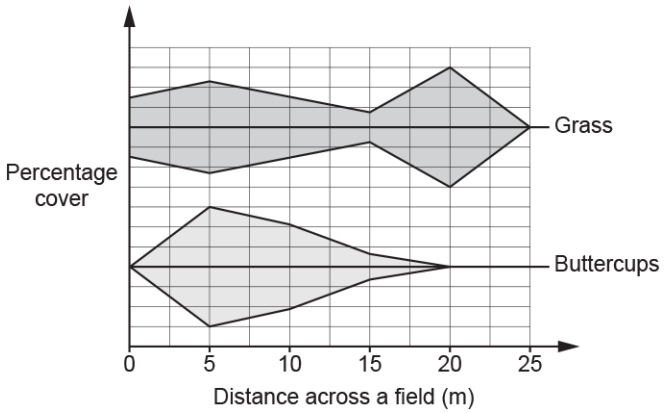
Monitoring & Maintaining the Environment (F)

1. 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]**

2. Many habitats are being destroyed.

Why is it important that we stop habitats from being destroyed?

A. to maintain biodiversity
B. to maintain homeostasis
C. to maintain active transport
D. to maintain differentiation

Your answer ☐

[1]

3. A scientist was studying a population of snails.

He caught 60 snails in the first sample. He marked them and released them.

He caught 50 snails in the second sample. 20 of the snails were marked.

Use this equation: $\text{estimated population} = \dfrac{\text{number caught in first sample} \times \text{number caught in second sample}}{\text{number in second sample that are marked}}$

What is the estimated population?

A 150
B 2400
C 3000
D 60 000

Your answer ☐ **[1]**

4. 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]**

5. Eva investigates the number of daisy plants growing on the school playing field.

She uses a quadrat to count the number of daisy plants growing in different areas of the field.

The table shows her results.

quadrat	number of daisy plants
1	8
2	2
3	7
4	5

Each quadrat has an area of 0.25 m^2.

The school playing field has an area of 15000 m^2.

Estimate the population of daisy plants growing on the school field.

A. 682
B. 82500
C. 330000
D. 1320000

Your answer ☐

[1]

6. Palm oil is used in the manufacture of biscuits, crisps, cereals and many other processed foods.

Palm oil production has a negative effect on the environment.

Which statement identifies a **negative** effect of palm oil production?

A. Palm oil plantations are found in countries with tropical rainforest.
B. Palm oil production has increased due to the demand for more processed food.
C. Palm oil plantations support a low biodiversity.
D. Palm oil production provides jobs for the local community.

Your answer ☐

[1]

7 (a). A salt marsh is a large, muddy area of land where a river joins the sea.

Student **A** and student **B** study the plants growing on a salt marsh.

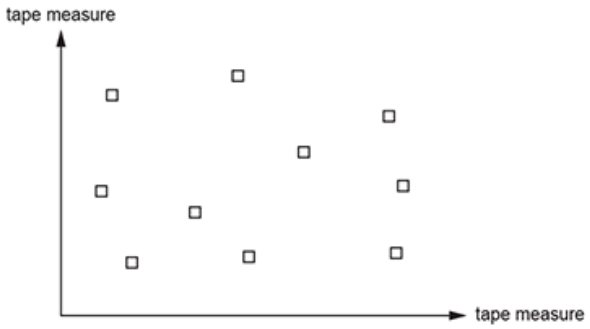
They both sample the plants present by laying out two tape measures at right angles across the salt marsh.

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

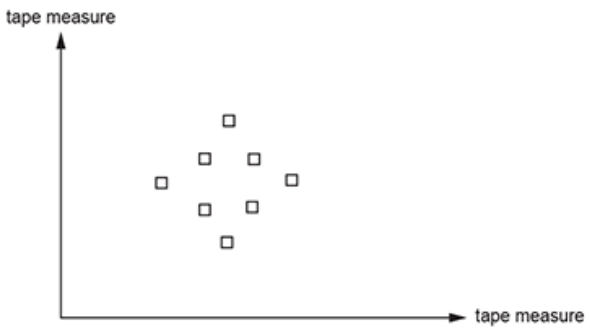
What is the name of the square frame that they use to sample the plants?

_____ **[1]**

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



Student **A**'s sampling



Student **B**'s sampling

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.

Percentage = ... % **[3]**

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

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explanation

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[3]

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.

1

2

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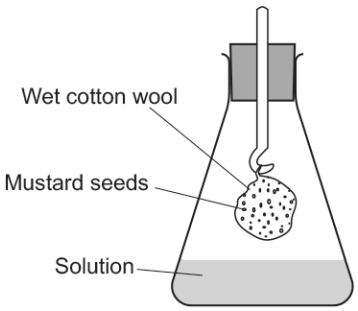
[2]

8. A student investigates the effect of acid rain on seed growth.

- She soaks cotton wool in a solution with a pH value of 7.0.
- She puts 20 mustard seeds onto the cotton wool and places it inside a flask.
- She adds the same solution to the flask.
- She then repeats this four times using solutions with different pH values.

One of the flasks is shown in the diagram.



After **8 days** she counts how many of the seeds are growing.

The table shows her results.

pH of solution	Number of the 20 seeds that are growing after 8 days
7.0	17
6.5	18
6.0	16
5.5	6
5.0	2

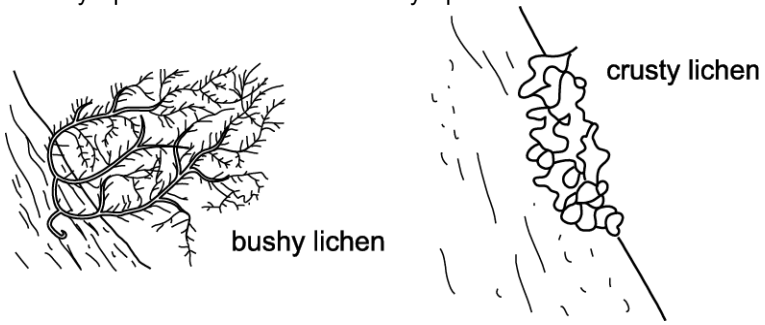
The student used 20 seeds in each flask.

Write down **one** other factor that the student should have kept the same in this investigation.

_____ **[1]**

9. Lichens are sensitive to pollution because they take up chemicals from the air.

The diagram shows a 'bushy' species of lichen and a 'crusty' species of lichen.



Bushy lichens are usually more sensitive to pollution than crusty lichens.

Use the diagrams to suggest why.

_____

_____ **[1]**

10. 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]**

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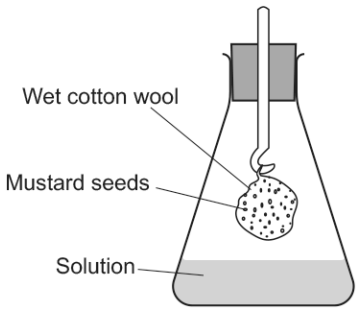

After **8 days** she counts how many of the seeds are growing.

The table shows her results.

pH of solution	Number of the 20 seeds that are growing after 8 days
7.0	17
6.5	18
6.0	16
5.5	6
5.0	2

The student used 20 seeds in each flask.

Describe what this investigation shows about the effect of acid rain on seed growth.

--- **[2]**

(b). One way to compare the growth of seeds is to use a germination index (**GI**).

Use the formula: $GI = \frac{\text{mean root length} \times \text{number of seeds that are growing}}{\text{number of days}}$

i. For the seeds at **pH 6.0**, the mean root length was 5 mm.

Calculate the **GI** for these seeds.

Answer = _____ **[2]**

ii. Look at the equation for **GI**.

This is a better way of measuring the effect of acid rain on seed growth than just counting the number of seeds growing.

Explain why.

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[1]

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

Fig. 18.1

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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[3]

(b). Scientists want to see if there is a link between the level of pollution in the air and the number of insects on trees.

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

Fig. 18.3 shows their results.

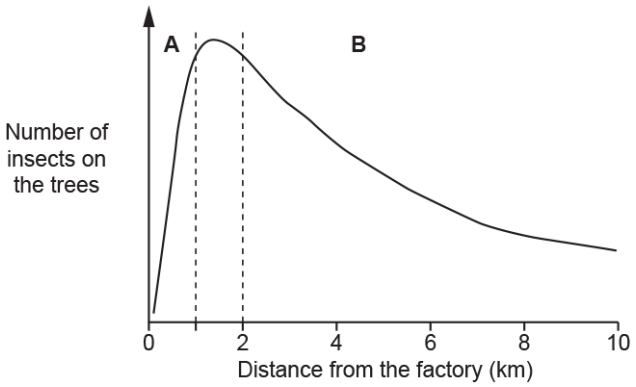

Fig. 18.3

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. ☐

[1]

(c). 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.

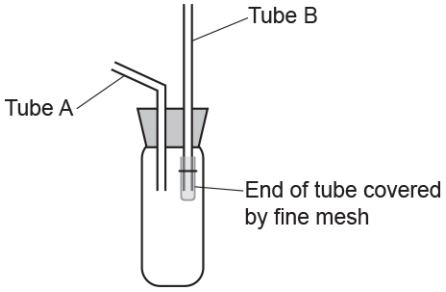


Fig. 18.2

They capture 25 insects from a 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.

_____

_____

_____ **[2]**

13 (a). Gardeners use dead plant material to make compost. They add this compost to soil where they are growing plants.

A new way of making compost is called bokashi. In this process the compost is made **anaerobically** in a different type of composter.

Scientists compare the normal methods of making compost with bokashi.

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.

Why did the scientists put the same mass of compost in each composter?

Tick (✓) **one** box.

To allow valid comparisons of the results. ☐

To decrease the temperature. ☐

To make the measurements more accurate. ☐

To make the results repeatable. ☐

[1]

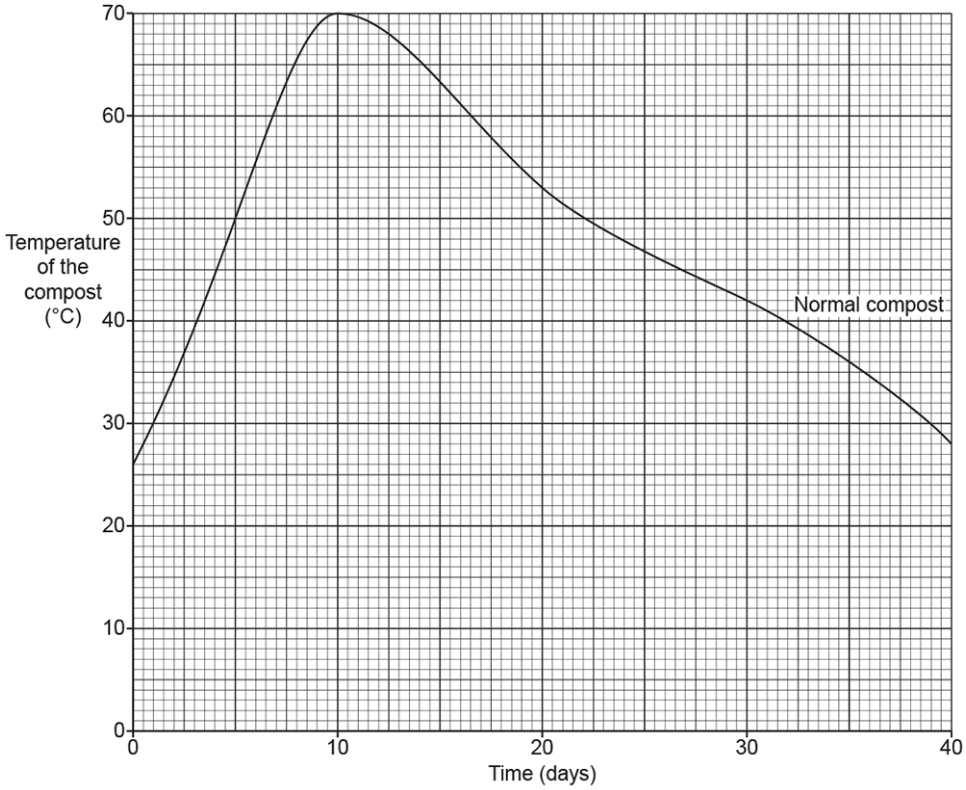
(b). Table 20.1 shows the scientists' temperature measurements.

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

Table 20.1

i. The scientists' results for the normal compost are plotted on the grid.

Complete the graph by plotting the results for the **bokashi** compost and draw a curve of best fit.



[3]

ii. Describe the change in the temperature of the **normal** compost during the investigation.

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[2]

iii. Use data from **Table 20.1** to calculate the difference between the maximum temperature of the normal compost and the maximum temperature of the bokashi compost.

Difference = ... °C **[2]**

iv. Which **two** statements explain this difference in temperature between the two types of compost?

Tick (✓) **two** boxes.

Both types of compost are made by aerobic respiration.	☐
Normal compost is made by aerobic respiration.	☐
Normal compost is made by anaerobic respiration.	☐
Aerobic respiration and anaerobic respiration release the same amount of energy.	☐
Aerobic respiration releases more energy than anaerobic respiration.	☐
Aerobic respiration releases less energy than anaerobic respiration.	☐

[2]

(c). Table 20.2 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)	760	1200

Table 20.2

i. The mass of the normal compost has decreased by 19 kg per day.

Calculate the decrease in mass of the bokashi compost per day.

Give your answer to the nearest **whole** number.

Decrease = ...kg per day **[3]**

ii. Carbon dioxide is given off in the making of the compost. This causes most of the decrease in mass.

Scientists think that the bokashi method of composting might be better for the environment.

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

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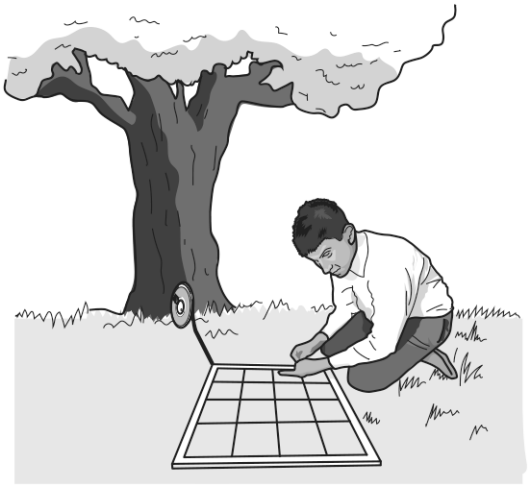
[1]

14. A student investigates plants growing underneath a tree.



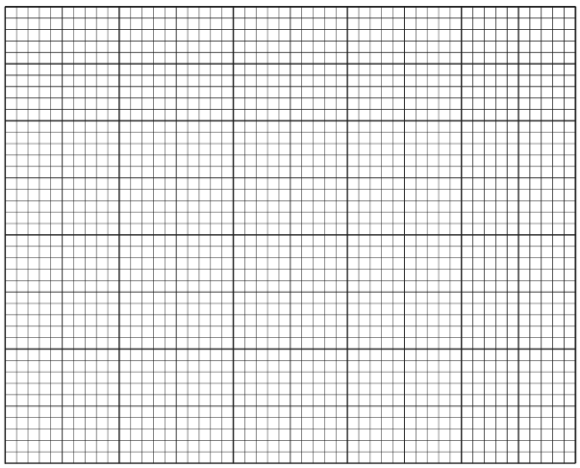
He lays out a tape measure on the ground, starting at the tree. He then places a quadrat on the ground.

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

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



[5]

15. A salt marsh is a large, muddy area of land where a river joins the sea.

* In some salt marshes large sand banks have been built. These stop tides from entering the salt marsh. The level of soil on the salt marsh builds up and the marsh turns into dry land.

Local farmers want to turn salt marshes into dry land and other people want to leave it as a salt marsh.

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

_____

_____

_____

_____

_____

_____

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_____

_____ **[6]**

16. The rock pocket mouse is a small grey coloured mouse that lives in Mexico.

These mice are the main food for owls.

Rattlesnakes also feed on these mice.

The mice get most of their food from grass plants.

Scientists want to construct a pyramid of biomass for this food web.

They first need to estimate how many organisms there are in the area.

They decide to do this using sampling.

i. Describe how the scientists would sample an area and ensure that the sample was not biased

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[2]

ii. * To estimate grass cover and the number of animals, they use a quadrat.

Why do scientists use sampling when studying the organisms living in a habitat?

Identify the limitations of this method and potential improvements that could be made to ensure that the estimated population size of plants and animals closely matches the actual value.

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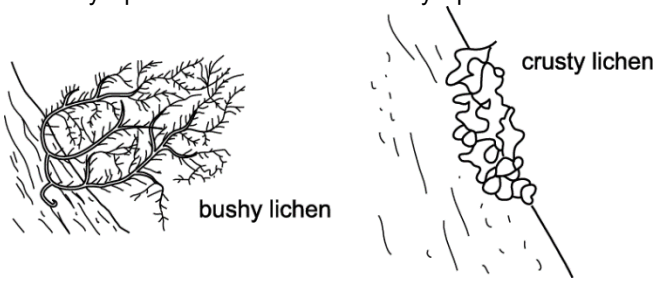
[6]

17. Lichens are sensitive to pollution because they take up chemicals from the air.

The diagram shows a 'bushy' species of lichen and a 'crusty' species of lichen.



Bushy lichens are usually more sensitive to pollution than crusty lichens.

Students decide to use lichens to try and work out how polluted their school grounds are.

They read about a scale called the Lichen Diversity Value (LDV).

It is worked out in this way:

- choose four trees in the area
- hold a quadrat on the north side of the trunk of one tree
- count the total number of all the lichens in the quadrat
- then do this on the east, south and west side of the tree
- repeat this for each tree.

i. Suggest how the students could choose four trees.

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[1]

ii. The students put their results into a table.

	Number of individual lichens found in each quadrat			
Tree number	North	East	South	West
1	3	11	18	7
2	4	12	17	8
3	5	10	15	12
4	4	15	12	9
mean	4.0	12.0	15.5	

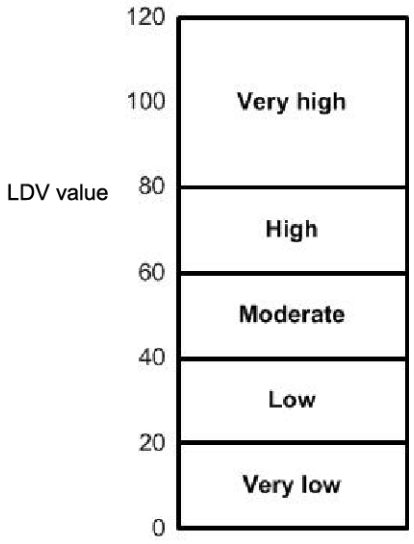
The LDV is found by adding together the four mean values.

The students calculate the mean number of lichens on the north, east and south sides of the trees.

Calculate the mean for the west side and use this to calculate the LDV.

LDV = ... **[2]**

iii. This scale shows the type of diversity shown by the LDV.



What does the LDV show about the amount of diversity in the school grounds?

_____

_____ **[2]**

iv. LDV is calculated by counting all the lichens present.

What else about the lichens could the students look for to make a better assessment of pollution?

_____

_____

_____

_____

_____ **[3]**

END OF QUESTION PAPER