

Q1. (June 2018)

7 A scientist is estimating the number of rabbits in a field.

He has eight different estimates, 12, 12, 13, 15, 17, 19, 22 and 26.

Which is the median value for his estimates?

- A** 8
- B** 12
- C** 16
- D** 17

Your answer

[1]

Q2. (June 2018)

15 Which approach would be used to classify organisms by phylogenetics?

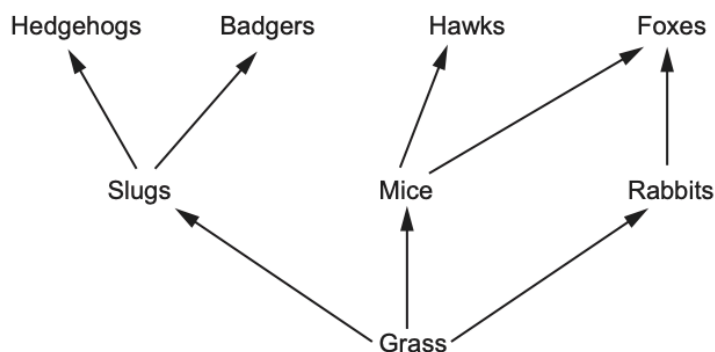
- A** Compare the structure of the organisms' internal organs
- B** Look at DNA base sequences
- C** Look at the behaviour of the organisms
- D** Study fossils

Your answer

[1]

Q3. (June 2018)

16 The diagram shows part of a food web from a grassland.



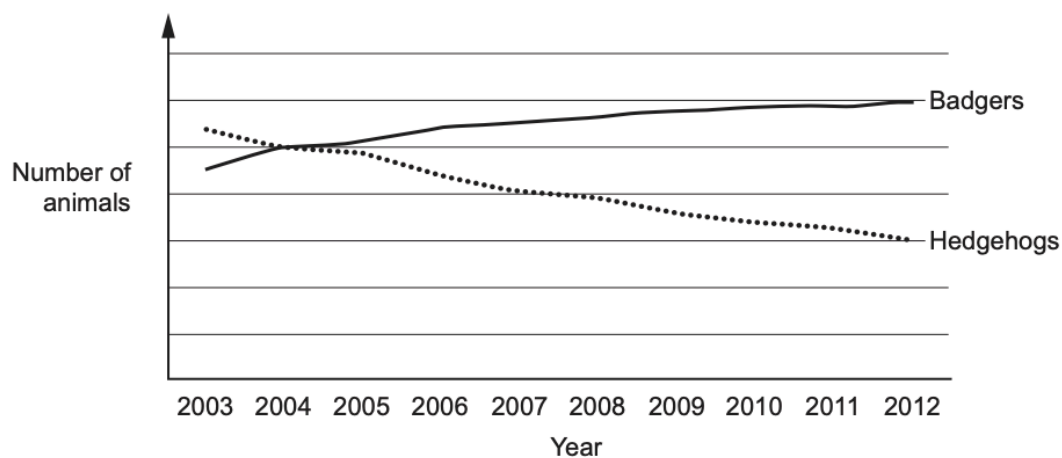
(a) How many secondary consumers are shown in this food web?

..... [1]

(b) A survey was set up to see if the number of badgers and hedgehogs has changed in the UK.

The number of badgers and hedgehogs were counted in different areas each year from 2003 to 2012.

The graph shows the results.



Use the food web to suggest an explanation for the change in the number of hedgehogs shown in the graph.

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 [2]

- (c) Hedgehogs are covered in small spines.

When they are frightened they often roll up into a ball and keep still.



- (i) In country areas, where badgers live, this is an advantage to the hedgehogs.

In cities, where there are many roads, this is a disadvantage.

Explain these two conclusions.

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- (ii) Scientists have noticed that a new type of hedgehog is increasing in numbers in cities.

These hedgehogs do not roll up. They run away when frightened. The scientists think that genes control this behaviour.

Explain how this type of hedgehog may become more common in cities.

Use ideas about natural selection.

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Q4. (June 2018)

17 A student investigates the plants growing underneath a tree.



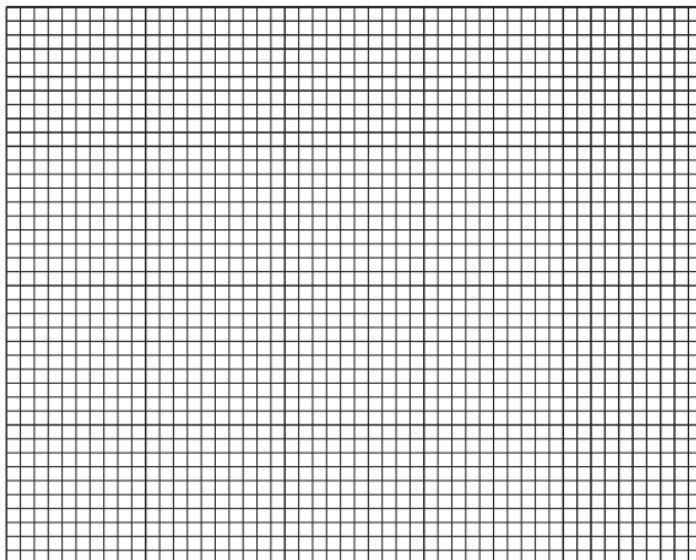
He lays out a tape measure on the ground, starting at the tree. He then places a quadrat on the ground.

He measures the percentage of the ground in the quadrat that is covered by plants. He repeats this every metre away from the tree.

The table shows his results.

Distance from the tree (m)	Percentage of ground covered by plants (%)
1	10
2	15
3	18
4	22
5	50
6	58
7	62
8	64

- (a) Plot a graph of the student's results and draw a line of best fit.



[5]

- (b) The student thinks that shade from the tree is affecting the plants.

Explain how the student's results show this.

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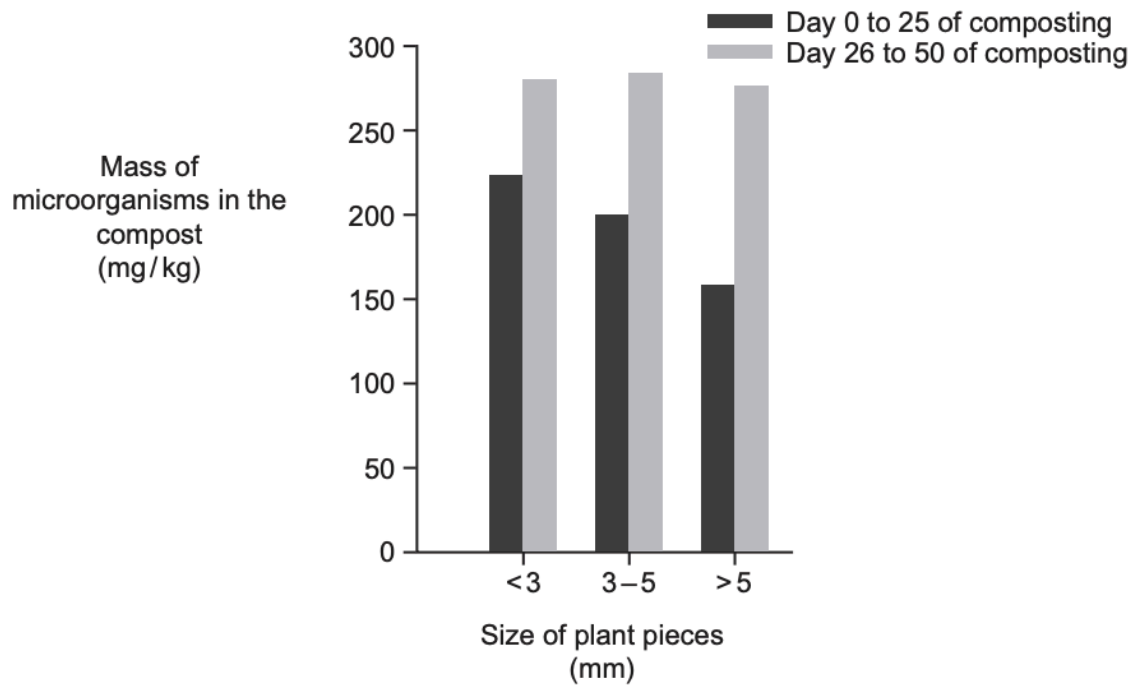
[4]

20 This machine helps shred plants for a compost heap.



The machine can shred plants into three different sizes.

This graph is in the instruction booklet for the machine.



- (a) Which size of plant pieces is best for making compost?

Explain your answer.

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..... [3]

- (b) The size of the plant pieces has an effect on the number of microorganisms in the compost.

Suggest why.

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..... [2]

- (c) The decomposition of dead plants and animals is an important process for ecosystems.

Explain why.

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..... [3]

- 2 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 that he is using?

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

Your answer

[1]

Q7. (June 2019)

- 8 In food chains, biomass is lost between different trophic levels.

One reason for this is the release of undigested food from the body.

Which term is used to describe this release?

- A Decomposition
- B Egestion
- C Excretion
- D Peristalsis

Your answer

[1]

Q8. (June 2019)

- 11 Which of these is a feature of an **artificial** classification system?

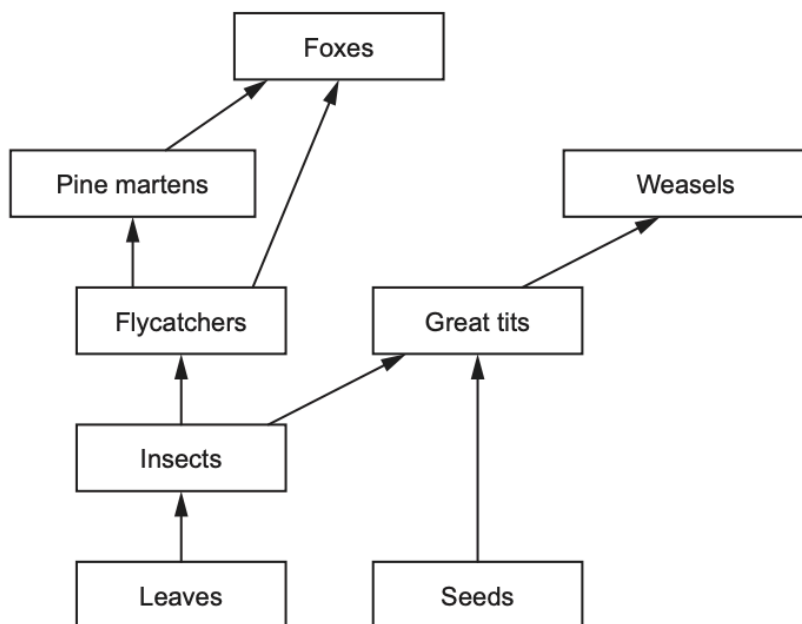
- A It shows evolutionary links between organisms.
- B It can be based on similarities in DNA.
- C It may compare the amino acids in proteins.
- D It uses a single difference or similarity between organisms.

Your answer

[1]

Q9. (June 2019)

16 The diagram shows part of a food web from a woodland.



- (a) (i)** Great tits are described as both primary consumers and secondary consumers.

Explain why.

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

- (ii)** Foxes are described as both predators and competitors of pine martens.

Explain why.

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

- (iii)** Which organism in the food web occupies the second trophic level?

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- (b) Great tits and flycatchers are both birds.

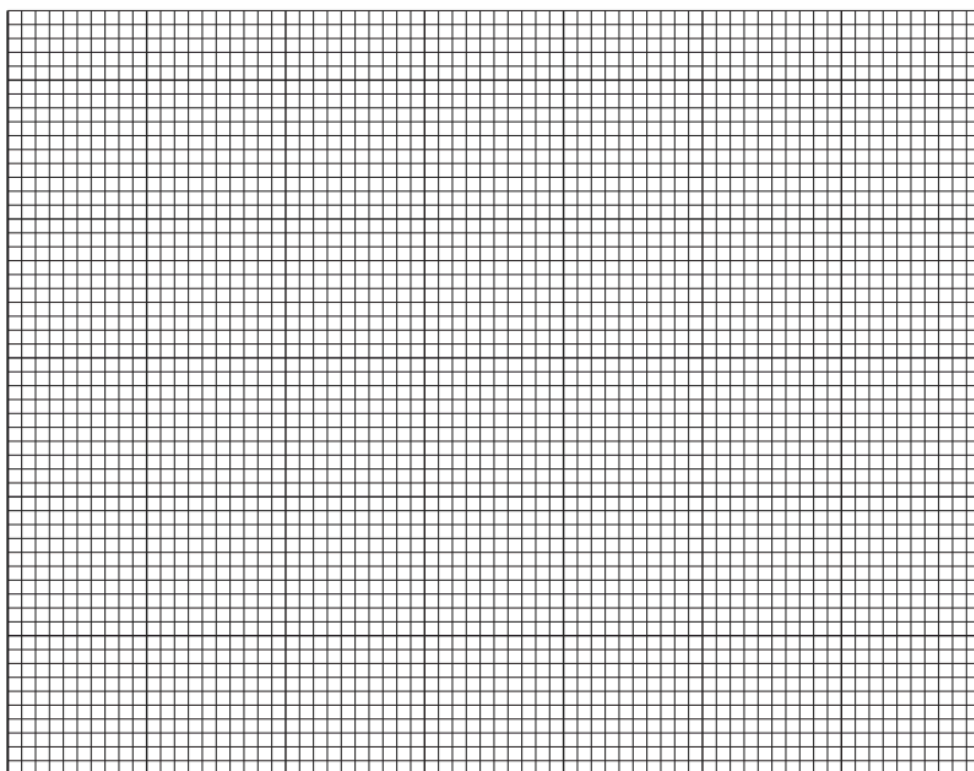
In a conservation project, scientists have built boxes for the birds to nest in. The scientists fixed the boxes on trees at different heights.

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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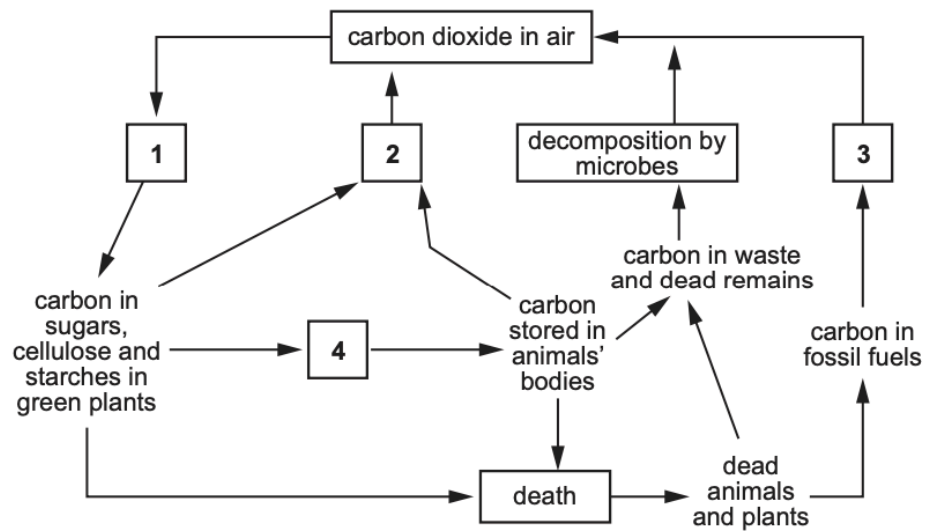
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Q10. (June 2019)

17 (a) The diagram shows the carbon cycle.



Boxes 1–4 represent different processes in the carbon cycle.

Draw lines to link boxes 1–4 to the correct name for the process in the carbon cycle.

1	Combustion
2	Eating
3	Photosynthesis
4	Respiration

[2]

- (b)** Scientists investigated if crops could be grown on the planet Mars.

They used a soil that was similar to the soil found on Mars. The soil contained some minerals but no living organisms.

- (i)** The scientists managed to grow crops in the soil. However on Mars, the minerals in the soil would soon run out.

Explain why.

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

- (ii)** Living organisms could be added to the soil but there is no air on Mars. The plants would need to be grown in an enclosed structure.

At first, air would need to be added, but after a while the organisms in the soil and the plants would supply each other with the gases they need.

Explain how this would happen.

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

- 22** A salt marsh is a large muddy area of land where a river joins the sea. This is a rare habitat and some plants grow on salt marshes but nowhere else.

(a) When the tide comes in the salt marsh gets covered with seawater.

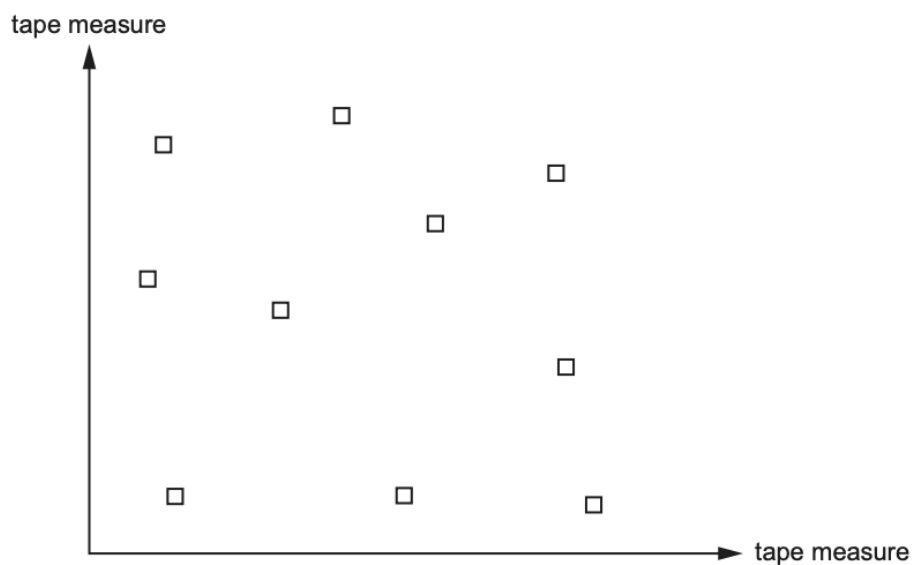
Explain the effects of salt water on plant cells.

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..... **[1]**

(b) A student investigates the plants growing on a salt marsh. He uses a quadrat to sample the plants.

He puts down two long tape measures at right angles to each other across the salt marsh. He then picks numbers at random and uses them to decide where to place a quadrat.

The diagram shows the position of all his quadrats across the salt marsh.



- (i) The salt marsh measured 50 m × 50 m.

Each quadrat measured 0.5 m × 0.5 m.

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

Percentage = %
[3]

- (ii) A second student sampled by placing five quadrats close together in the centre of the salt marsh.

Evaluate the sampling method of the second student compared to the method of the first student.

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..... [3]

- (iii) Suggest **one** factor that the students should consider in a risk assessment for their experiment.

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..... [1]

- (c) In some salt marshes large sand banks have been built. This stops tides from entering the salt marsh.

The level of soil on the salt marsh builds up and the marsh turns into dry land.

This dry land shows a greater biodiversity of plants than a salt marsh.

Explain why some scientists want to limit the building of sand banks, even though they increase biodiversity.

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..... [2]

Q12. (June 2022)

- 1 The diagram shows the energy trapped as biomass at each stage of a food chain.



What is the percentage efficiency in the transfer of energy between the grasshopper and the mouse?

- A 0.2%
B 8%
C 10%
D 20%

Your answer

[1]

Q13. (June 2022)

- 5 What is the definition of a parasite?

- A An organism that kills another organism and then feeds from it.
B An organism that kills another organism by out-competing it.
C An organism that lives on or in another organism causing it harm.
D A microorganism that causes disease in another living organism.

Your answer

[1]

Q14. (June 2022)

- 6** Animal populations can be estimated using a method called capture-recapture. The number of animals in the population is estimated using the formula:

$$\text{population estimate} = \frac{\text{number in first sample} \times \text{number in second sample}}{\text{number of marked animals in second sample}}$$

Sometimes marking the animals makes them less well-camouflaged.

What effect would this have on the population estimate?

- A** The estimate is always too high.
- B** The estimate is always too low.
- C** The estimate is either too high or too low.
- D** There is no effect on the estimate.

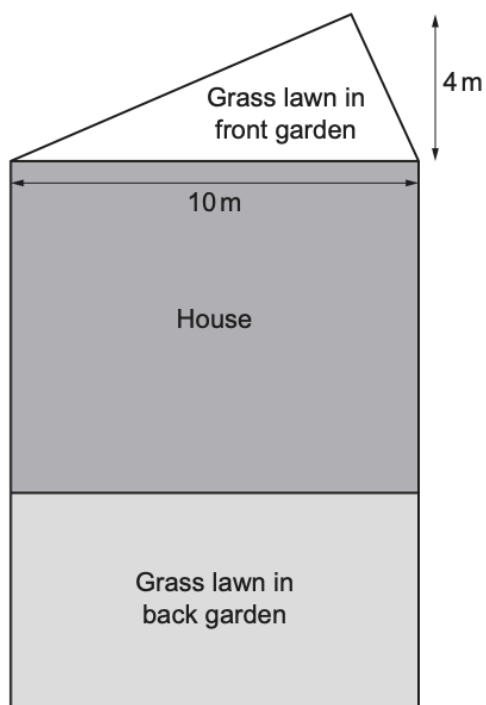
Your answer

[1]

Q15. (June 2022)

- 16** 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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[3]

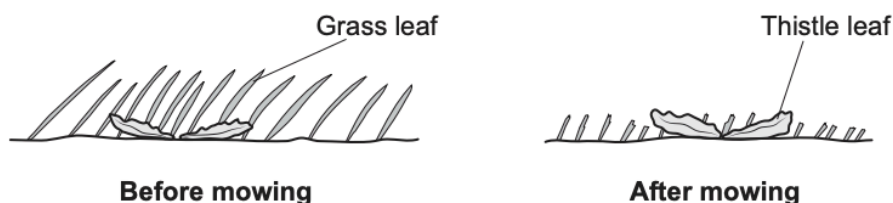
- (b) The **front** garden is smaller so he counts all the thistle plants growing in the lawn. He counts 36 plants.

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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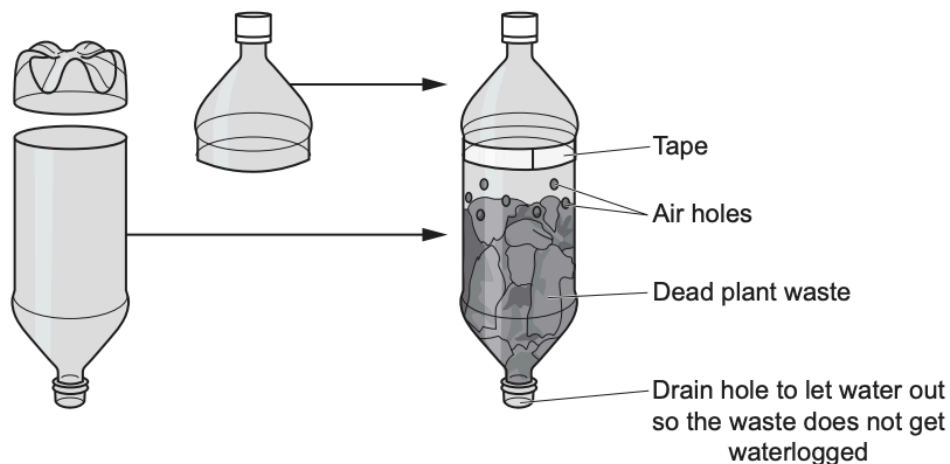
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..... [3]

- 17 Some students investigate decomposition of dead plant waste. They make a compostor from two plastic bottles.



- (a) Why do the students make air holes in the bottle?

Tick (✓) **one** box.

To allow heat into the bottle.

To allow oxygen gas into the bottle.

To prevent the build-up of nitrogen gas in the bottle.

So that carbon dioxide gas can enter.

☐
☐
☐
☐

[1]

- (b) The students want to see if the number of air holes in the bottles affects the rate of decomposition.

- They set up bottles with different numbers of air holes.
- They then measure the mass of the bottle and compost at the start and after four weeks.

The table shows their results.

Number of air holes	Mass of bottles and plant waste (g)	
	At the start	After 4 weeks
2	300	270
4	300	250
8	300	240
16	300	235

- (i) Calculate the loss in mass **per week** of the bottle and plant waste with 16 air holes.

Give your answer to **3** significant figures.

Loss in mass = grams/week **[3]**

- (ii) Describe the effect of the number of air holes on the rate of decomposition of the plant waste.

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

- (iii) The students checked that all the bottles and plant waste had a mass of 300 g at the start of the experiment.

Explain why this helps the students to analyse the results.

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..... **[1]**

- (iv) What is the independent variable in the students' investigation?

..... **[1]**

- (v) The students notice that during the experiment, water drips through the drain hole at the bottom of the apparatus on to the floor.

Explain why this can produce inaccurate results **and** how the students can change their method to correct this.

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

- 
- moth
- caterpillar

The caterpillars are fed on by birds such as cuckoos. The caterpillars are also parasitised by fungi.

- [2]

- Explain how natural selection may have resulted in all cuckoos having the sticky membrane.

..... [4]

. [4]

- (c) Scientists are controlling the pine processionary moth to conserve pine trees.

They spray the caterpillar's eggs or larvae with fungal spores.

This has been successful when spraying different concentrations of spores:

- 1×10^6 spores/ml on the eggs
- 1×10^8 spores/ml on the larvae.

- (i) Name this type of control method.

..... [1]

- (ii) The concentration of spores used on the larvae is higher than the concentration used on the eggs.

By how many orders of magnitude is it higher?

..... [1]

- (d) Scientists have also tried to use natural plant defence methods on the larvae.

The table shows the effects of two plant-based oils on the larvae in laboratory conditions and on the pine trees.

Type of oil	Deaths per 1000 larvae	
	In the laboratory	On the pine tree
Ginger	712	874
Rosemary	300	761
Control treatment	13	22

- (i) Calculate the percentage increase in the death of larvae on the pine trees compared to in the laboratory for the control treatment.

Percentage change = % [2]

- (ii) More larvae die in the natural environment of the pine trees than in the laboratory for all treatments.

Suggest **one** reason why.

..... [1]

- (iii) Evaluate the use of the two plant oils in the control of the larvae.

Use data from the table.

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..... [3]

Q18. (June 2023)

- 1 Which group will have the **most** organisms in any ecosystem?

- A Community
- B Population
- C Species
- D Trophic level

Your answer

[1]

Q19. (June 2023)

- 2 Biomass is lost as it passes through a food chain.

Which processes are responsible for this loss in biomass?

- A Egestion, excretion and respiration
- B Egestion, transpiration and respiration
- C Excretion, transpiration and respiration
- D Photosynthesis, egestion and excretion

Your answer

[1]

Q20. (June 2023)

- 3** Lichens grow on trees and can indicate air pollution levels.

A student wants to find out the level of pollution in an area by measuring the abundance of a particular species of lichen.

Which two tools should the student use to find out the abundance of the lichen in the area?

- A** Key and net
- B** Key and quadrat
- C** Line transect and key
- D** Pooter and quadrat

Your answer

[1]

Q21. (June 2023)

16 (a) Complete each sentence about decomposition.

Decomposition is caused by microorganisms such as

The microorganisms use the process of to release the energy in dead organisms.

Decomposition also allows minerals to be in nature for plants to use.

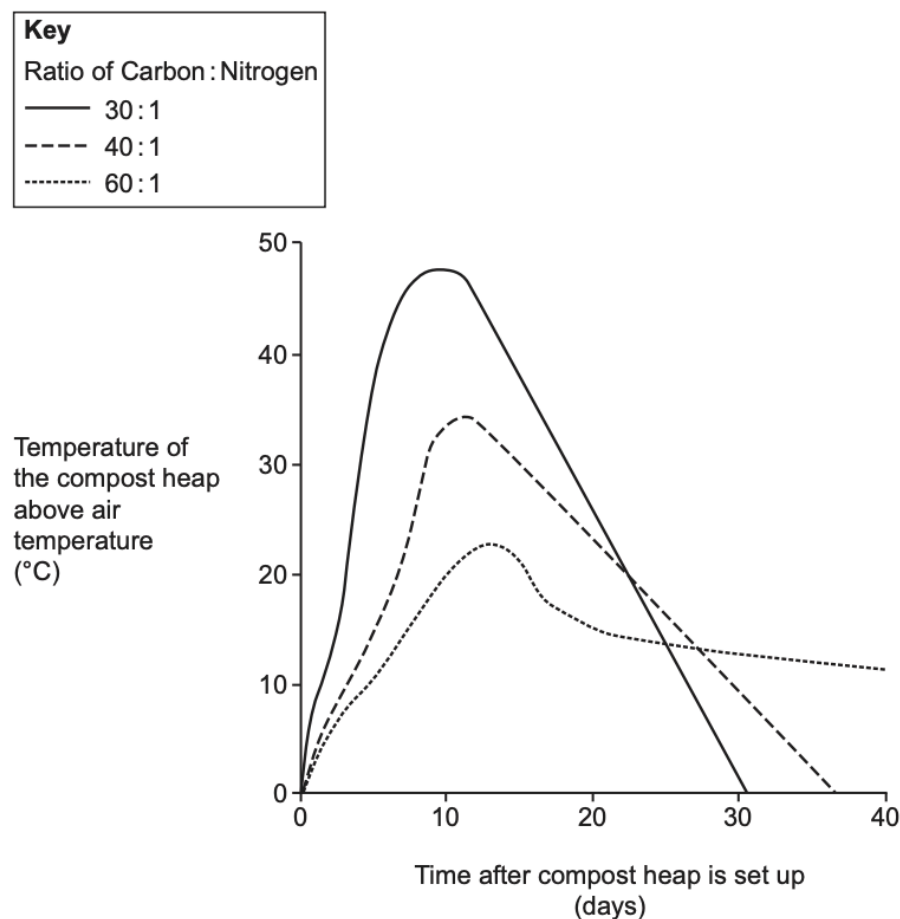
[3]**(b)** Some students investigate plant decomposition.

They put three different plant wastes into compost heaps.

Each type of plant waste contains different ratios of carbon to nitrogen.

They measure the rate of decomposition by measuring the temperature in the compost.

The graph shows their results.



- (i) The pupils used the temperature of the compost heap as a measure of the rate of decomposition.

Which statement explains why they could do this?

Tick (✓) **one** box.

Carbon dioxide contains more energy than oxygen.

☐

Decomposition involves an endothermic reaction.

☐

Microorganisms give off heat when they decompose waste.

☐

Mineral salts will increase the temperature of the compost.

☐

[1]

- (ii) Which statement describes the results of the investigation?

Tick (✓) **one** box.

High levels of carbon results in faster decomposition.

☐

If the carbon : nitrogen ratio is higher, then decomposition is faster.

☐

Low levels of nitrogen result in faster decomposition.

☐

The higher the nitrogen content compared to carbon, the faster the rate of decomposition.

☐

[1]

- (iii) Give **one** abiotic factor that the students should keep constant in their experiment.

..... [1]

(c) The table shows the mass of carbon and nitrogen in different plant materials.

Plant material	Mass of carbon per kg (g)	Mass of nitrogen per kg (g)
Fruit waste	14	0.350
Horse manure	18	0.600
Straw	9	0.015

Which plant material would decompose the **fastest**?

Explain your answer using calculations and the graph in (b).

Plant material

Reason

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[3]

Q22. (June 2023)

- 19 The table shows the mean mass of four types of rodent and the mean number of years they live.

Type of rodent	Mean mass (g)	Mean number of years they live
Gerbil	40	1.5
Guinea pig	1000	4.0
Rat	200	2.0
Squirrel	600	3.0

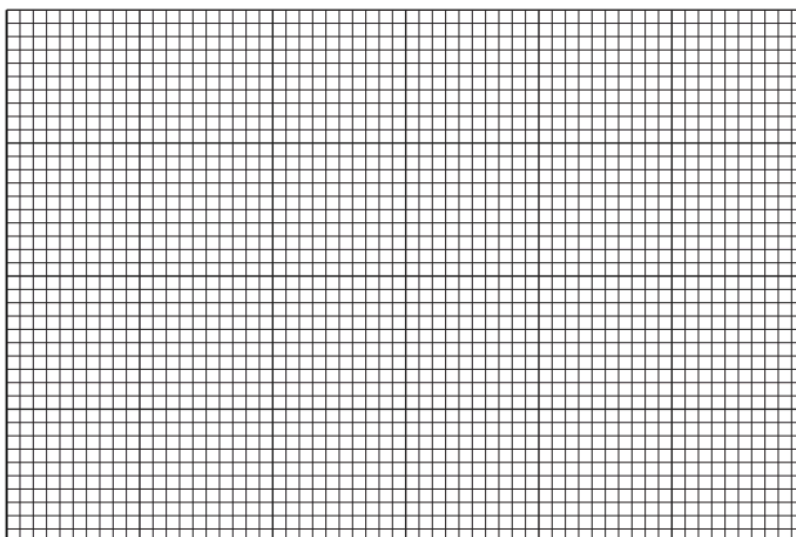
- (a) (i) Choose suitable scales and plot the data from the table onto the graph.

[3]

- (ii) Draw a line of best fit through the points.

[1]

Mean number
of years they
live



Mean mass (g)

(b) Mole rats are rodents that live in Africa.



The mean mass of a mole rat is 60g and they live for about 18 years.

Use the graph you drew in **(a)** to explain what is unusual about the mole rat data compared to other rodents.

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

- [6]

- [2]

Buddleia, a butterfly's friend?



Buddleia flowers attract butterflies that feed on nectar.

Buddleia bushes produce large numbers of very small seeds. This means that buddleia bushes quickly colonise new habitats.

This has resulted in the populations of other plants decreasing. Scientists have noticed there are large communities of butterflies in these areas but the biodiversity of butterflies is low.

- (a) Suggest why the colonisation of land by buddleia bushes has caused a decrease in the populations of other plants.

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..... [2]

- (b) Describe a sampling technique that could be used to estimate the number of one species of butterfly in a habitat.

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..... [3]

- (c) Explain how there can be a large community of butterflies but a low biodiversity of butterflies in an area.

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..... [2]

- (d) Scientists have suggested two possible methods of reducing the damage caused to habitats by too many buddleia bushes.

Explain how each of these methods would reduce the damage to habitats.

- (i) genetically engineering buddleia bushes that produce larger seeds

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..... [2]

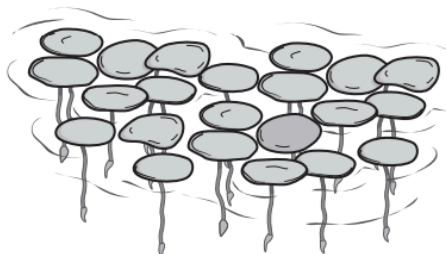
- (ii) producing hybrid buddleia bushes that have uneven numbers of chromosomes, which prevent meiosis occurring

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..... [2]

- 22** Some students investigate the effect of run-off water from a farm on the growth of plants. The run-off water is washed off the fields in the farm when it rains.

They use a pond plant called duckweed, shown in the diagram. A duckweed plant has a single leaf that floats on the surface of the water.

They chose duckweed because it is easy to count the plants.



This is the method they follow:

- Put different volumes of clean pond water and run-off water into 4 beakers.
- Add 3 duckweed plants into each beaker.
- Leave the beakers for ten days at the same temperature.

The table shows the results.

Beaker number	Contents	Number of duckweed plants after ten days
1	250 cm ³ of pond water	6
2	230 cm ³ of pond water + 20 cm ³ of run-off	12
3	210 cm ³ of pond water + 40 cm ³ of run-off	24
4	190 cm ³ of pond water + 60 cm ³ of run-off	48

- (a) (i) Explain why the students put different volumes of clean pond water into each beaker.

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 [2]

- (ii) To improve their experiment, the students should make sure that the carbon dioxide levels are the same in each beaker.

Describe how they could achieve this.

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 [1]

(b) Duckweed plants reproduce by dividing into two.

(i) What is the name given to this type of reproduction?

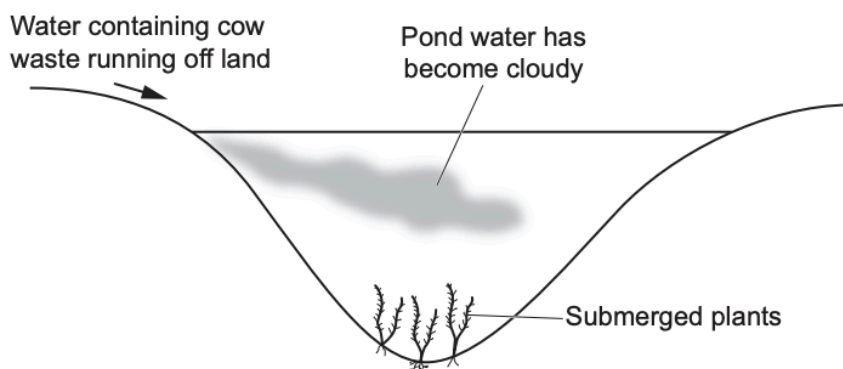
..... [1]

(ii) In beaker 4, how many generations of duckweed plants are present after 10 days?

Number of generations = [1]

(c) An article said that the run-off water contains waste from cows and this makes the pond water cloudy. The run-off water is reducing the growth of submerged plants that grow in the pond.

The diagram shows this process.



Explain the results of the students' experiment and why using duckweed produces results that do **not** agree with the effect of run-off water described in the article.

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 [3]

(d) The students change their method to use a submerged plant rather than using duckweed.

Describe how the students could change their method to measure the growth of the submerged plant.

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 [1]

Q25. (June 2024)

- 1 Which row shows correct abiotic and biotic factors?

	Abiotic	Biotic
A	food	light intensity
B	food	predators
C	pH of soil	predators
D	temperature	light intensity

Your answer

[1]

Q26. (June 2024)

- 3 All the living organisms and the place where they live is called ...

- A A community
- B A habitat
- C A population
- D An ecosystem

Your answer

[1]

Q27. (June 2024)

- 4 Which processes in the carbon cycle return carbon to the atmosphere?

- A Decomposition and photosynthesis
- B Decomposition and respiration
- C Photosynthesis and fossilisation
- D Respiration and fossilisation

Your answer

[1]

Q28. (June 2024)

- 8** What is the advantage of sampling using a transect line rather than using random sampling?
- A** A transect allows changes in the size of populations over time to be seen.
 - B** A transect allows patterns in the distribution of organisms to be seen.
 - C** A transect avoids areas which may contain few organisms.
 - D** A transect gives a more accurate estimate of the population.

Your answer

[1]

Q29. (June 2024)

16 The St Lucia racer is the rarest snake in the world.

The snake lives on the island of St Lucia. The diagram shows a food web from St Lucia.



(a) How many secondary consumers are in this food web?

..... [1]

(b) Mongooses are described as both **predators** and **competitors** of St Lucia racers.



Explain why.

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 [2]

(c) Biomass is lost as it passes through this food web.

Put a ring around **two** ways that biomass is lost from this food web.

egestion

growth

photosynthesis

respiration

[1]

- 19** Mistletoe is a green plant that is often seen growing high in a tree in winter.



Mistletoe can photosynthesise, but not at a very fast rate.

It therefore needs to act as a parasite on the tree.

- (a)** Put a ring around the term used to describe the **tree** in this relationship with the mistletoe.

competitor

host

mutualistic partner

prey

[1]

- (b)** Explain why the mistletoe grows into the phloem of the tree.

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

- (c) Scientists investigate two different species of mistletoe growing on a tree. One species of mistletoe has greener leaves than the other.

They give the tree carbon dioxide which contains radioactive carbon.

The carbon dioxide is not supplied to the mistletoe.

They then measure:

- the chlorophyll content of the mistletoe plants,
- the percentage of sugar that is radioactive in each type of mistletoe.

The table shows their results.

Species of mistletoe	Chlorophyll content in mg/g of tissue	Percentage of sugar in the mistletoe that is radioactive (%)
Dwarf mistletoe	0.4	39
Eastern mistletoe	0.9	1

- (i) Explain why sugar in the mistletoe becomes radioactive.

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- (ii) Explain the relationship between the chlorophyll content and the percentage of radioactive sugar in each species of mistletoe.

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20 Bacteria are found in milk.

They can cause the milk to decompose.

Enzymes from the bacteria convert sugar in the milk into lactic acid.

Some students investigate the effect of temperature on the decomposition of milk.

This is the method the students use:

- Pour 20 cm³ of milk into 3 different beakers.
- Keep each beaker in a water bath at a different temperature: 15°C, 25°C and 35°C.
- Measure the pH of the milk at different times over 4 days.

The table shows their results.

Temperature (°C)	pH of milk				
	at the start	after 12 hours	after 24 hours	after 48 hours	after 72 hours
15	6.5	6.4	6.3	6.1	5.8
25	6.5	6.3	6.2	5.9	5.5
35	6.5	6.3	6.1	5.5	4.9

(a) Explain why the students measured the pH of the milk.

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..... [2]

(b) Describe how the students should display their results in a graph.

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..... [3]

- (c) Explain the effect of increasing the temperature on the decomposition of the milk in the experiment.

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..... [3]

- (d) The students plan a further experiment where they boil the milk first before placing it in the beaker.

Predict what effect this would have on the results.

Explain your answer.

Prediction

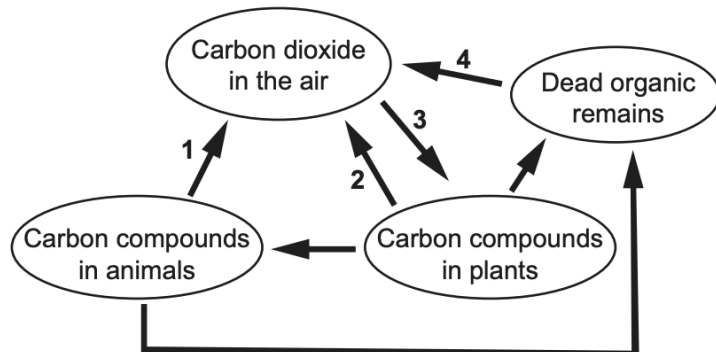
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Explanation

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..... [2]

10 The diagram shows how carbon is recycled in nature.



Which of the processes 1, 2, 3 and 4 may require oxygen?

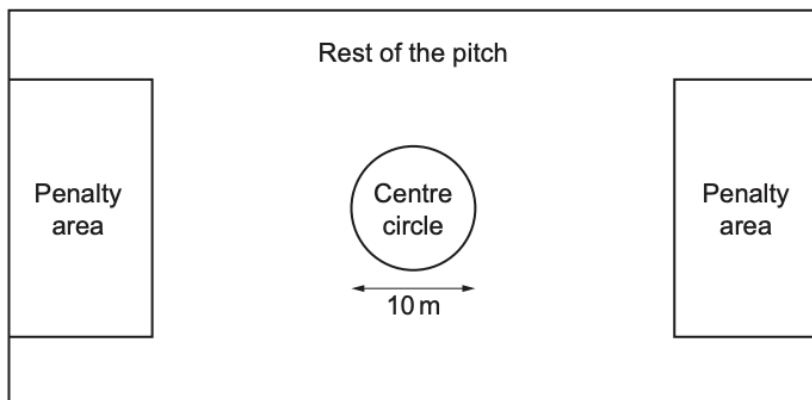
- A 1, 2, 3 and 4
- B 1, 2 and 4 only
- C 1 and 4 only
- D 1 only

Your answer

[1]

Q33. (June 2025)

- 17** 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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..... [3]

(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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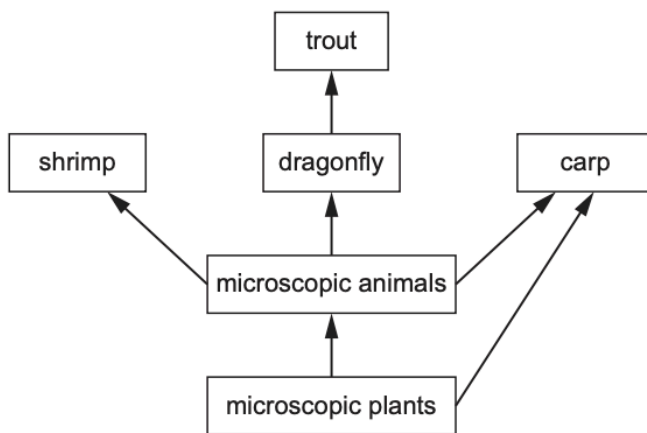
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..... [2]

Q34. (June 2025)

- 20 The diagram shows a food web from a lake in North America.



- (a) Explain why carp are described as feeding at **two** different trophic levels.

Use details from the food web.

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..... [2]

- (b) Carp are large fish that have been introduced into America from Asia.

Their numbers in lakes have increased and they are becoming pests.

Suggest a reason why the population of a species often increases rapidly after they are introduced into a new area.

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..... [1]

- (c) Carp feed at the bottom of lakes and this stirs up mud into the water.

The mud contains minerals but makes the water cloudy.

Explain **two** different effects that this could have on the microscopic plants living in the lake.

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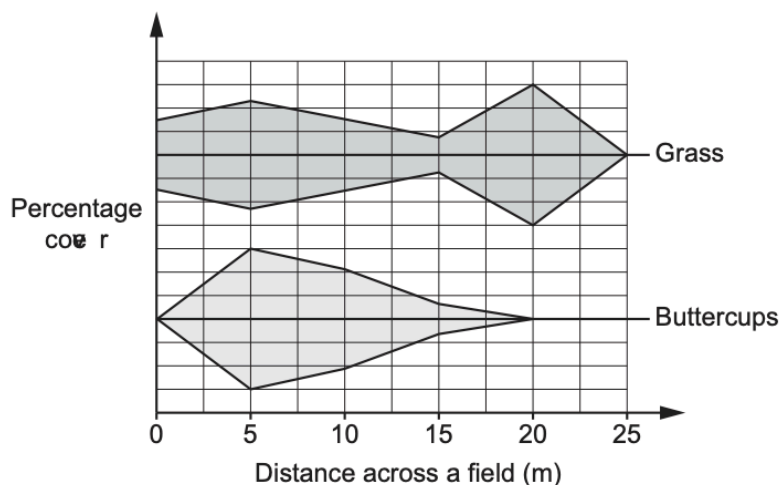
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[4]

Q35. (Nov 2020)

- 2 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]

Q36. (Nov 2020)

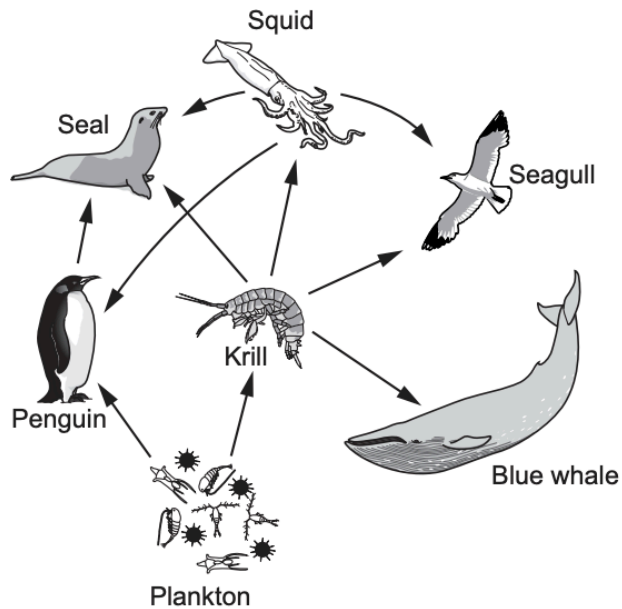
- 3 Which is the correct definition of a parasite?
- A An organism that is always at the top of a food chain.
 - B An organism that kills and eats another organism.
 - C An organism that lives on another living organism so that they both benefit.
 - D An organism that lives on or in another living organism causing it harm.

Your answer

[1]

Q37. (Nov 2020)

- 4 The diagram shows a food web in the sea.



Not to scale

The number of penguins decreased in the area. This caused an increase in seal numbers.

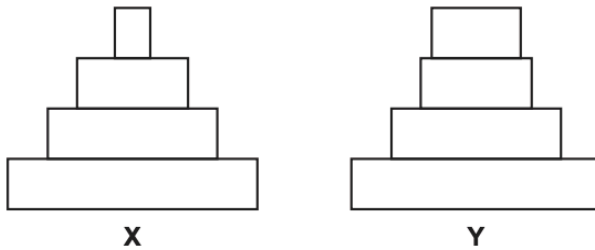
What is a possible reason for the increase in seal numbers?

- A Less seals were eaten.
- B The krill numbers dropped.
- C There were more plankton for the seals to eat.
- D The seals had less competition for squid.

Your answer

[1]

- 14 The diagram shows pyramids of biomass for two food webs, **X** and **Y**.



Which statement explains the difference between the two pyramids?

- A** In food web **X** there is a greater efficiency of transfer between primary consumer and secondary consumer than in **Y**.
- B** In food web **X** there is a greater efficiency of transfer between secondary consumer and tertiary consumer than in **Y**.
- C** In food web **X** there is a lower efficiency of transfer between primary consumer and secondary consumer than in **Y**.
- D** In food web **X** there is a lower efficiency of transfer between secondary consumer and tertiary consumer than in **Y**.

Your answer

[1]

Q39. (Nov 2020)

16 Fig. 16.1 shows the water cycle occurring in a lake.

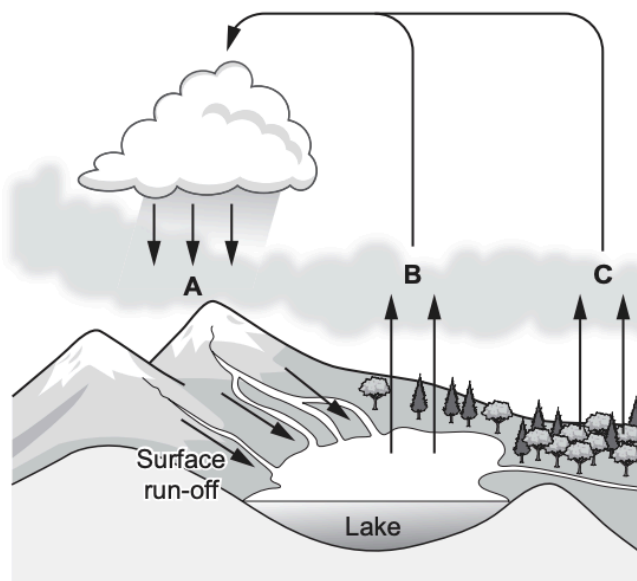


Fig. 16.1

(a) Draw a line to the correct name for the three processes labelled **A**, **B** and **C** in **Fig. 16.1**.

A

Evaporation

Photosynthesis

B

Precipitation

Respiration

C

Translocation

Transpiration

- (b) Surface run-off water passes through soil and back into the lake.

Write down **one** reason why surface run-off water is important to organisms living in the lake.

.....
..... [1]

- (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. 16.2** shows the apparatus they use.

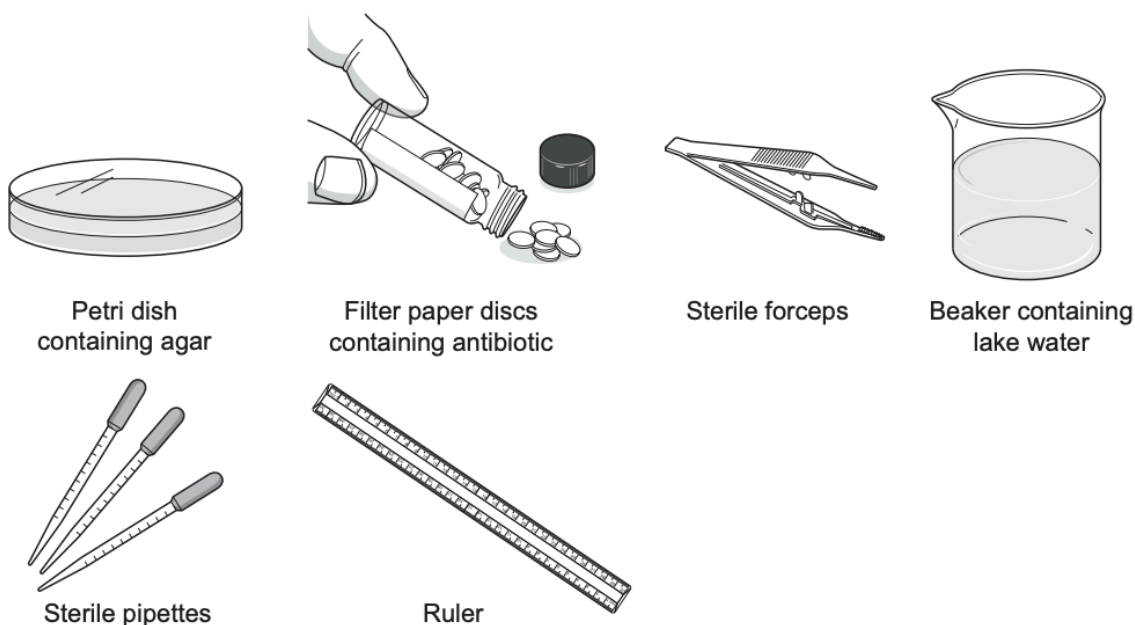


Fig. 16.2

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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..... [2]

- 18 Gardeners often turn dead plant material from their garden into compost. They then add this compost to the soil where they are growing plants.

(a) Why do gardeners add compost to their soil?

Tick (✓) **one** box.

Bacteria in the compost kill disease causing fungi.

The compost is sterile and so is aseptic.

The compost provides carbon dioxide for photosynthesis.

The compost provides minerals for the plants.

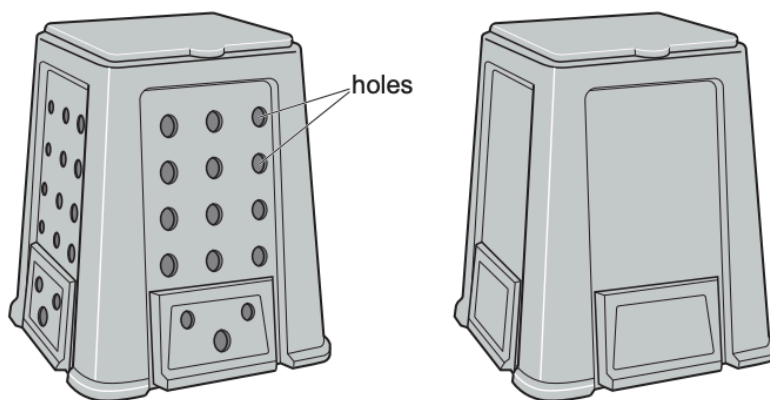
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[1]

- (b) Compost can be made in a composting bin. In the bin **aerobic bacteria** turn dead plant material into compost.

Some people use a different way of making compost, called bokashi. In this process the compost is made **anaerobically**.

The drawings show a normal composting bin and a bokashi bin.



Normal composting bin

Bokashi bin

Explain the difference in the design of the two composting bins.

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.....

[2]

(c) Scientists investigate the two methods of making compost.

This is their method:

- Take one large pile of dead plant material
- Divide the material into two samples of equal mass
- Place one sample into the normal composter and place one sample into the bokashi composter
- Measure the temperature in each composter every 10 days
- After 40 days, measure the mass of the compost.

Write down **one** way that the scientists make sure that they can draw valid conclusions.

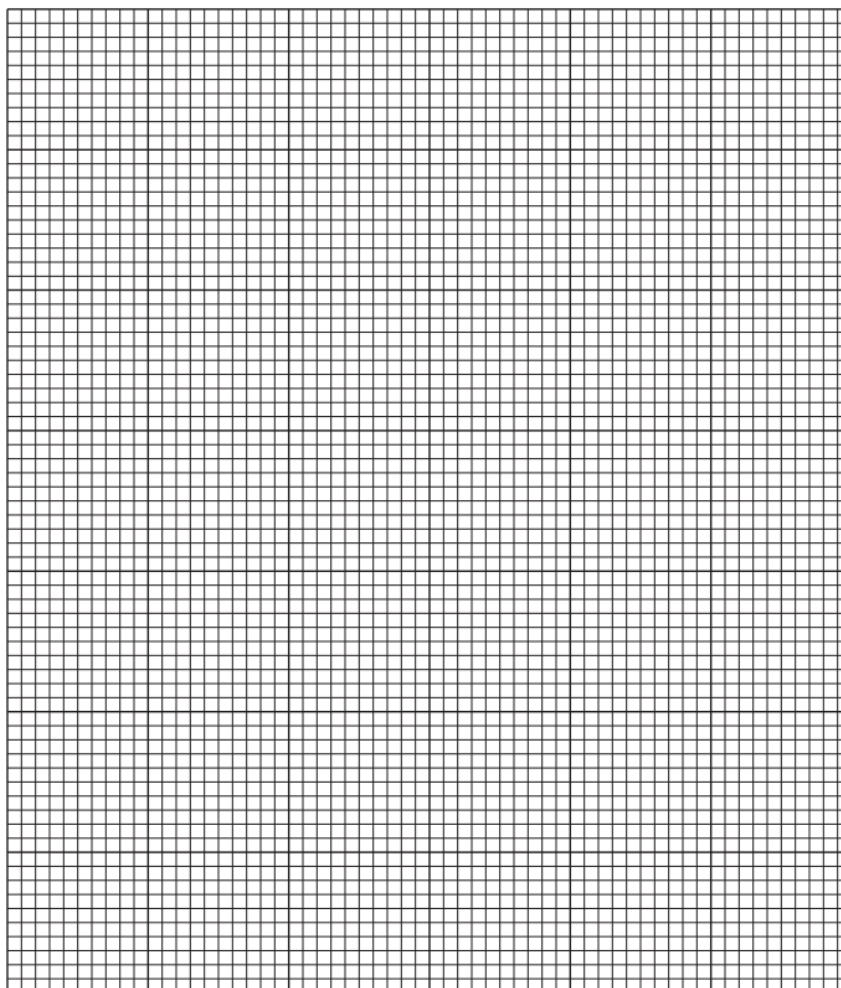
.....
..... [1]

(d) **Table 18.1** shows the scientists' temperature readings.

Time (days)	Temperature of the compost (°C)	
	normal compost	bokashi compost
0	26	26
10	70	27
20	53	29
30	42	31
40	28	28

Table 18.1

(i) Plot the scientists' results on the grid for normal and bokashi compost, and draw **two** curves of best fit.



- (ii) Explain why the temperature of the compost in the **normal** bin changed as shown in the graph.

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..... [2]

- (iii) Explain the difference in the temperature changes between the aerobic normal compost and the anaerobic bokashi compost.

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..... [2]

(e) Table 18.2 shows the scientists' results for the mass of the compost.

	Normal compost	Bokashi compost
Mass at start (kg)	1500	1500
Mass after 40 days (kg)	750	1100

Table 18.2

A gas is given off in the formation of the compost. This causes most of the decrease in mass.

(i) The percentage decrease in the mass of the normal compost is 50%.

Calculate the percentage decrease in the mass of the bokashi compost.

Give your answer to 2 significant figures.

Percentage decrease = % **[3]**

(ii) The scientists concluded that the bokashi method of composting might be better for the environment.

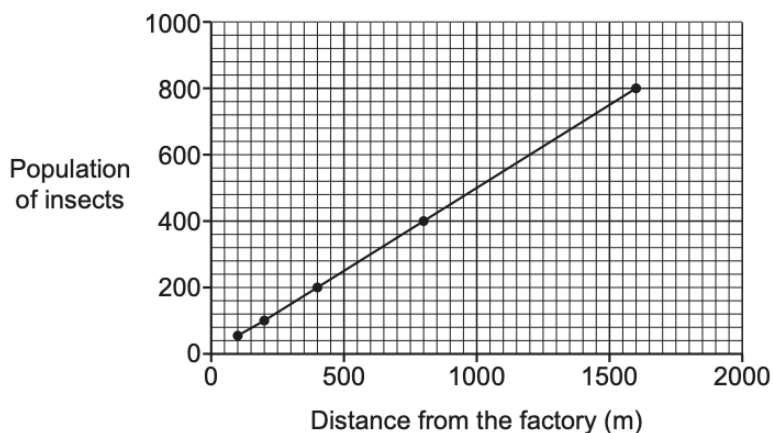
Use your answer from part (e)(i) to justify the scientists' conclusion.

.....

 **[2]**

- 1 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]

Q42. (Nov 2021)

- 2 Which row in the table gives the optimum conditions for decomposition?

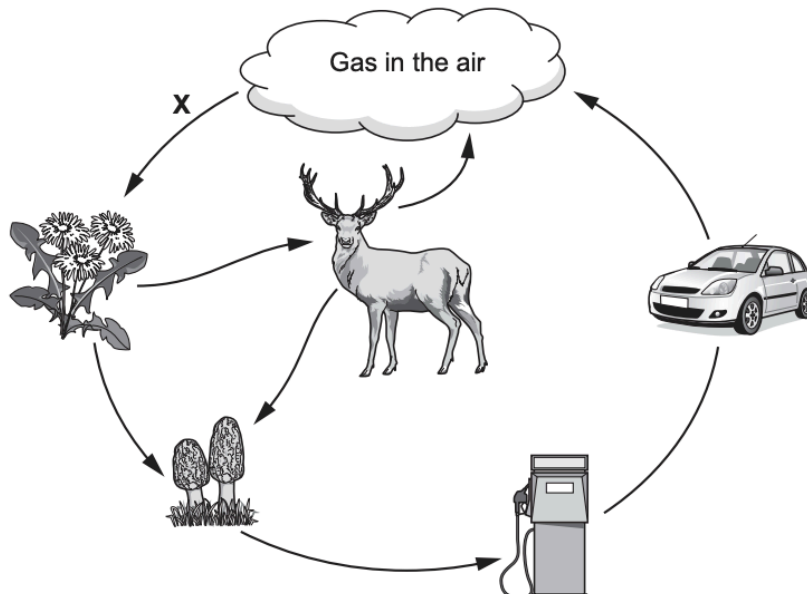
	Oxygen	Temperature ($^{\circ}\text{C}$)	Decomposers
A	Present	40	Present
B	Absent	10	Absent
C	Present	80	Present
D	Absent	40	Present

Your answer

[1]

Q43. (Nov 2021)

3 The diagram shows the carbon cycle.



What is the importance of process **X** to living organisms?

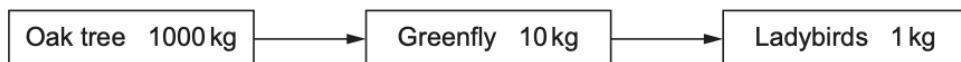
- A** It produces food containing carbon molecules.
- B** It produces fossil fuels for combustion.
- C** It provides minerals to plants.
- D** It releases energy and carbon dioxide.

Your answer

[1]

Q44. (Nov 2021)

- 4 The diagram shows the biomass in different trophic levels of a food chain.



Which processes account for the decrease of biomass along the food chain?

- A Egestion, growth and respiration
- B Egestion, respiration and excretion
- C Photosynthesis, respiration and excretion
- D Respiration, growth and excretion

Your answer

[1]

Q45. (Nov 2021)

- 16 Farmers' fields are usually surrounded by hedges. An example of this is shown in **Fig. 16.1**.

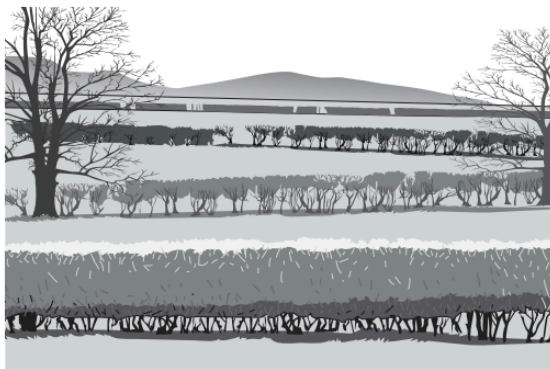


Fig. 16.1

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

.....

.....

Key

.....

[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. 16.2**.

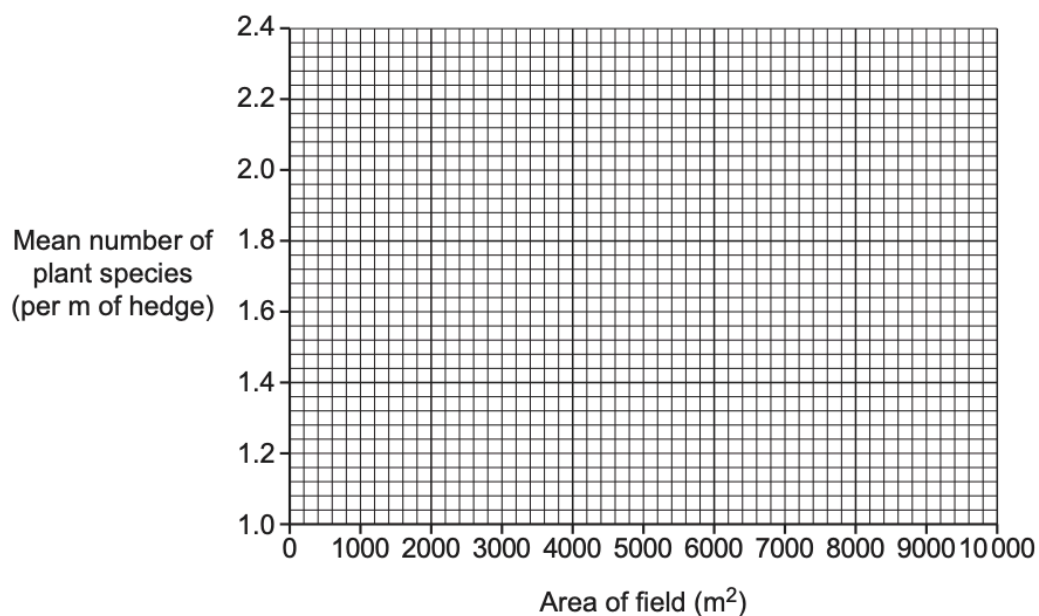


Fig. 16.2

[2]

- (ii) Draw a line of best fit on the graph in **Fig. 16.2**.

[1]

- (iii) There is a formula that can be used to estimate the age of a hedge.

$$\text{age in years} = \left(\begin{array}{c} \text{mean number of} \\ \text{plant species} \\ \text{per m of hedge} \end{array} \right) \times 110 + 30$$

The hedges in field **E** are 162 years old.

Calculate the age of the hedges in field **D**.

Age = years [2]

- (iv) To try to grow more crops, farmers now use larger machines.

Modern farms have larger fields to make it easier to use these machines.

Does the scientists' data support the idea that older fields are smaller?

Explain your answer.

.....

 [2]

Q46. (Nov 2021)

- 17 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.

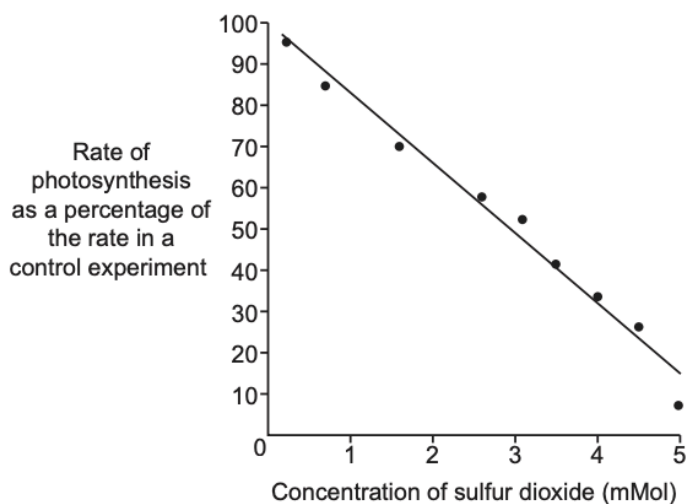
☐

[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.

..... [1]

- (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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..... [2]

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

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..... [1]

Q47. (Nov 2021)

20 Fig. 20.1 shows two types of insect called the Blandford fly and the mayfly.

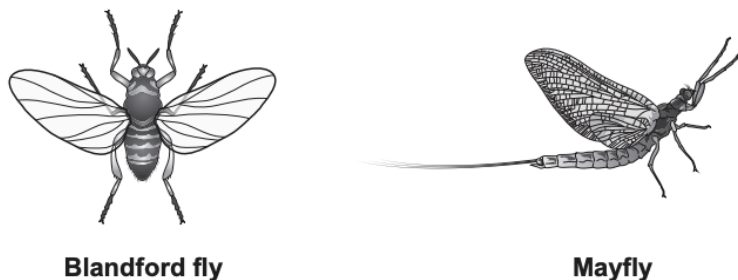


Fig. 20.1

(a) The young of Blandford flies live in rivers. They compete with mayflies for algae.

Large fish called trout are predators of mayflies and Blandford flies.

Complete the pyramid of biomass in Fig. 20.2 for these feeding relationships.

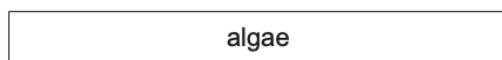


Fig. 20.2

[2]

(b) Adult Blandford flies feed on sugary liquid from flowers.

However, when eggs start to develop inside female flies, they will start to suck animal blood.

(i) Suggest why the females show different feeding behaviour when they develop eggs.

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..... [1]