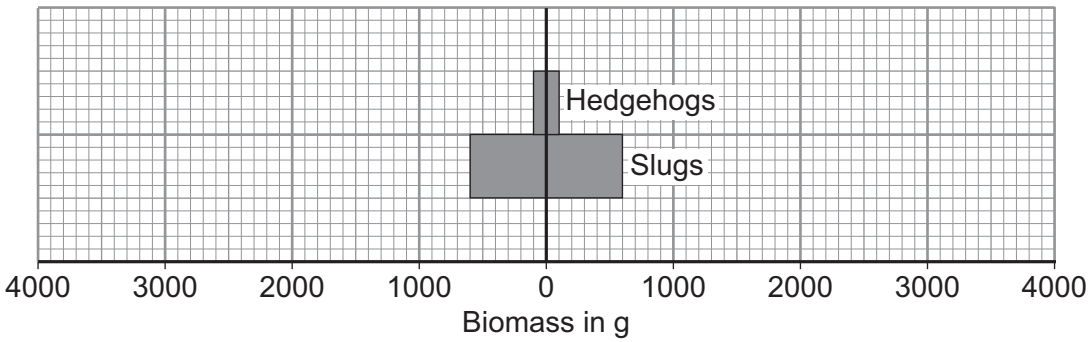
.....

Biomass = ... g

(2 marks)

2 (a) (ii) Use your answer to part (a)(i) to complete the pyramid of biomass.

Show the biomass of the lettuces in the garden.



(2 marks)

4.7.2.1 Levels of organisation

Question 05 · continued

2 (b) Hedgehogs eat slugs.

The biomass of the hedgehog population is much less than the biomass of the slug population.

Explain why as fully as you can.

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(3 marks)

7

4.7.2.1 Levels of organisation

Question 06

June 2011 | BLY1H | Original Q5 | Legacy

5 Some *recreational* drugs are dangerous.

Class A drugs include heroin and cocaine. Class A drugs are very addictive.

5 (a) It is difficult to stop using addictive drugs.

Explain why.

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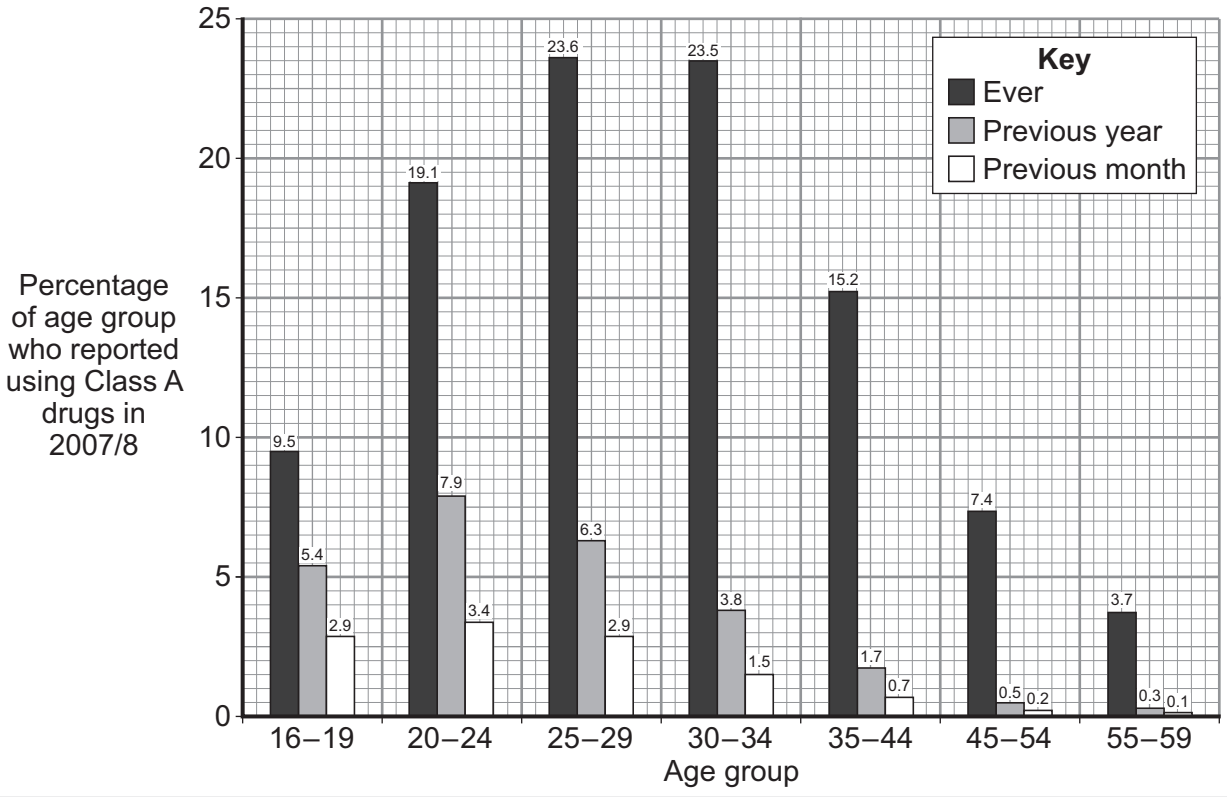
(2 marks)

5 (b) As part of the British Crime Survey, a large, random selection of the UK population is interviewed in their own home about drug use.

People in the sample:

- answer questions about drug use
- answer questions on a lap top
- do not give their names.

The bar chart shows the percentages of people aged 16–59 by age group who reported using any Class A drug ever, in the previous year and in the previous month.



4.7.2.1 Levels of organisation

Question 06 · continued

5 (b) (i) Describe how the percentage of people who have ever used Class A drugs is related to age.

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(2 marks)

5 (b) (ii) The percentage of people who reported using Class A drugs in the previous month is highest amongst 16–29 year-olds.

Suggest **two** reasons for this.

1 .....

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2 .....

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(2 marks)

5 (b) (iii) The data in the bar chart is unlikely to be completely accurate.

Explain why.

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(2 marks)

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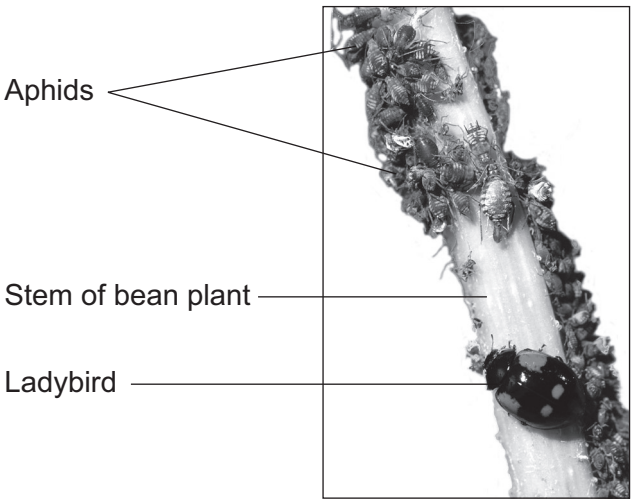
4.7.2.1 Levels of organisation

Question 07

January 2012 | BL1HP | Original Q3 | Legacy

3 Students investigated a food chain in a garden.

The students found 650 aphids feeding on one bean plant.
Five ladybirds were feeding on the aphids.



3 (a) (i) Draw a pyramid of biomass for this food chain.
Label the pyramid.

(2 marks)

4.7.2.1 Levels of organisation

Question 07 · continued

3 (a) (ii) The biomass in the five ladybirds is less than the biomass in the bean plant.

Give **two** reasons why.

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(2 marks)

3 (b) The carbon in dead bean plants is returned to the atmosphere via the carbon cycle.

Describe this part of the carbon cycle.

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(4 marks)

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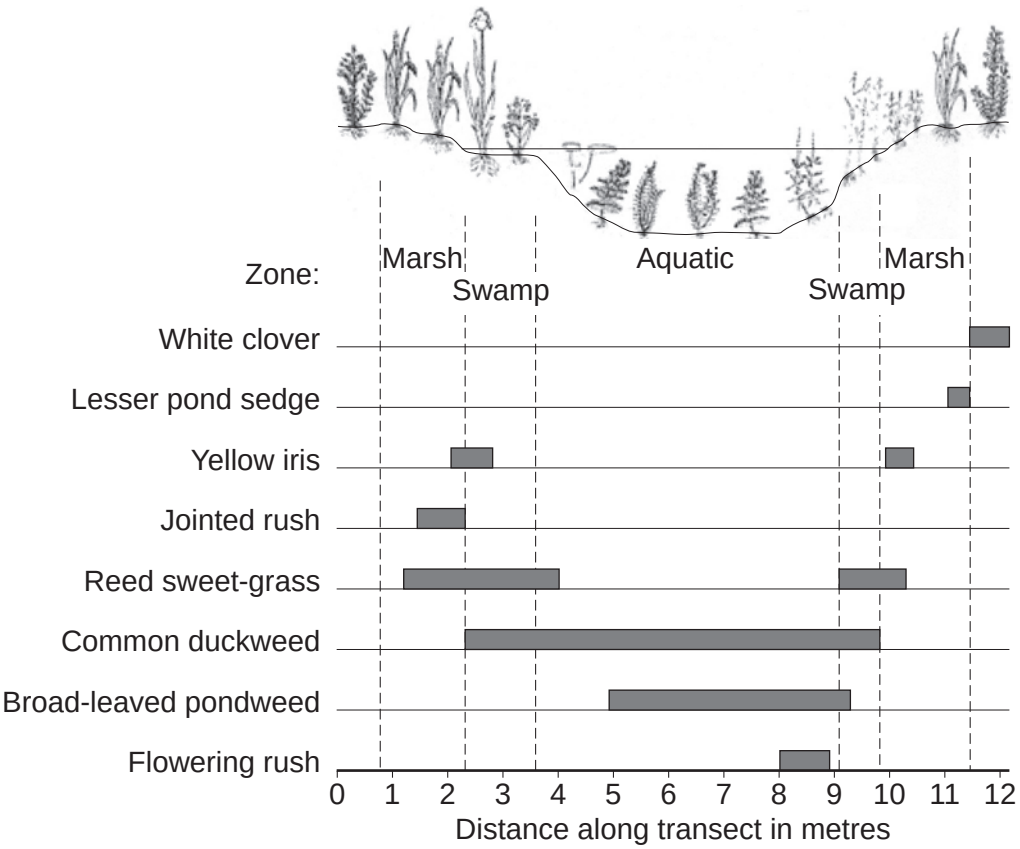
4.7.2.1 Levels of organisation

Question 08

June 2012 | BL2HP | Original Q3 | Legacy

3 Some students investigated the distribution of some of the plants growing in and around a shallow stream. They sampled along a transect line.

The diagram shows their results.



3 (a) (i) Name the **one** species that grew only in the driest conditions.

.....

(1 mark)

3 (a) (ii) Only **one** species grew in the marsh, the swamp and in the aquatic zones.

Which species?

.....

(1 mark)

3 (a) (iii) Duckweed grows floating in water. What evidence is there for this in the students' results?

.....

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(1 mark)

4.7.2.1 Levels of organisation

Question 08 · continued

3 (b) *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

Describe how you would use a $\frac{1}{2}$-metre $\times$ $\frac{1}{2}$-metre quadrat frame and a 30-metre tape measure to obtain data similar to the data shown in the diagram.

You should include details of how you would make sure that you would obtain valid results.

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(6 marks)

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4.7.2.1 Levels of organisation

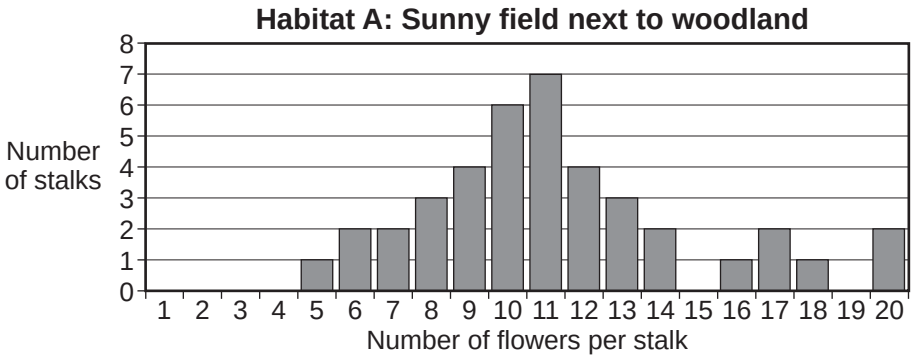
Question 09

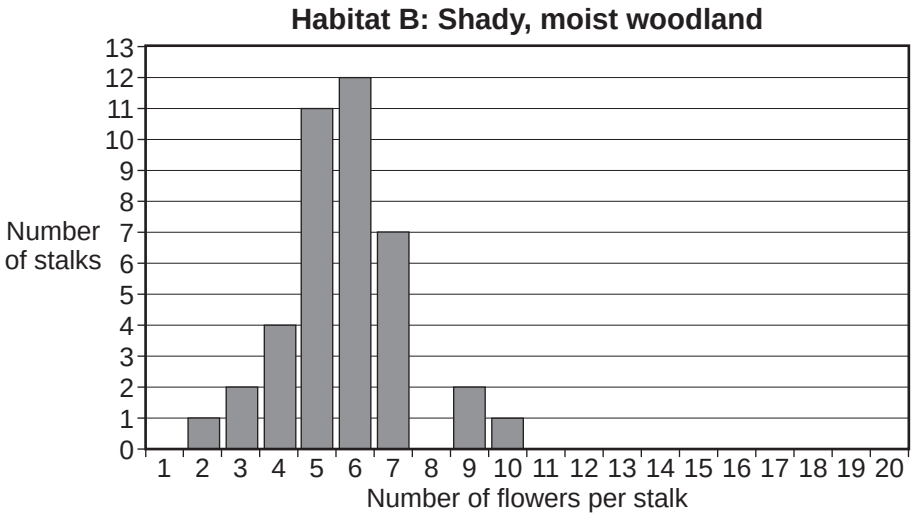
January 2013 | BL2HP | Original Q5 | Legacy

5 Some students studied bluebell plants growing in two different habitats.

Habitat **A** was a sunny field next to woodland.
Habitat **B** was a shady, moist woodland.

A bluebell plant can have several flowers on one flower stalk. The students counted the number of flowers on each of 40 bluebell flower stalks growing in each habitat. The bar charts show the results.





5 (a) The students wanted to collect valid data.

Describe how the students should have sampled the bluebell plants at each habitat to collect valid data.

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(2 marks)

4.7.2.1 Levels of organisation

Question 09 · continued

5 (b) (i) The students used the bar charts to find the mode for the number of flowers per stalk in the two habitats.

The mode for the number of flowers per stalk in habitat **A** was 11.

What was the mode for the number of flowers per stalk in habitat **B**?

Mode = ...

(1 mark)

5 (b) (ii) The students suggested the following hypothesis:

'The difference in the modes is due to the plants receiving different amounts of sunlight.'

Suggest why.

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(2 marks)

5 (b) (iii) Suggest how the students could test their hypothesis for the two habitats.

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(2 marks)

5 (c) Suggest how receiving more sunlight could result in the plants producing more flowers per stalk.

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(2 marks)

9

4.7.2.1 Levels of organisation

Question 10

June 2013 | BL2HP | Original Q2 | Legacy

2 Some students were asked to investigate the distribution of clover in a field of grass. They noticed that the clover grew in patches amongst the grass.

2 (a) The students decided to use quadrats.

Describe how the students should decide where to place the quadrats to investigate the distribution of the clover.

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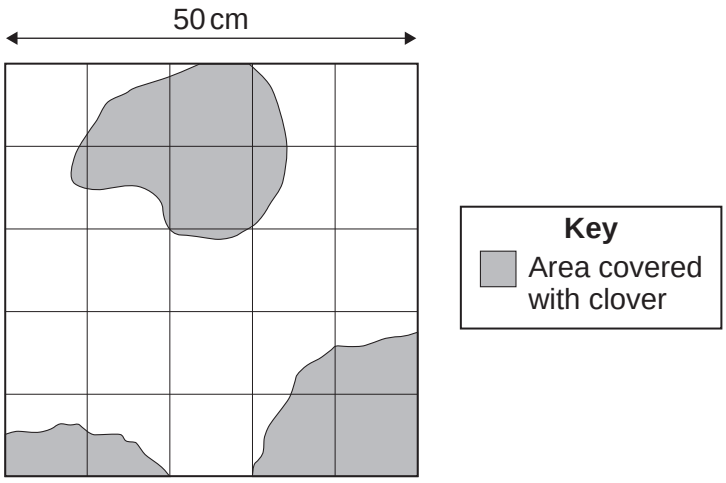
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(2 marks)

2 (b) The diagram shows one of the quadrats the students used.



2 (b) (i) Estimate the number of squares of the quadrat covered with clover.

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Number of squares = ...

(1 mark)

4.7.2.1 Levels of organisation

Question 10 · continued

2 (b) (ii) Describe how you worked out your answer to part **(b)(i)**.

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(1 mark)

2 (b) (iii) Use your answer from part **(b)(i)** to calculate the percentage of the quadrat covered by the clover.

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Answer = ... %

(2 marks)

2 (c) Suggest **one** factor that could account for the distribution of the clover plants.

.....

(1 mark)

7

4.7.2.1 Levels of organisation

Question 11

June 2014 | BL1HP | Original Q1 | Legacy

1 Food chains show the flow of energy through the organisms in a habitat.

1 (a) **Figure 1** shows a food chain.

Figure 1



The biomass in each stage of the food chain changes as food passes along the food chain.

Draw a pyramid of biomass for this food chain.

Label the pyramid.

[2 marks]

4.7.2.1 Levels of organisation

Question 11 · continued

1 (b) **Table 1** shows three food chains, **A**, **B** and **C**.

Table 1

	Food chain
A	plants → sheep → human
B	plants → grasshoppers → frogs → trout → human
C	plants → human

1 (b) (i) In which food chain, **A**, **B** or **C**, will the greatest proportion of biomass and energy of the plants be passed to humans? ☐

[1 mark]

1 (b) (ii) Give reasons why the food chain that you chose in part **(b)(i)** passes on the greatest proportion of biomass and energy to humans.

[3 marks]

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4.7.2.1 Levels of organisation

Question 12

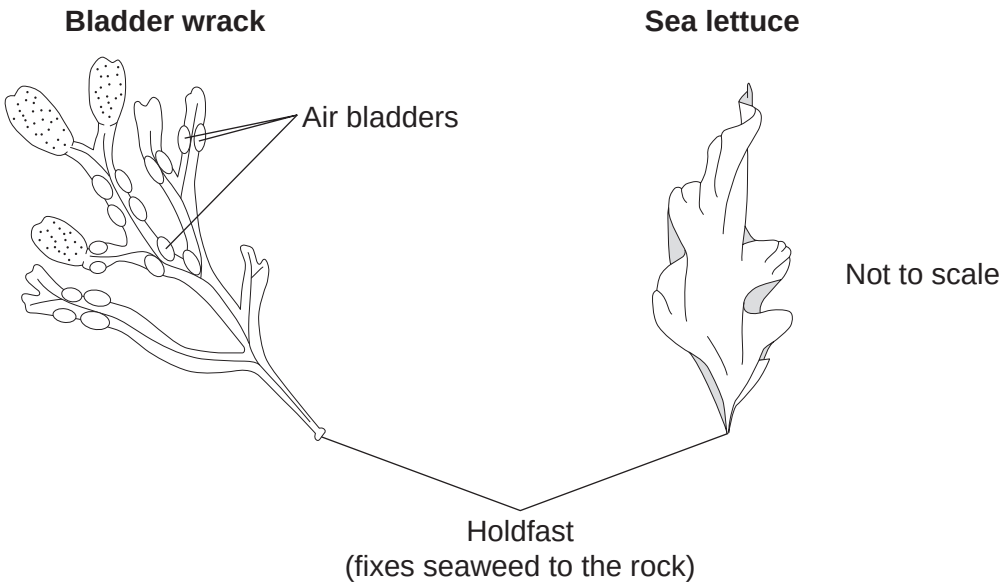
June 2014 | BL2HP | Original Q5 | Legacy

5 At the seashore, the tide comes in and goes out twice each day.

Some students investigated whether two different species of seaweed could live only at certain positions on a rocky shore.
Seaweeds are plant-like organisms that make their food by photosynthesis.

Figure 6 shows the two species of seaweed that the students investigated.

Figure 6



5 (a) The students:

1 placed a 50-metre tape measure on the rocks at right angles to the sea

2 placed a quadrat next to the tape measure

3 recorded whether each species was present or not.

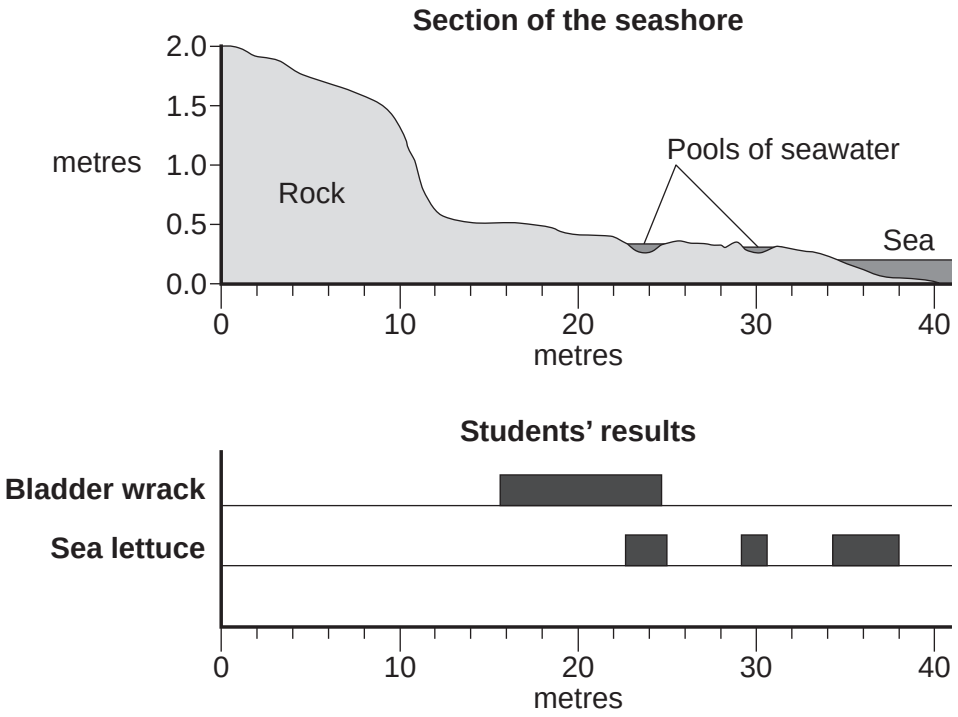
The students repeated steps 2 and 3 every metre down the shore.

Figure 7 shows a section of the seashore and the students' results.

4.7.2.1 Levels of organisation

Question 12 · continued

Figure 7



5 (a) (i) The students placed the quadrat at regular intervals along a transect line rather than placing the quadrat at random positions anywhere on the rocky shore.

Explain why.

[2 marks]

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5 (a) (ii) How could the students have improved their investigation to ensure that they produced valid data?

[2 marks]

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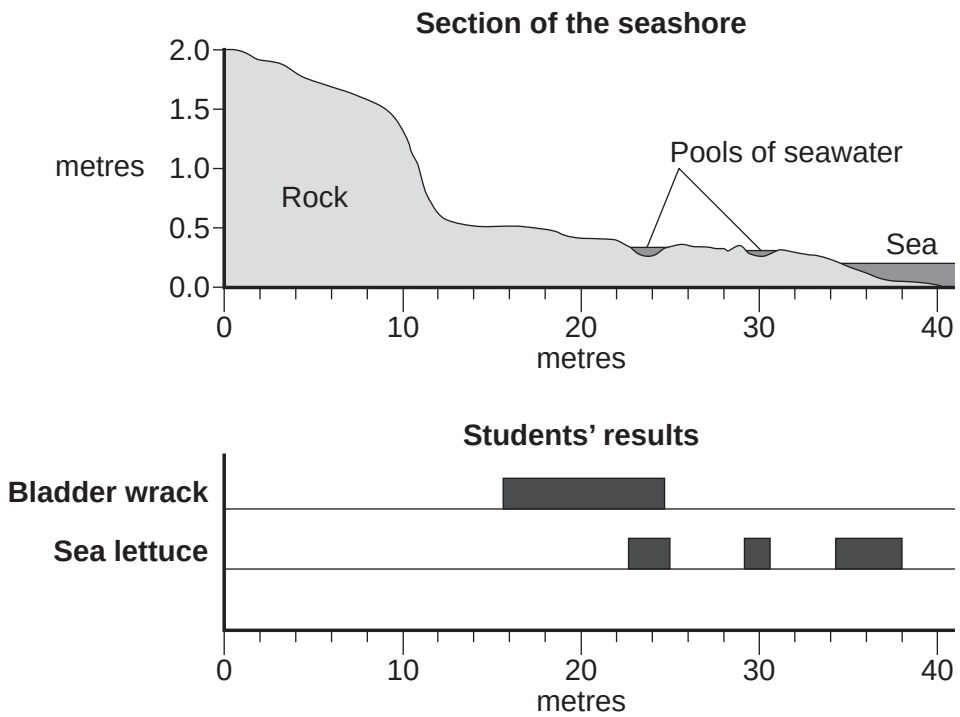
Question 5 continues on the next page

4.7.2.1 Levels of organisation

Question 12 · continued

5 (a) (iii) **Figure 7** is repeated here to help you answer this question.

Figure 7



The students concluded that bladder wrack is better adapted than sea lettuce to survive in dry conditions.

What is the evidence for this conclusion?

Use information from **Figure 7**.

[2 marks]

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4.7.2.1 Levels of organisation

Question 12 · continued

5 (b) The bladder wrack has many air bladders.
The air bladders help the bladder wrack to float upwards when the sea covers it.

Suggest how this helps the bladder wrack to survive.

[2 marks]

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8

Turn over for the next question

4.7.2.1 Levels of organisation

Question 13

June 2016 | BL1HP | Original Q7 | Legacy

7 Students investigated a food chain in a garden.

lettuce → **snail** → **thrush (bird)**

The students:

- estimated the number of lettuce plants in the garden
- estimated the number of snails feeding on the lettuces
- counted two thrushes in the garden in 5 hours.

Table 2 shows the students' results and calculations.

Table 2

Organism	Population size	Mean mass of each organism in g	Biomass of population in g	Biomass from previous organism that is lost in g	Percentage of biomass lost
Lettuce	50	120.0	6000		
Snail	200	2.5	500	5500	91
Thrush	2	85.0	170	330	66

7 (a) (i) Give **two** ways that biomass is lost along a food chain.

[2 marks]

7 (a) (ii) Scientists estimate that about 90% of the biomass in food is lost at each step in a food chain.

Suggest **one** reason why the students' value for the percentage of biomass lost between the snails and the thrushes is only 66%.

[1 mark]

Question 7 continues on the next page

Question 13 · continued

7 (b) European banded snails have shells with different colours (light or dark) and with stripes or with no stripes.

Figure 6 shows two examples of European banded snails.

Figure 6



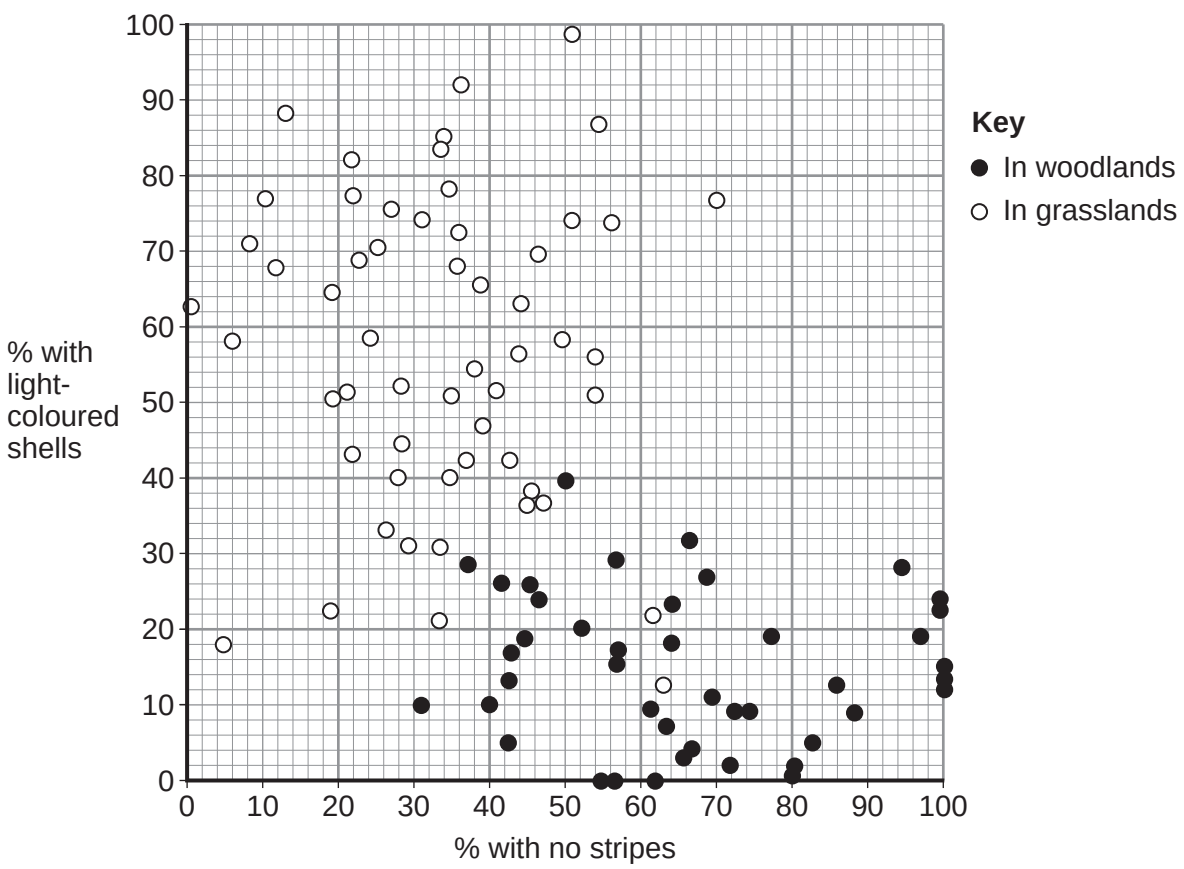
Dark-coloured shell, with stripes

Light-coloured shell, with no stripes

Figure 7 shows results from surveys in woodlands and in grasslands of the percentage of snails with light-coloured shells and the percentage of snails with no stripes.

Each point on **Figure 7** represents the results of one survey in one habitat.

Figure 7



4.7.2.1 Levels of organisation

Question 13 · continued

7 (b) (i) **Figure 7** is a scatter graph.

Why is a scatter graph used for this data?

[1 mark]

7 (b) (ii) Compare the general appearance of snails that live in woodlands with the general appearance of snails that live in grasslands.

[2 marks]

7 (b) (iii) Suggest a reason for the general appearance of snails that live in woodlands.

[1 mark]

7 (c) Snails are **not** used as indicator species as they cannot give us information about pollution levels.

7 (c) (i) Name **one** type of animal that can be used as an indicator species.
State the environmental factor that the animal indicates.

[1 mark]

Indicator species _____

Environmental factor _____

7 (c) (ii) Give **one** different method of measuring the environmental factor you gave in part **(c)(i)**.

[1 mark]

9

4.7.2.1 Levels of organisation

Question 14

June 2016 | BL2HP | Original Q7 | Legacy

7 Some students wanted to estimate the number of plantain plants in a grassy field.

The field measured 100 metres × 50 metres.

The students:
- chose areas where plantains were growing
- placed 10 quadrats in these areas
- counted the number of plantains in each of the 10 quadrats.

Each quadrat measured 25 cm × 25 cm.

Table 1 shows the students' results.

Table 1

Quadrat number	Number of plantain plants
1	2
2	1
3	4
4	1
5	3
6	2
7	4
8	1
9	1
10	1

7 (a) Complete the following calculation to estimate the number of plantain plants in the field.

Use the students' results from **Table 1**.

[3 marks]

Total number of plantains in 10 quadrats = _____

Total area of 10 quadrats = _____ m^2

Mean number of plantains per m^2 = _____

_____

Area of field = _____ m^2

Therefore estimated number of plantains in field = _____

_____

4.7.2.1 Levels of organisation

Question 14 · continued

7 (b) The students' method would **not** give a valid estimate of the number of plantain plants in the field.

Describe **three** improvements you could make to the students' method.

For each improvement, give the reason why your method would produce more valid results than the students' method.

[3 marks]

Improvement 1 _____

Reason _____

_____

Improvement 2 _____

Reason _____

_____

Improvement 3 _____

Reason _____

_____

6

4.7.2.1 Levels of organisation

Question 15

June 2017 | BL2HP | Original Q2 | Legacy

2 **In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.**

Figure 2 shows part of a plant called cross-leaved heath.

Figure 2



A student noticed that some areas of marshland contained cross-leaved heath plants and some areas did not.

The student made the following hypothesis:

'Soil pH affects the amount of cross-leaved heath plants that grow in an area.'

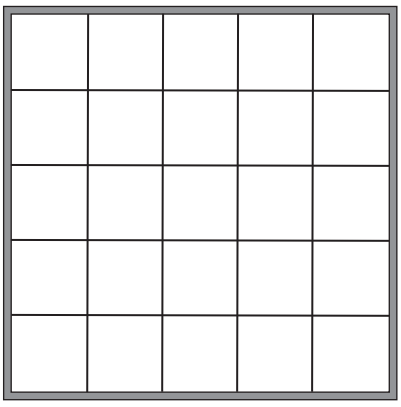
How could the student use apparatus, including the quadrat and pH meter shown in **Figure 3**, to find the range of pHs where the cross-leaved heath plants grew best?

You should include details of how the student could make sure the results are valid.

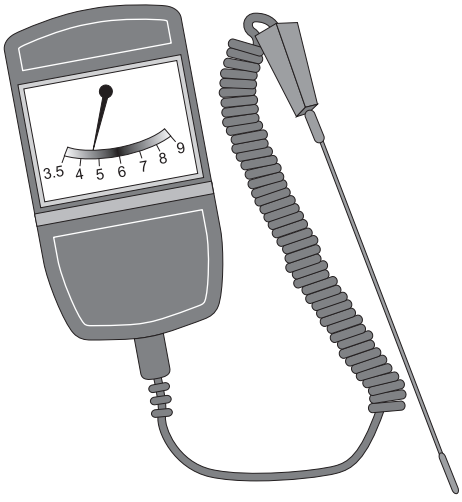
[6 marks]

Figure 3

1 m x 1 m quadrat



Soil pH meter



Not to scale

4.7.2.1 Levels of organisation

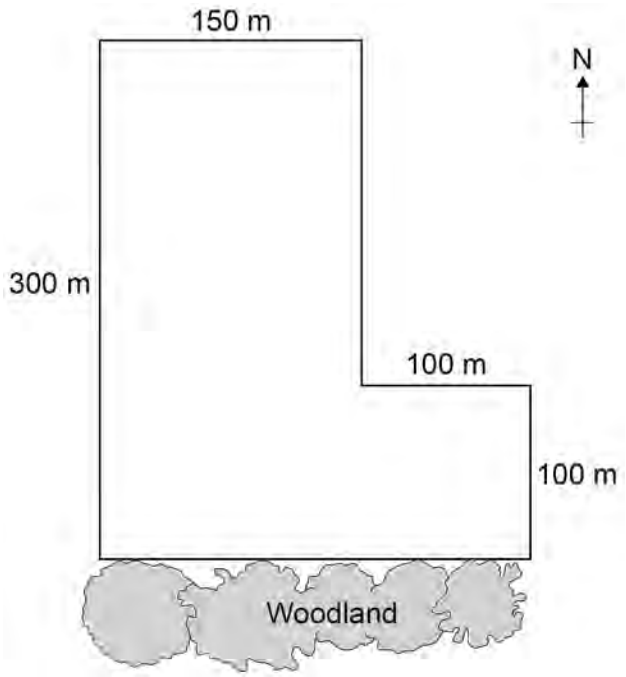
Question 16

June 2018 | 8461/2H | Original Q4

0 4 Some students investigated the size of a population of dandelion plants in a field.

Figure 5 shows the field.

Figure 5



The students:

- placed a 1 m x 1 m square quadrat at 10 random positions in the field
- counted the number of dandelion plants in each quadrat.

Table 2 shows the students' results.

Table 2

Quadrat number	Number of dandelion plants
1	6
2	9
3	5
4	8
5	0
6	10
7	2
8	1
9	8
10	11

4.7.2.1 Levels of organisation

Question 16 · continued

0 4 . 1 Why did the students place the quadrats at random positions?

[1 mark]

0 4 . 2 Estimate the total number of dandelion plants in the field.

Calculate your answer using information from **Figure 5** and **Table 2**.

Give your answer in standard form.

[5 marks]

Total number of dandelion plants = _____

Question 4 continues on the next page

4.7.2.1 Levels of organisation

Question 16 · continued

Quadrats **5**, **7** and **8** were each placed less than 10 metres from the woodland.

These quadrats contained low numbers of dandelion plants.

The students made the hypothesis:

‘Light intensity affects the number of dandelion plants that grow in an area.’

0 4 . 3 Plan an investigation to test this hypothesis.

[6 marks]

4.7.2.1 Levels of organisation

Question 16 · continued

0 4 . 4 Light is an environmental factor that affects the growth of dandelion plants.

Give **two** other environmental factors that affect the growth of dandelion plants.

[2 marks]

1 _____

2 _____

14

Turn over for the next question

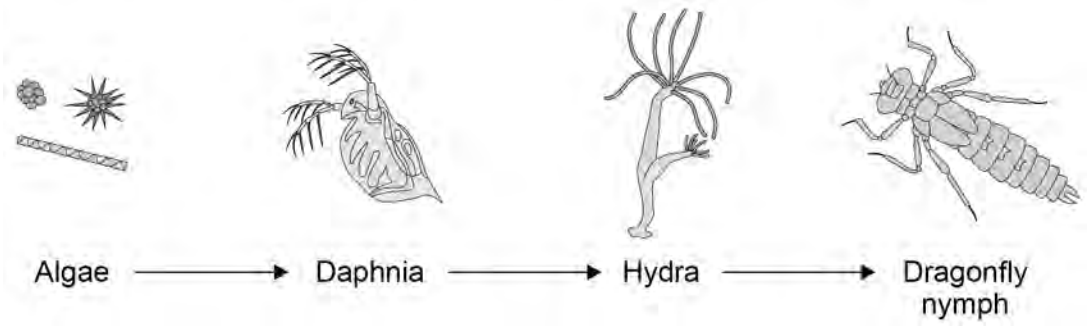
4.7.2.1 Levels of organisation

Question 17

June 2019 | 8461/2H | Original Q1

0 1 **Figure 1** shows a food chain in a pond.

Figure 1



0 1 . 1 Which term describes the Daphnia in this food chain?

[1 mark]

Tick (✓) **one** box.

- Apex predator ☐
- Primary consumer ☐
- Producer ☐
- Secondary consumer ☐

4.7.2.1 Levels of organisation

Question 17 · continued

0 1 . 2 Draw a pyramid of biomass for the food chain.

Label each trophic level.

[2 marks]

0 1 . 3 Give **one** reason why the total biomass of the Daphnia in the pond is different from the total biomass of the algae.

[1 mark]

_____

_____

Question 1 continues on the next page

Question 17 · continued

Students investigated the size of the population of Daphnia in the pond.

This is the method used.

1. Collect 1 dm^3 of pond water from near the edge of the pond.
2. Pour the water through a fine net.
3. Count the number of Daphnia caught in the net.
4. Repeat steps 1–3 four more times.

Table 1 shows the results.

Table 1

Sample number	Number of Daphnia in 1 dm^3 water
1	5
2	21
3	0
4	16
5	28

0 1 . 4 Calculate the mean number of Daphnia in 1 m^3 of pond water.

1 m^3 = 1000 dm^3

[2 marks]

Mean number of Daphnia in 1 m^3 of pond water = _____

4.7.2.1 Levels of organisation

Question 17 · continued

0 1 . 5 The pond was a rectangular shape, measuring:

- length = 2.5 metres
- width = 1.5 metres
- depth = 0.5 metres.

Calculate the estimated number of Daphnia in the pond.

Use your answer from Question **01.4**.

Give your answer in standard form.

[4 marks]

Number of Daphnia in the pond = _____

Question 1 continues on the next page

Question 17 · continued

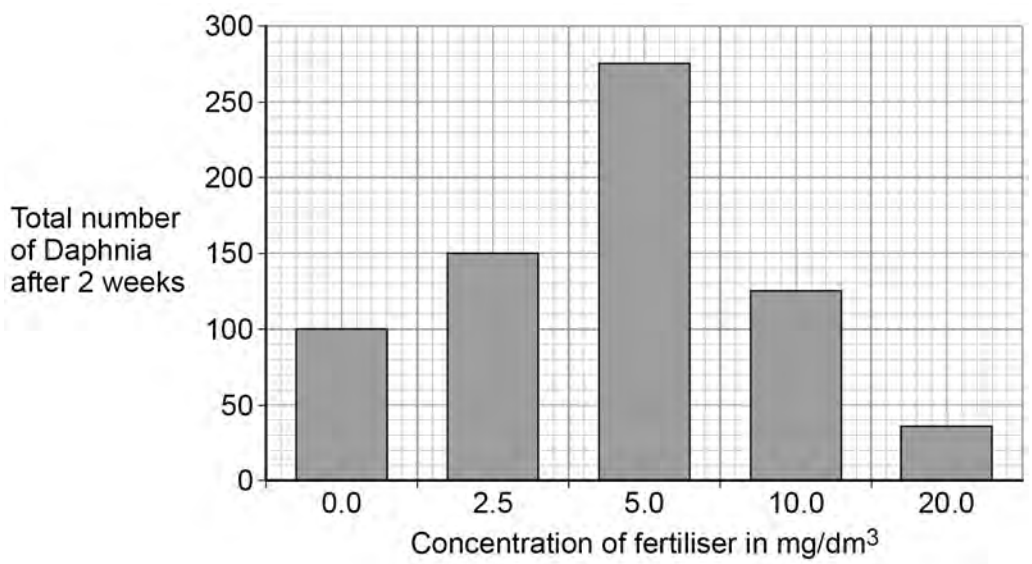
Rainfall can cause fertiliser to be washed from farmland into a pond.

The students investigated the effect of fertiliser on the population of Daphnia in water from the pond.

- The students put 20 Daphnia in each of five different concentrations of fertiliser.
- The students counted the total number of Daphnia in each concentration of fertiliser after 2 weeks.

Figure 2 shows the results.

Figure 2



0 1 . 6 A concentration of 5.0 mg/dm^3 of fertiliser caused a large increase in the population of Daphnia.

Explain why.

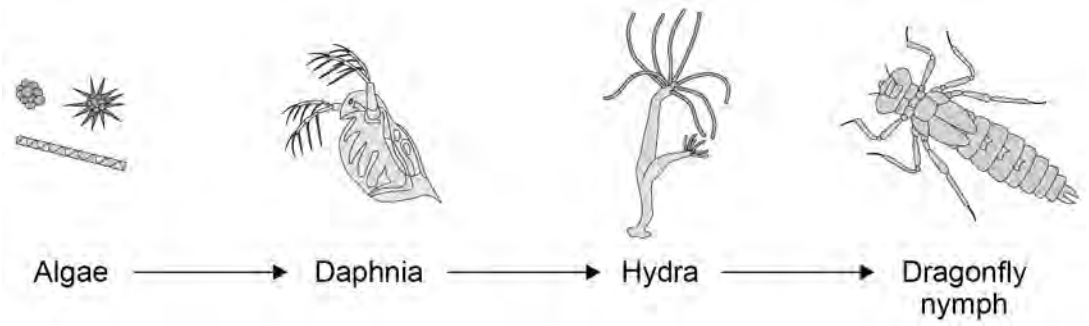
[2 marks]

4.7.2.1 Levels of organisation

Question 17 · continued

0 1 . 7 **Figure 1** is repeated below.

Figure 1



The population of **Hydra** will decrease when 20 mg/dm^3 of fertiliser is added to the pond.

Explain why.

[2 marks]

14

4.7.2.1 Levels of organisation

Question 18

November 2021 | 8461/2H | Original Q5

0 5 The growth of daisy plants on a lawn is affected by biotic factors and by abiotic factors.

0 5 . 1 **Table 2** shows six factors.

Tick (✓) **one** box in each row to show whether the factor is biotic or abiotic.

[3 marks]

Table 2

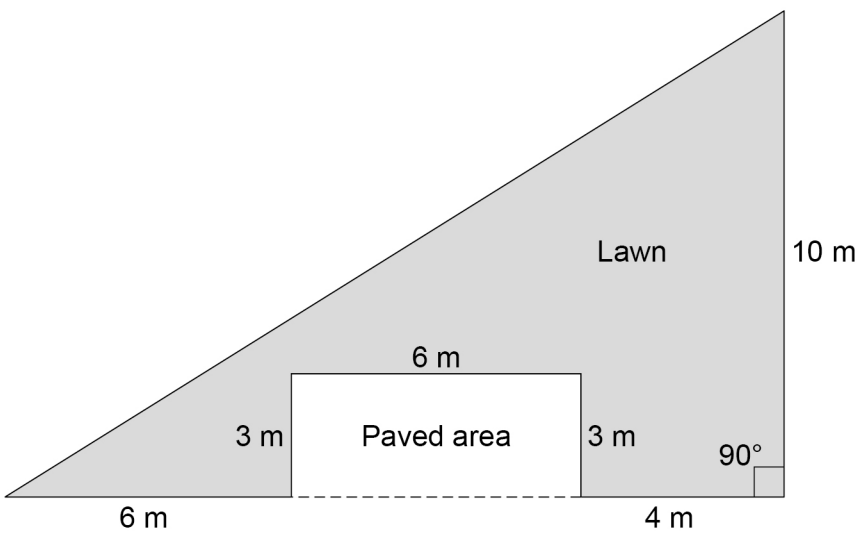
Factor	Biotic	Abiotic
Nitrates in the soil		
Rabbits eating the plants		
Shading by a building		
Soil pH		
Temperature		
Trampling by people		

Question 5 continues on the next page

Question 18 · continued

Figure 8 shows a plan of a garden.

Figure 8



A student estimates the number of daisy plants growing on the lawn.

The student places a quadrat at 10 different positions on the lawn.

The quadrat measures 50 cm × 50 cm.

The student counts the number of daisy plants in each quadrat.

0 5 . 2 How should the student decide where to place the quadrat?

Give the reason for your answer.

[2 marks]

4.7.2.1 Levels of organisation

Question 18 · continued

0 5 . 3 The mean number of daisy plants in each quadrat is 6.

Calculate the number of daisy plants on the lawn.

Give your answer to 3 significant figures.

[6 marks]

Number of daisy plants on the lawn = _____

0 5 . 4 Using the mean from this investigation to calculate the number of daisy plants on the lawn may **not** be accurate.

Give **two** reasons why.

[2 marks]

1 _____

2 _____

13

4.7.2.1 Levels of organisation

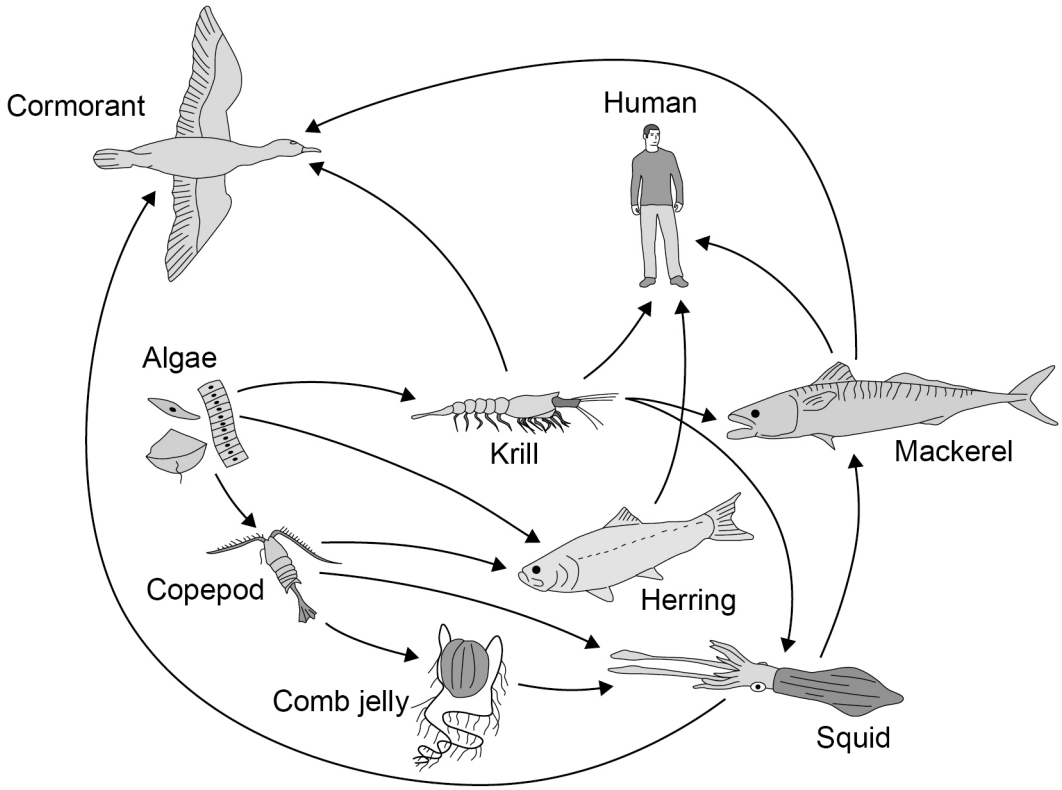
Question 19

November 2021 | 8461/2H | Original Q7

0 7 A food web contains several food chains.

Figure 9 shows a food web.

Figure 9



0 7 . 1 The animals in **Figure 9** get their energy by eating other organisms.

Describe how the algae get energy.

[2 marks]

0 7 . 2 Name **one** primary consumer in **Figure 9**.

[1 mark]

4.7.2.1 Levels of organisation

Question 19 · continued

0 7 . 3 Name **one** producer in **Figure 9**.

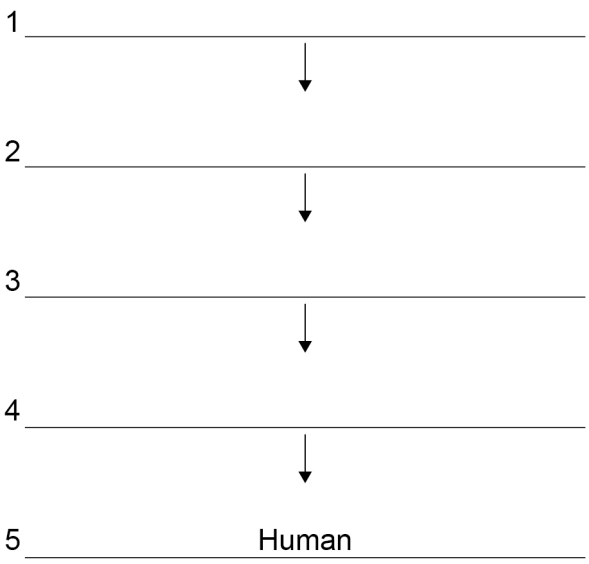
[1 mark]

0 7 . 4 The different food chains in **Figure 9** have different numbers of organisms.

Complete **Figure 10** to show a food chain in **Figure 9** with **five** organisms, including the human.

[1 mark]

Figure 10



0 7 . 5 **Figure 9** shows that mackerel eat krill and squid.

The biomass of mackerel is much less than the combined biomass of krill and squid.

One reason for this is that the mackerel cannot digest all parts of the krill and squid.

Give **two** other reasons.

[2 marks]

1

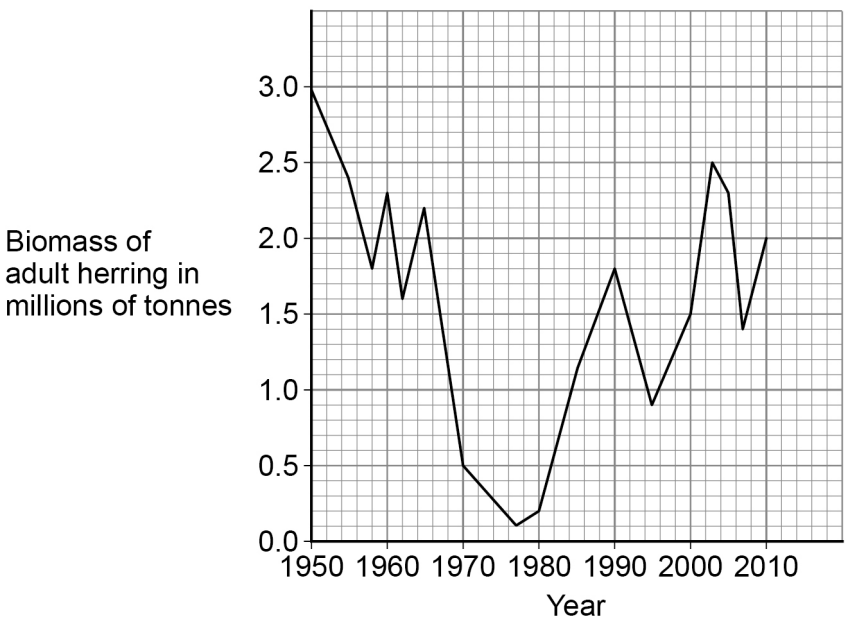
2

4.7.2.1 Levels of organisation

Question 19 · continued

Figure 11 shows how the biomass of adult herring in the North Sea has changed between 1950 and 2010.

Figure 11



0 7 . 6 Calculate the percentage decrease in the biomass of herring between 1960 and 1977.

Give your answer to the nearest whole number.

[4 marks]

Percentage decrease = _____ %

Question 19 · continued

0 7 . 7 Too many herring were caught by fishermen between 1960 and 1977.

Herring can live for up to 12 years and begin to reproduce when 3 to 4 years old.

Laws have been introduced to help conserve herring:

- 1977 to 1981 – herring fishing was banned in the North Sea
- 1984 to present day – control of mesh size of fishing nets
- 1997 to present day – fishing quotas were introduced
- 1998 to present day – herring fishing was banned in breeding grounds during the breeding season.

Figure 12 shows how a minimum mesh size helps to conserve herring.

Figure 12

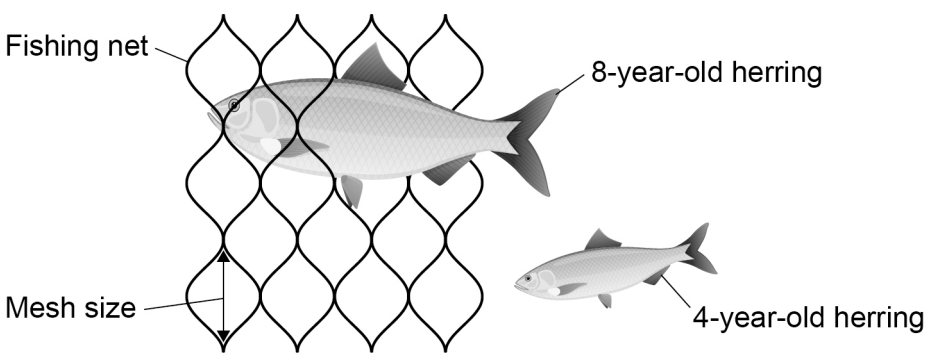
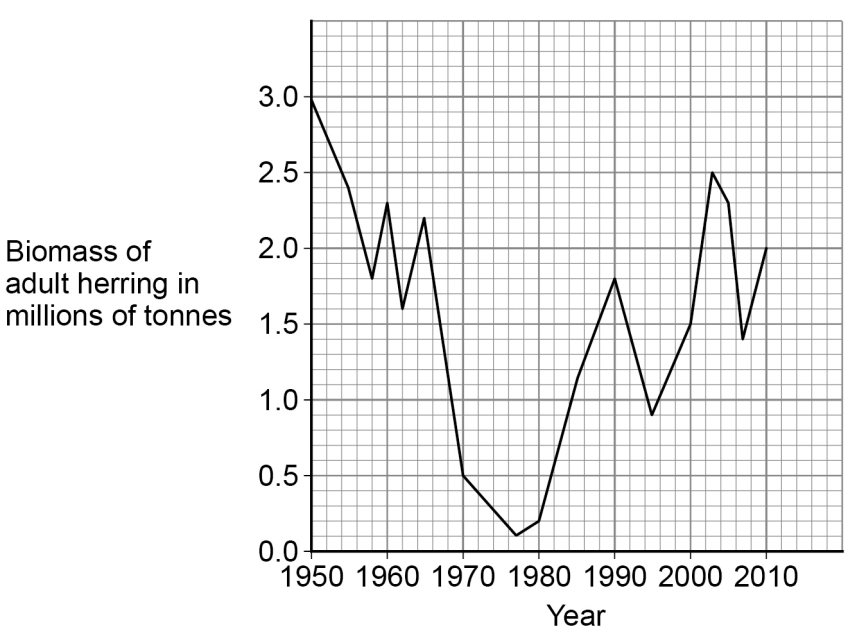


Figure 11 is repeated below.

Figure 11



4.7.2.1 Levels of organisation

Question 19 · continued

Evaluate the effect of these laws on the conservation of herring stocks.

Use data from **Figure 11** and information from **Figure 12** in your answer.

[6 marks]

17

4.7.2.1 Levels of organisation

Question 20

June 2024 | 8461/2H | Original Q3

0 3 Frogs are animals that lay their eggs in water. The eggs hatch as tadpoles.

Students investigated the number of tadpoles in a pond for 8 weeks.

This is the method used.

1. Collect 10 dm^3 of pond water in a bucket.
2. Count the number of tadpoles collected.
3. Put the tadpoles back into the pond.
4. Repeat steps 1 to 3 another three times in different parts of the pond.
5. Repeat steps 1 to 4 at intervals for 8 weeks.

0 3 . 1 Suggest **one** improvement to the method.

[1 mark]

Question 3 continues on the next page

Question 20 · continued

Table 1 shows the results.

Table 1

Sample number	Number of tadpoles in each sample					
	0 weeks	1 week	2 weeks	3 weeks	5 weeks	8 weeks
1	11	17	8	9	5	0
2	15	11	12	7	0	5
3	23	16	14	10	7	3
4	11	14	16	**X**	4	4
Totals	60	58	50	32	16	12

0 3 . 2 Value **X** is the number of tadpoles in sample 4, at 3 weeks.

Calculate value **X**.

[1 mark]

Value **X** = _____

4.7.2.1 Levels of organisation

Question 20 · continued

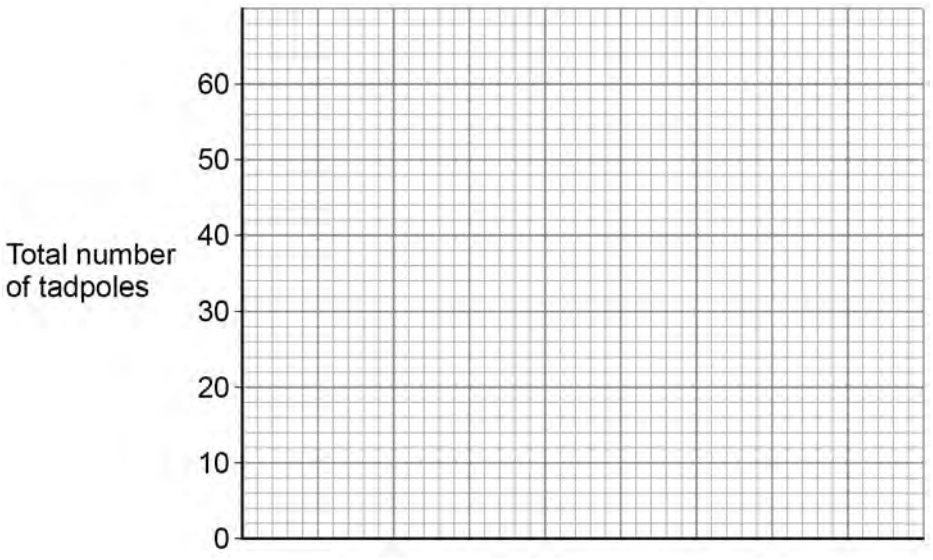
0 3 . 3 Complete **Figure 4** to show how the **total** number of tadpoles changed over the 8 weeks.

[4 marks]

You should:

- label the x-axis
- use a suitable scale for the x-axis
- plot the data for the **total** numbers of tadpoles from **Table 1**
- draw a line of best fit.

Figure 4



0 3 . 4 After 0 weeks, no more tadpoles hatched in the pond.

Calculate the percentage of the tadpoles that would still be found in the pond at 4 weeks compared with 0 weeks.

Use information from **Figure 4**.

[3 marks]

Percentage of tadpoles found at 4 weeks = _____ %

4.7.2.1 Levels of organisation

Question 20 · continued

0 3 . 5 After 4 weeks many of the tadpoles had died.

Suggest **two** reasons why the tadpoles died.

[2 marks]

1 _____

_____

2 _____

_____

11

4.7.2.1 Levels of organisation

Question 21

June 2025 | 8461/2H | Original Q2

0 2 Students investigated how many daisy plants were growing in a field at different distances from a tree.

This is the method used.

1. Place a 20-metre tape measure on the ground, with the tree at 0 metres.

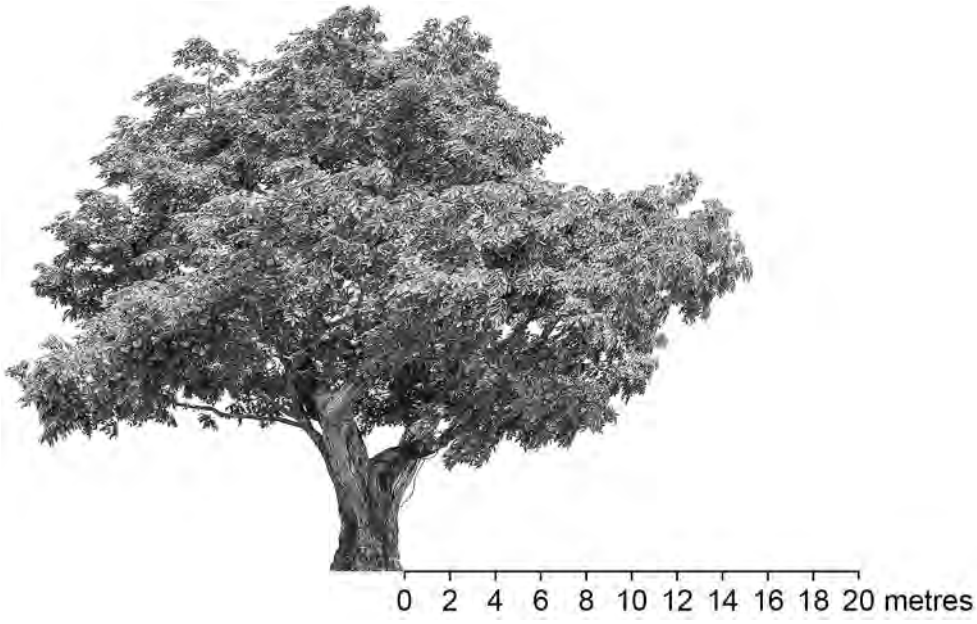
2. Place a 1 m^2 quadrat on the ground every 4 metres along the tape measure.

3. Count the number of daisy plants in each quadrat.

4. Take a soil sample from each quadrat to find the percentage of water in the soil.

Figure 2 shows the tree and the tape measure.

Figure 2



This is the method used for finding the percentage of water in each soil sample (step 4):

5. Weigh an empty container.

6. Place the soil sample in the container and weigh again.

7. Heat the container of soil in an oven at 100 °C for several hours.

8. Allow the container of soil to cool and weigh again.

9. Repeat steps 7 and 8 until there is no further change in mass.

4.7.2.1 Levels of organisation

Question 21 · continued

0 2 . 1 Suggest why the students repeated steps **7** and **8** until there was no further change in mass.

[1 mark]

Question 2 continues on the next page

Question 21 · continued

Table 2 shows the results.

Table 2

	Distance from the tree in metres				
	4	**8**	**12**	**16**	**20**
Mass of fresh soil in grams	250	266	260	248	252
Mass of dried soil in grams	225	234	209	184	181
Mass of water lost from soil in grams	25	32	51	64	71
Percentage of water in soil	10	12	20	26	**X**
Number of daisies per m^2	0	7	15	28	32

0 2 . 2 Calculate percentage **X** in **Table 2**.

Give your answer to the nearest whole number.

[3 marks]

Percentage **X** (nearest whole number) = _____ %

0 2 . 3 Describe the effect of distance from the tree on the percentage of water in the soil between 4 metres and 16 metres.

Use **Table 2**.

[1 mark]

4.7.2.1 Levels of organisation

Question 21 · continued

0 2 . 4 A student concluded:

‘As the water content of the soil increases, so does the number of daisy plants.’

Describe **two** changes to the investigation that would increase the validity of the student’s conclusion.

[2 marks]

1 _____

_____

2 _____

_____

0 2 . 5 The percentage of water in the soil is an abiotic factor.

Suggest **three** other **abiotic** factors that might have caused more daisy plants to grow further away from the tree.

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

[3 marks]

1 _____

_____

2 _____

_____

3 _____

_____

10