

Q1. (June 2019)

- 14** A student estimates the number of snails in a pond. Part of his method involves collecting snails and marking them.

What is the name of the method he is using?

- A** Aseptic technique
- B** Capture-recapture
- C** Percentage increase
- D** Scaling-up

Your answer

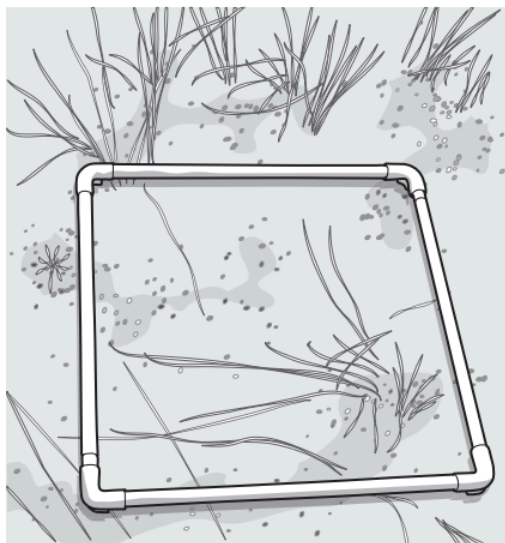
[1]

Q2. (June 2019)

- (b)** Student **A** and student **B** study the plants growing on a salt marsh.

They both sample the plants present by laying out two tape measures at right angles across the salt marsh.

They then place a square frame on the ground in different places and count the number of plants in the square, as shown below.

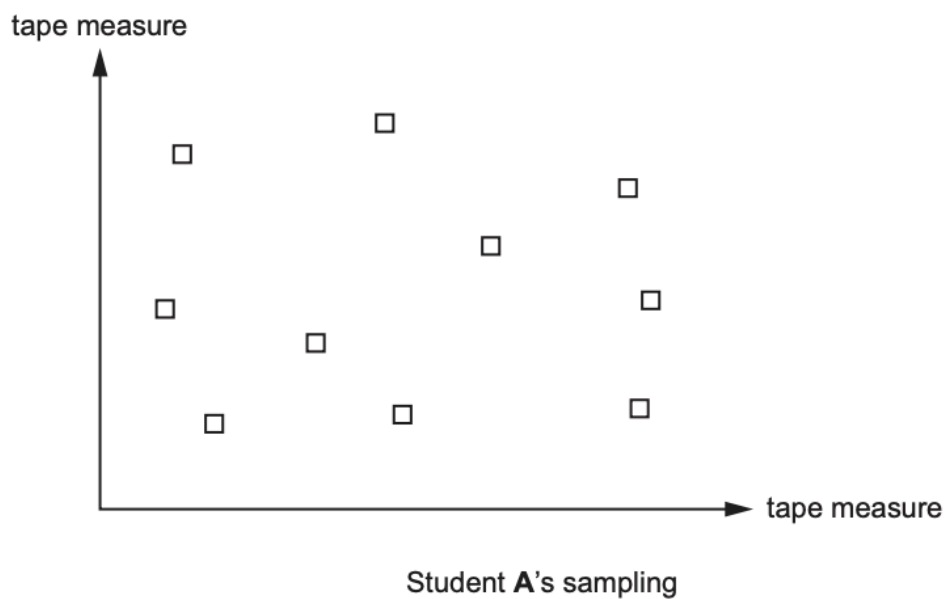
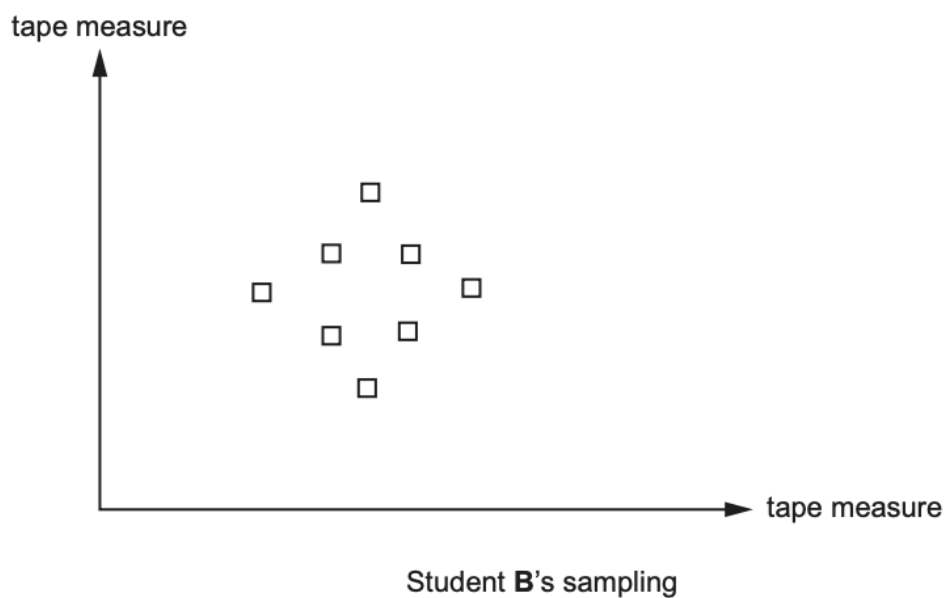


What is the name of the square frame that they use to sample the plants?

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Q3. (June 2019)

- (c) The diagrams show the position of each student's samples across the salt marsh. Each small square in the diagrams represents one sample.



- (i) The whole salt marsh has an area of 2500 m^2 .

Each square frame has an area of 0.25 m^2 .

Calculate the percentage of the whole salt marsh that was sampled by student A.

- (ii) Look at the two students' sampling shown in the diagrams.

Explain which student is likely to get the most accurate estimate for the number of plants in the salt marsh.

student

explanation

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- (iii) Their teacher said that they should take care as there may be harmful bacteria in the salt marsh.

State **two** things that the students could do to reduce the risk of infection from the harmful bacteria.

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[2]

Explain why. Use ideas about land use and biodiversity in your answer.

..... [6]

Q5. (June 2019)

(b) Great tits and flycatchers are both birds.

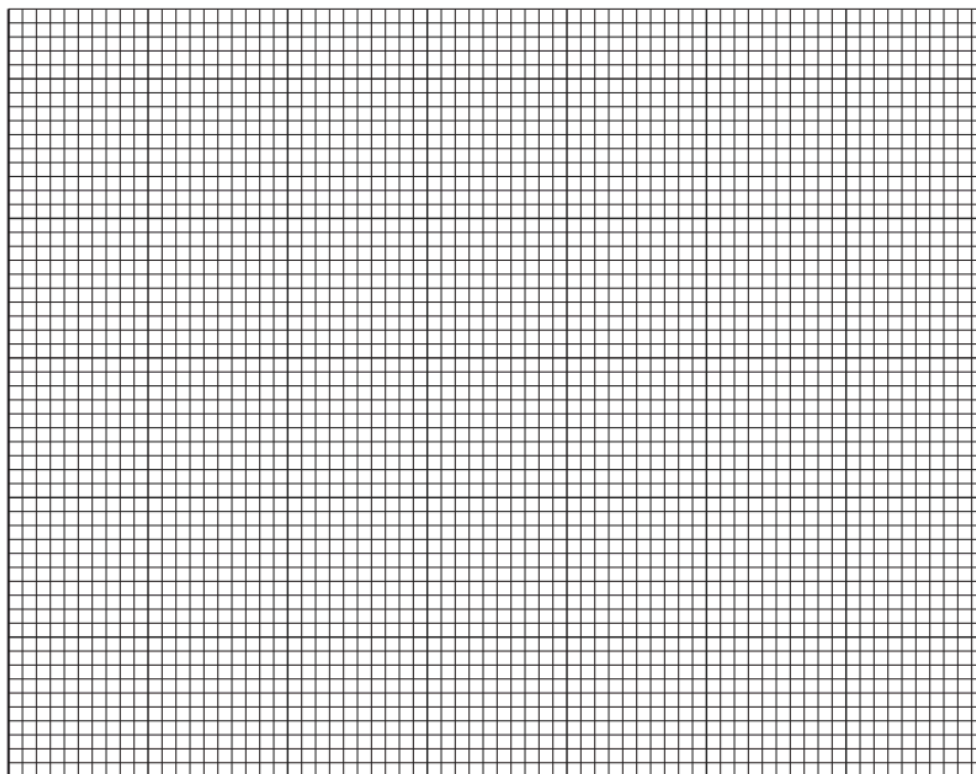
In a conservation project, scientists have built boxes for the birds to nest in. The scientists fixed the boxes on trees at different heights.

The table shows how many birds of each type used the boxes for nesting.

Height of bird box above the ground (m)	Number of bird boxes used	
	By great tits	By flycatchers
1	1	6
2	7	5
4	10	6

(i) Draw a **bar chart** on the graph paper to show the scientists' results.

The results for great tits and flycatchers should be on the same axis.



(ii) The food web shows:

- Weasels feed on great tits
- Pine martens feed on flycatchers.

Weasels live on the ground but pine martens live in trees.

How can this be used to explain the results of the scientists' investigation?

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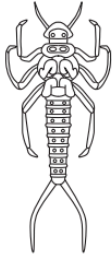
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Q6. (June 2022)

- 4 A student finds this organism in a pond:



The student uses this key to identify the organism.

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|---|---------------------------------|-------------------|
| 1 | 3 pairs of legs | go to 3 |
| | more than 3 pairs of legs | go to 2 |
| 2 | curved body | freshwater shrimp |
| | straight body | water-louse |
| 3 | tail parts | go to 4 |
| | no tail parts | water-boatman |
| 4 | 2 tail parts | stonefly nymph |
| | 3 tail parts | mayfly nymph |

What is the name of the organism?

- A Freshwater shrimp
- B Mayfly nymph
- C Stonefly nymph
- D Water-louse

Your answer

[1]

- 13 The table shows the number of insects caught using a net on different days in a week.

Day	M	Tu	W	Th	F	S	Su
Number of insects	6	8	5	4	8	9	2

What is the median and mode of the number of insects caught in **one** day?

- A Median = 6 Mode = 8
B Median = 6 Mode = 6
C Median = 8 Mode = 8
D Median = 8 Mode = 6

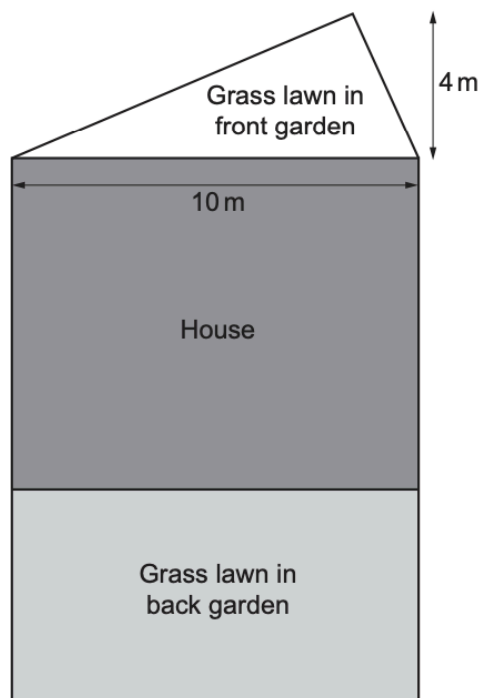
Your answer

[1]

Q8. (June 2022)

- 22** A gardener grows thistle plants as weeds in his grass lawns. He wants to see if thistle plants grow better in the front garden than in the back garden.

The diagram shows a plan of the grass lawns in each garden.



- (a) The gardener estimates the number of thistle plants in each metre squared of the **back** garden. He gets an estimate of 2.5 thistle plants/m².

Describe an experimental method the gardener uses to get this estimate.

Include the name of the piece of apparatus he uses.

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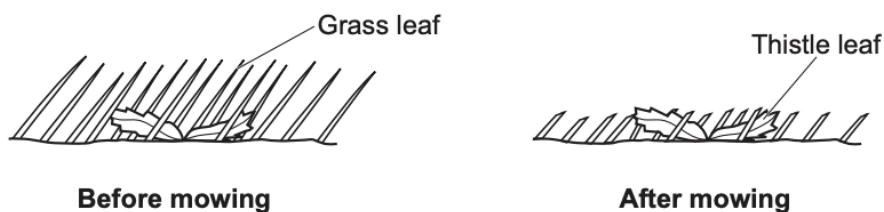
- (b) The **front** garden is smaller so he counts all the thistle plants growing in the lawn. He counts 36 plants.

Calculate the number of thistle plants per metre squared in the front garden.
Use the formula: area of a triangle = $\frac{1}{2} \times \text{base} \times \text{height}$

Number of thistles = /m² [2]

- (c) The gardener cuts the grass more often in the back garden. He thinks thistles grow better when he mows the grass more often.

The diagram shows the grass lawns before and after he has mown them.



Explain how cutting the grass more often can affect how well the thistles grow.

Use ideas about competition and photosynthesis.

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- 9 Ecotourism can cause benefits and problems for conservation.

Which row gives a benefit and a problem caused by ecotourism?

	Benefit	Problem
A	educates people about conservation	brings money into the local economy
B	brings money into the local economy	tourists can cause pollution and damage
C	tourists can cause pollution and damage	educates people about conservation
D	brings money into the local economy	educates people about conservation

Your answer

[1]

Q10. (June 2023)

- 13 Which statement describes why seeds from seedbanks are an important tool in conservation?

- A If there is a food shortage then the seeds can be used for food.
- B The seeds can be used if certain species of plants become extinct.
- C The seeds can be used to feed endangered animals.
- D The seeds grow fast as the temperature is warm inside the seedbank.

Your answer

[1]

Q11. (June 2023)

- 19 (a) Describe how scientists could estimate the number of one type of **plant** in a habitat.

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..... [3]

(b)*

Buddleia, a pest or a friend?



Many people grow buddleia bushes in their gardens.

Buddleia flowers attract butterflies that feed on nectar. Birds and bats feed on butterflies. Foxes and badgers can live under the cover of the bushes.

Buddleia bushes spread and grow very quickly. In some areas this has caused the numbers of other plants to decrease.

In these areas, scientists have seen large numbers of butterflies. However, they only see the more common types of butterflies and not rare ones.

Use information from the passage to explain these different opinions about buddleia.

- interdependence
- competition
- biodiversity.

[6]

Q12. (June 2023)

- (b) A student investigates the effect of acid rain on the reproduction rate of duckweed.

This is the student's method:

- Put pondwater with a pH of 4.5 in four different beakers.
- Add five duckweed plants to each beaker.
- Repeat this with beakers containing pondwater at pH 6.5 and 8.5.
- Leave the beakers for 10 days in the same conditions.
- After 10 days count how many duckweed plants are in each beaker.

The table shows the student's results.

pH of pondwater	Number of duckweed plants after 10 days				
	Beaker 1	Beaker 2	Beaker 3	Beaker 4	mean
4.5	6	5	7	6	6
6.5	12	14	11	11	12
8.5	7	6	5	14	8

- (i) What is the **independent** variable in this investigation?

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- (ii) Identify the **pH** of the pondwater where the mean number of duckweed plants is the same as the mode for the four beakers.

Tick (✓) **one** box.

4.5	☐
6.5	☐
8.5	☐

[1]

- (iii) The student thinks that there is a problem with their data at pH8.5. This resulted in the mean being inaccurate.

Explain how the student could improve their investigation to get a more accurate result for the mean.

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- (iv) The student concluded that acid pollution slows the rate of duckweed reproduction.

Explain how acid pollution slows the rate of duckweed reproduction.

Use ideas about enzymes and photosynthesis in your answer.

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- (v) The student also concluded that pH6.5 is the best pH for duckweed reproduction.

The student's teacher says that they need to extend the experiment to be sure of this.

Describe how the student should extend their experiment.

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- 21** The number of elephants living in Africa is decreasing. They are often killed by hunters.

The table shows estimates for the number of elephants in Africa.

Year	1979	1989	2015
Number of elephants	1.3 million	600 000	400 000

(a)

- (i)** Calculate how many times more elephants there were in 1979 compared to in 2015.

Answer = **[2]**

- (ii)** Suggest **two** reasons why it is difficult for scientists to give an accurate estimate for the number of elephants living in Africa.

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[2]

- (b)** Elephants are very important for ecotourism in southern Africa.

Explain how ecotourism benefits the elephants and the local people.

Elephants benefit from ecotourism because

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Local people benefit from ecotourism because

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[2]

- (e) By 1973 the St Lucia racers were thought to be extinct but a small number were found on a small island off the coast of St Lucia.

There was a plan to build a bridge to allow tourists to visit the island.

- (i) Suggest why these snakes have survived on the island.

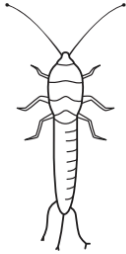
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- (ii) Suggest why scientists are against the plan to build the bridge.

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Q15. (June 2025)

- 6 Some students want to identify an insect that they found.



They use this key to identify the insect.

1. Does it have wings?	Yes – go to 2 No – go to 3
2. Does it have two pairs of wings?	Yes – shield bug No – lacewing
3. Does it have three projections from the end of its body?	Yes – silverfish No – springtail

What is the name of the insect that the students found?

- A Lacewing
- B Shield bug
- C Silverfish
- D Springtail

Your answer

[1]

Q16. (June 2025)

- 7 Ecotourism can be useful in helping to protect ecosystems.

What is a possible **disadvantage** of ecotourism?

- A More money is made available for conservation projects.
- B More people visiting the area will produce more rubbish.
- C More people will be made aware of the importance of conservation.
- D There will be more jobs for local people.

Your answer

[1]

Q17. (June 2025)

- (v) Describe **one** way that burning large amounts of surplus food can damage ecosystems.

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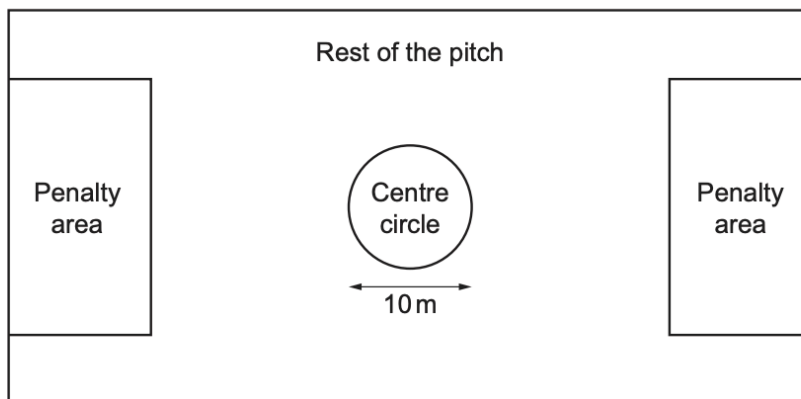
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Q18. (June 2025)

- 23** Some students investigate the number of dandelion plants growing in three different parts of a football pitch.



- (a) The students sample the pitch to find the mean number of dandelion plants per m^2 in each part.

Explain how the students use a quadrat to find the mean number of dandelion plants per m^2 in a part of the pitch.

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(b) The table shows some of the students' results.

Part of the pitch	Area (m ²)	Mean number of dandelions per m ²	Total number of dandelions
Both penalty areas	1300	4.0	5200
Centre circle		3.0	
Rest of the pitch	5500	2.0	11 000

Calculate the area of the centre circle and the total number of dandelions in the centre circle.

Use the equation: area of a circle = πr^2

Use $\pi = 3.14$

Write your answers in the table.

[3]

(c) The students write a conclusion for their experiment.

Complete the students' conclusion.

Use words from the list.

community	compete	differently	efficiently	equally
habitat	mutate	population	respire	

The football pitch contains a of different plant species, mainly grass and dandelions.

The part of the pitch that has the most players running on it has the most dandelions.

This is because it is more difficult for plants to grow there.

The dandelions successfully with the grass in these areas.

We can only make this conclusion if abiotic factors affect each area

[3]

- (d) Describe how the pupils could extend their experiment to show that soil pH was the same in each part of the pitch.

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Q19. (Nov 2020)

- 5 Seedbanks store many types of seed for long periods of time.

Why were seedbanks set up?

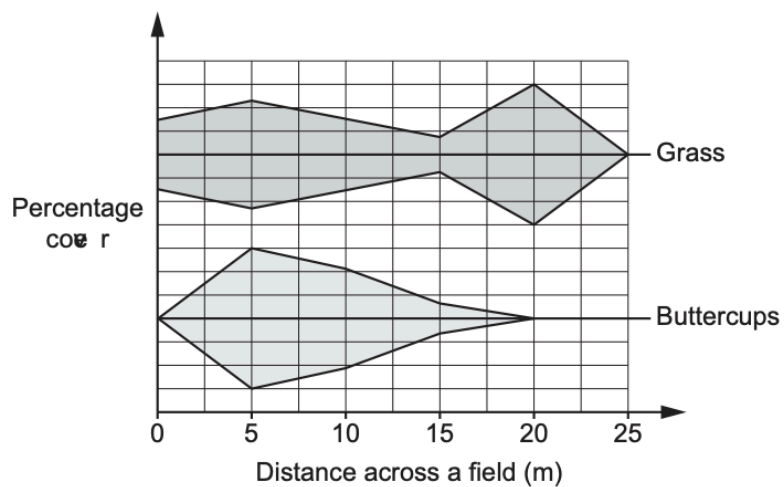
- A To act as a store of biodiversity.
- B To be used to feed animals if food is short.
- C To store pathogens for future use.
- D To supply seeds to farmers at a cheaper cost.

Your answer

[1]

Q20. (Nov 2020)

- 15 A group of students collected some measurements from a field. They plotted the measurements on this graph.



Which technique have the students used to collect the data?

- A Capture-recapture
- B Random quadrats
- C Scaling up
- D Transect line with quadrats

Your answer

[1]

Q21. (Nov 2020)

18 Fig. 18.1 shows a drawing of a very small insect that feeds on the leaves of pine trees.



Fig. 18.1

Scientists can estimate the number of insects on a tree using capture-recapture.

First, they collect some insects from the tree.

Fig. 18.2 shows the equipment they use.

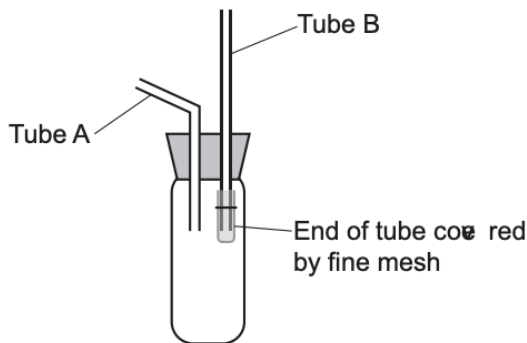


Fig. 18.2

(a) Give the **name of the equipment** and **explain how** the scientists would use it to collect insects.

Name of equipment

How it is used

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- (b)** The scientists capture 25 insects from the tree and then mark them. This is their first sample.

They then release the insects and sample the tree again two days later. In this second sample there were 30 insects and 3 had been marked.

- (i)** Estimate the population size of insects on the tree.

Use this formula:

$$\text{Estimated population size} = \frac{\text{Number in first sample} \times \text{Number in second sample}}{\text{Number in second sample previously marked}}$$

Estimated population size = **[2]**

- (ii)** To mark each insect the scientists put a small spot of paint on the underside of the insect.

Explain why they marked the underside of the insects and not the top.

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..... **[2]**

- (c) The scientists wanted to see if there was a link between the level of pollution in the air and the number of insects on the trees.

They sampled trees at different distances from a factory that was releasing sulfur dioxide.

Fig. 18.3 shows their results.

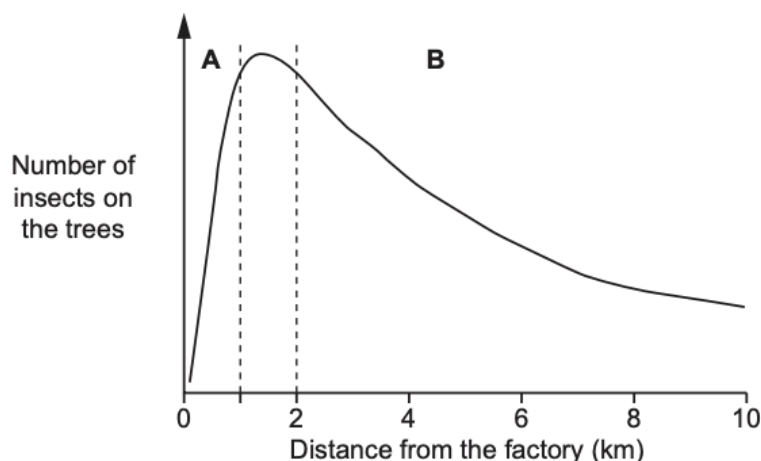


Fig. 18.3

- (i) The scientists found that sulfur dioxide can make the waxy cuticle of leaves thinner.

Suggest how this could explain the number of insects on the trees, further from the factory, in section **B** of the graph in **Fig. 18.3**.

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..... **[2]**

- (ii) Look at section **A** of the graph in **Fig. 18.3**. Which is a possible explanation for the shape of the graph nearest the factory, in section **A**?

Tick (✓) **one** box.

Low concentrations of sulfur dioxide kill the insects.

Low concentrations of sulfur dioxide make the insects reproduce faster.

Very high concentrations of sulfur dioxide kill the insects.

Very high concentrations of sulfur dioxide make the insects reproduce faster.

☐
☐
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[1]

Q22. (Nov 2020)

(c) Scientists investigate antibiotic pollution in two different lakes.

They collect samples of water from the two lakes. The scientists then use aseptic techniques to investigate how resistant the bacteria in the water are to antibiotics. **Fig. 22.2** shows the apparatus they use.

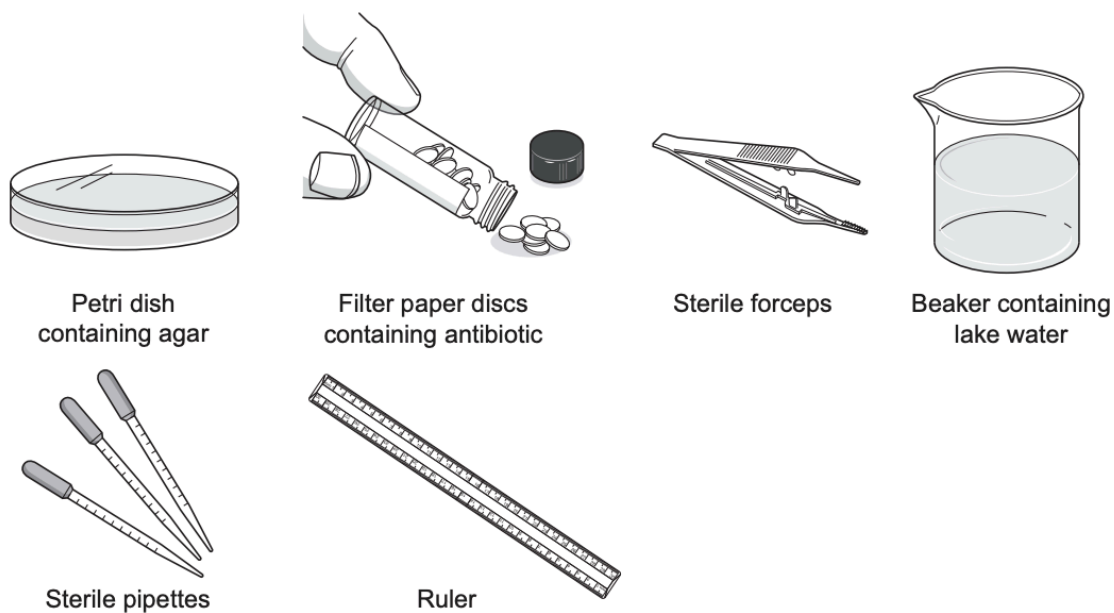


Fig. 22.2

Describe how the scientists could use **this** apparatus to **measure** how resistant the bacteria are to antibiotics.

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[4]

- (d) The scientists also counted how many species of bacteria were resistant to antibiotics and how many species of bacteria were killed by antibiotics.

The scientists found these results.

	Number of different species of bacteria	
	In Lake Bellandur	In Lake Jakkur
Resistant to antibiotics	53	35
Killed by antibiotics	28	37

Which lake has the **highest** levels of antibiotic pollution?

Tick (✓) **one** box.

Lake Bellandur

☐

Lake Jakkur

☐

Explain your answer.

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Q23. (Nov 2021)

- 8 Which of these changes would cause an **increase** in biodiversity?

- A Draining ponds to build a car park.
- B Keeping tigers in a zoo.
- C Reintroducing otters into an area where they had died out.
- D Replacing a woodland with a field that contains wheat.

Your answer

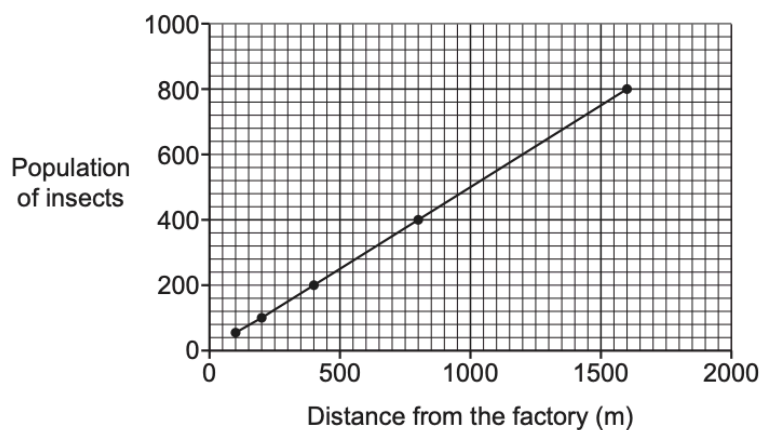
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[1]

Q24. (Nov 2021)

- 15** A student estimated the population of insects at different distances from a factory using capture-recapture.

They plotted their results on a graph.



Which of these statements describes the student's results?

- A** Population size = distance from the factory
- B** Population size $\propto$ distance from the factory
- C** Population size > distance from the factory
- D** Population size $\sim$ distance from the factory

Your answer

[1]

Q25. (Nov 2021)

- 22** Farmers' fields are usually surrounded by hedges. An example of this is shown in **Fig. 22.1**.

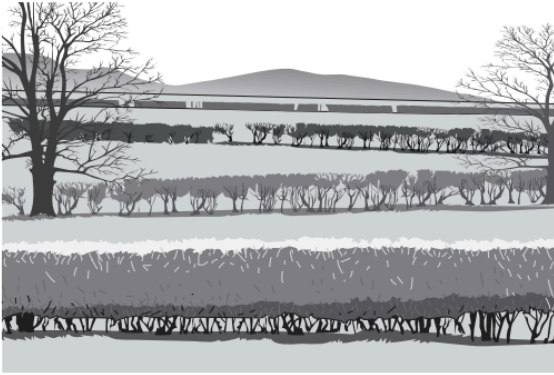


Fig. 22.1

Different plant species grow in the hedges. Scientists are studying hedges to find the number of different plant species.

- (a)** Write down why they would use a quadrat and a biological key in this process.

Quadrat

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Key

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[3]

- (b) The scientists want to see if there is a link between the area of a field and the number of plant species growing in the hedge.

They sample hedges in five different sizes of fields, **A, B, C, D** and **E**.

The table shows the scientists' results.

Field	Area of field (m ²)	Mean number of plant species (per m of hedge)
A	3000	2.0
B	4000	1.7
C	7500	1.3
D	1500	2.1
E	10000	1.2

- (i) Plot the data for the five fields on the grid in **Fig. 22.2**.

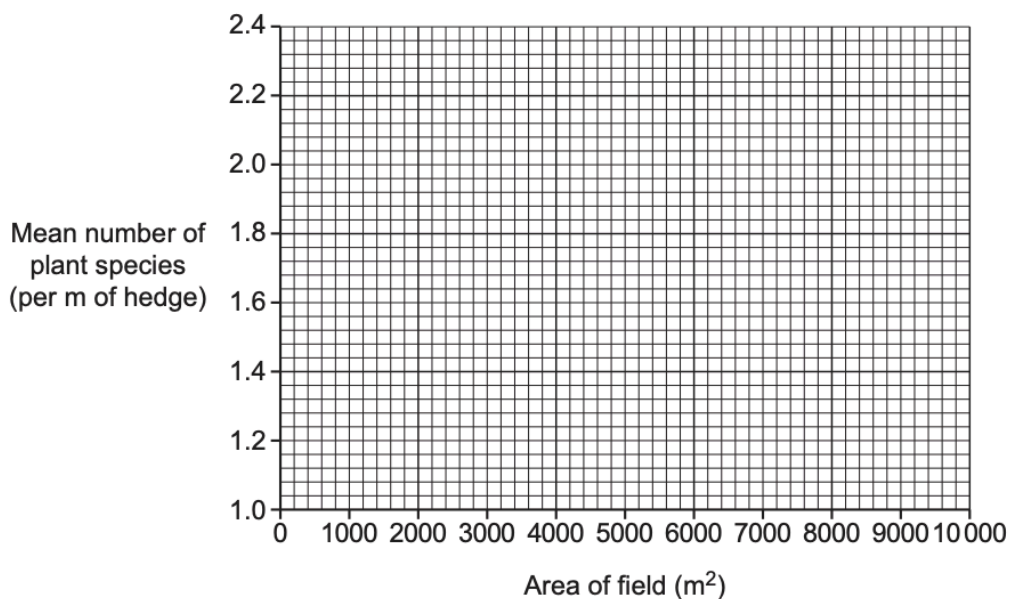


Fig. 22.2

[2]

- (ii) Draw a line of best fit on the graph in **Fig. 22.2**.

[1]

- 23** Sulfur dioxide is a gas released when coal and oil are burned. Sulfur dioxide dissolves in water to make an acid. Scientists think that this might harm plants by affecting photosynthesis.

(a) Photosynthesis is controlled by enzymes.

Which **two** statements explain how an acid could affect photosynthesis?

Tick (✓) **two** boxes.

Acid will decrease the pH and cause the enzyme to change shape.

☐

Acid will increase the pH and cause the enzyme to change shape.

☐

Acid will increase the pH and cause the substrate to change shape.

☐

The enzyme will not fit into the active site of the substrate.

☐

The substrate will denature.

☐

The substrate will not fit into the active site of the enzyme.

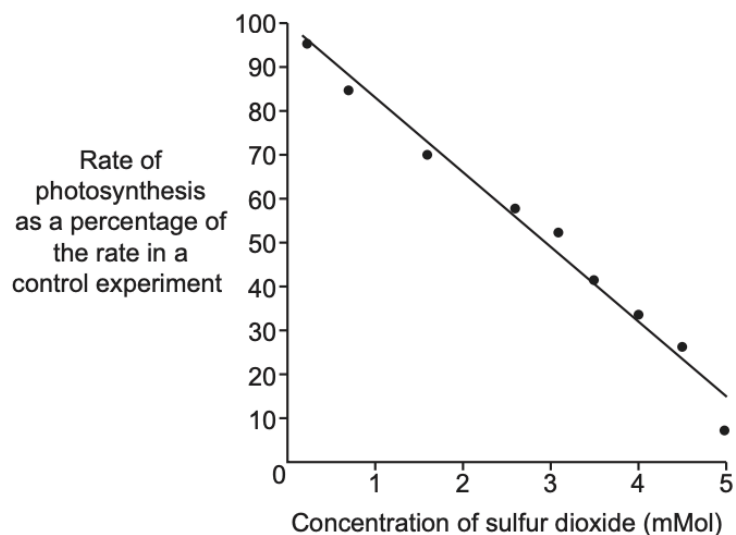
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[2]

- (b) Students take some spinach leaves and spray them with water containing different concentrations of sulfur dioxide.

They then measure the rate of photosynthesis of the leaves.

The graph shows their results.



- (i) The students plotted the rate of photosynthesis as a percentage of the rate in a control experiment. The control experiment involved spraying the leaves with a different substance.

Suggest what substance the students used to spray the leaves as a control.

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- (ii) One of the students makes this conclusion:

'The results of our experiment show that sulfur dioxide is affecting the plant and it is doing this because it forms an acid.'

Discuss whether this is a reasonable conclusion to make from the students' results.

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- (iii) Suggest how the students could modify their experiment to prove that sulfur dioxide is affecting the plant because it is an acid.

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