Cambridge Assessment International Education

Cambridge International AS Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ENVIRONMENTAL MANAGEMENT **8291/22**

Paper 2 Management in Context **October/November 2024**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- You may use a calculator.
- You should show all your working and use appropriate units.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **24** pages. Any blank pages are indicated.

[Turn over

1 Fig. 1.1 shows a vertical aquaculture farm.

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Fig. 1.1

In Fig. 1.1, seaweed grows from ropes under the water. Shellfish such as mussels grow on chains. Scallops and oysters are farmed in nets and cages.

Seaweed photosynthesises. Some species of seaweed grow up to 0.5 m in one day.

The seaweed is harvested for use as human and animal food, organic fertiliser and biofuel; it is also used as an ingredient in natural medicines, cosmetics and bioplastics.

Any seaweed that is not harvested falls to the sea floor and is covered by layers of sediment.

(a) Vertical aquaculture farming is an example of adaptation to climate change.

(i) Suggest why some crop farmers need to adapt to climate change by investing in aquaculture.

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..... [3]

(ii) Suggest how vertical aquaculture can reduce the concentration of carbon dioxide in the atmosphere.

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(iii) Suggest **one** benefit of vertical aquaculture farming other than reducing the impacts of climate change.

..... [1]

(b) Fig. 1.2 shows the annual yield of seaweed from aquaculture farms in China from 1978 to 2014.

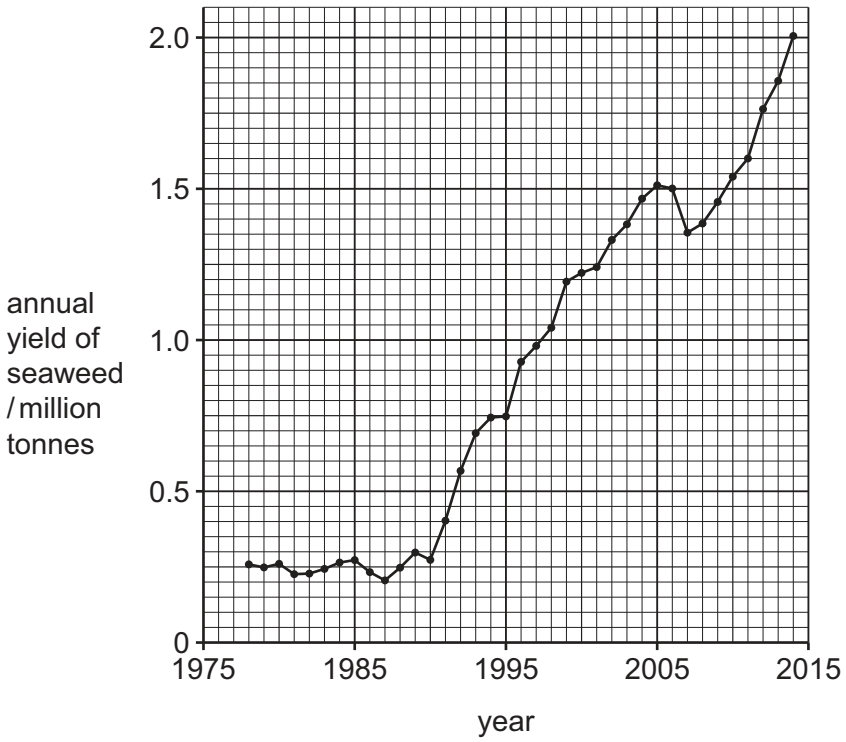

Fig. 1.2

(i) Describe the trend in the annual yield of seaweed from aquaculture farms in China from 1978 to 2014.

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..... [3]

(ii) Suggest **one** reason for a decrease in annual yield of seaweed from aquaculture farms.

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..... [1]

(c) The seaweed aquaculture farming sector is predicted to grow.

Fig. 1.3 shows three predictions for global yield of seaweed from aquaculture farms based on three different percentage growth rates.

Key

percentage growth rate per year

- 6%
- 12%
- 20%

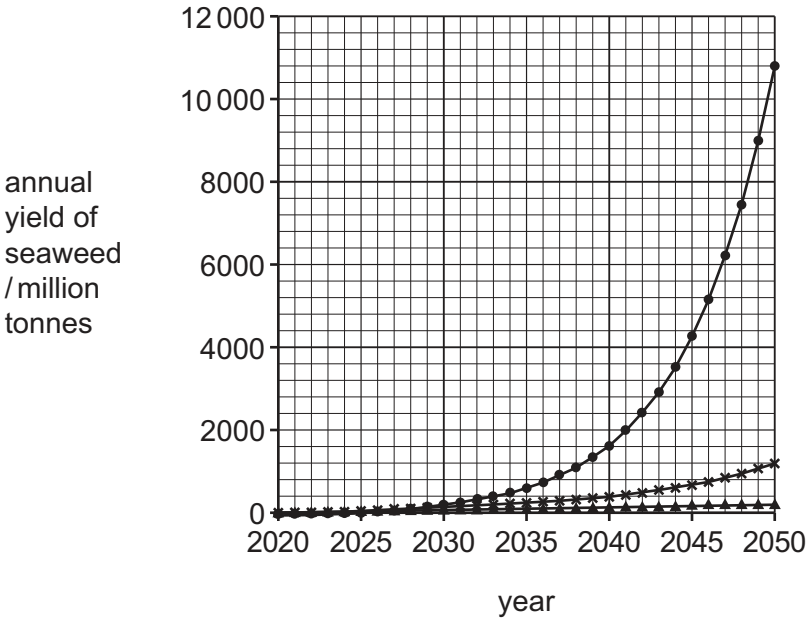

Fig. 1.3

Table 1.1 shows the area of ocean required by 2050 for each percentage growth rate.

Table 1.1

percentage growth rate per year	area of ocean required by 2050 / km^2
6	12 797
12	74 524
20	677 832

Suggest why there is concern about the impact of a 20% growth rate in global aquaculture.

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..... [2]

(d) Overfishing impacts ecosystems.

Describe strategies for reducing the impact of overfishing.

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..... [3]

(e) The ocean is a source of salt water.

(i) State **three** sources of surface fresh water.

1 .....

2 .....

3 .....

[3]

(ii) The atmosphere contains water vapour.

State **three** other gases in unpolluted air.

1 .....

2 .....

3 .....

[3]

(f) Water is an abiotic component of an ecosystem.

State **three** other abiotic components of an ecosystem.

1 .....

2 .....

3 .....

[3]

[Total: 25]

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2 **(a)** Bats are flying nocturnal mammals. They are active at night time and feed on insects.

Fig. 2.1 shows a bat. This species of bat has a wingspan of approximately 12 cm.

Fig. 2.1

A biologist investigates bat activity using an electronic detector.

The bats nest in a cave. The detector counts the number of bat flights into and out of the cave for 70 nights.

The bat activity for each night is calculated as a percentage of the total activity for the 70-day period.

The number of insects near the cave is recorded for the same number of nights.

Fig. 2.2 shows the results.

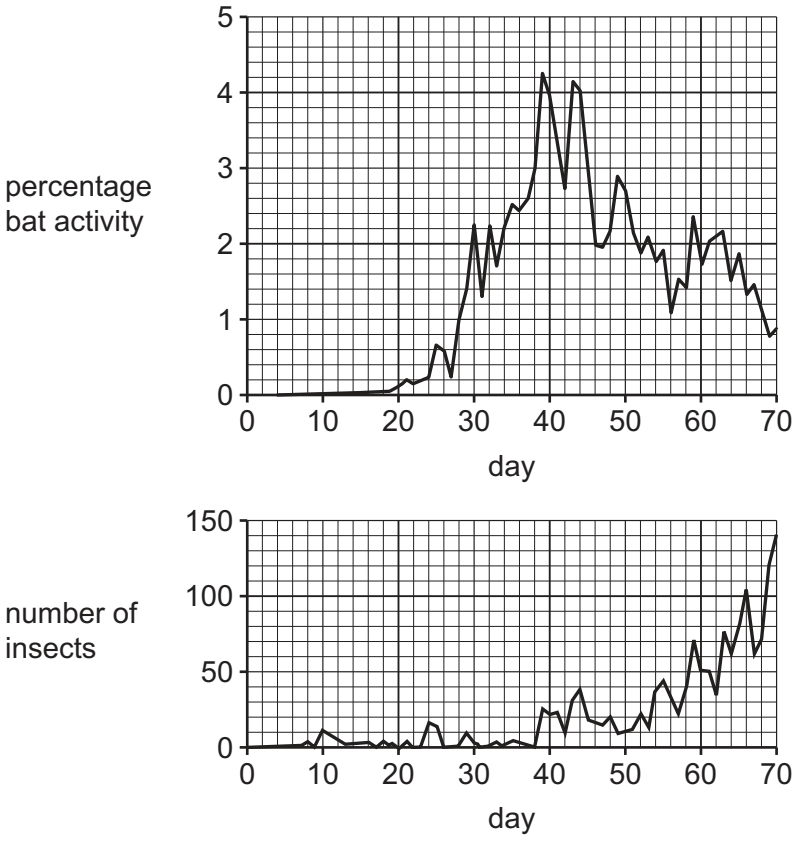

Fig. 2.2

(i) Data is collected from a second electronic detector that does **not** record bat activity.

Suggest why this data is collected.

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..... [1]

(ii) The biologist hypothesises that bat activity increases when insect numbers increase.

Conclude whether the data in Fig. 2.2 supports the biologist's hypothesis. Give a reason to support your conclusion.

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..... [1]

(iii) Suggest why the data in Fig. 2.2 is **not** used to predict the population of the bats in the cave.

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..... [1]

(b) Bats travel between 0.5 km and 65 km to find food.

Suggest how the distance bats travel from the cave for food can be investigated.

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..... [2]

(c) Some species of bats are endangered.

Explain the role of the Convention on International Trade in Endangered Species (CITES) in conserving bat populations.

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..... [3]

(d) The data for the number of insects in Fig. 2.2 were collected using the large suction device shown in Fig. 2.3.

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Fig. 2.3

Suggest the benefits and limitations of using this large suction device to monitor insect population.

benefits .....

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limitations .....

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[4]

[Total: 12]

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3 Gold is a valuable metal.

(a) Mercury, Hg, is used to extract gold in small-scale gold mining.

Mercury is mixed with gold-containing minerals. The gold dissolves in mercury. The mercury-gold mixture is then heated. The mercury is converted into a gas and the gold is left to cool and become solid.

Fig. 3.1 shows how gaseous mercury is deposited onto the land.

Key

Hg dust and gases

Hg water

Hg leaf

Hg mercury

→ movement of mercury (Hg)

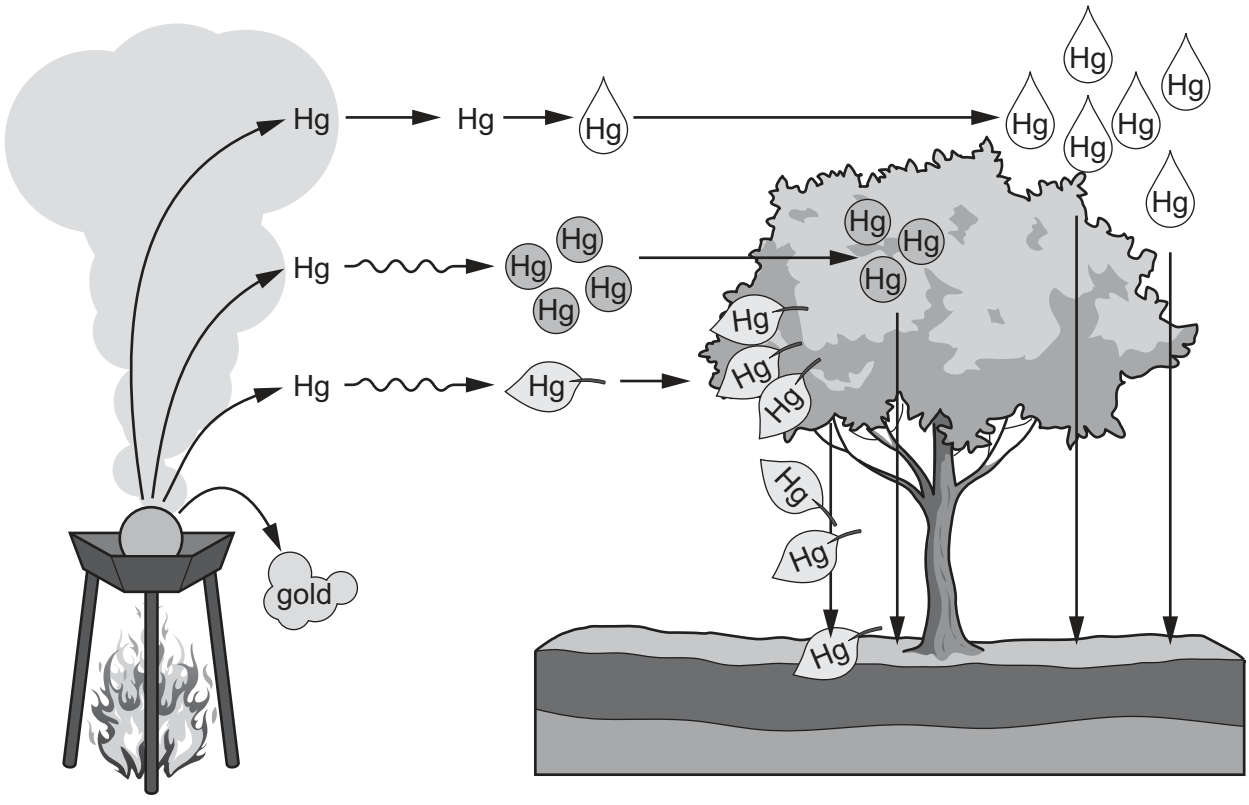

Fig. 3.1

Use Fig. 3.1 to explain how mercury is deposited onto the land.

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..... [4]

(b) A chemist analyses soil samples from villages close to small-scale gold mines in five countries.

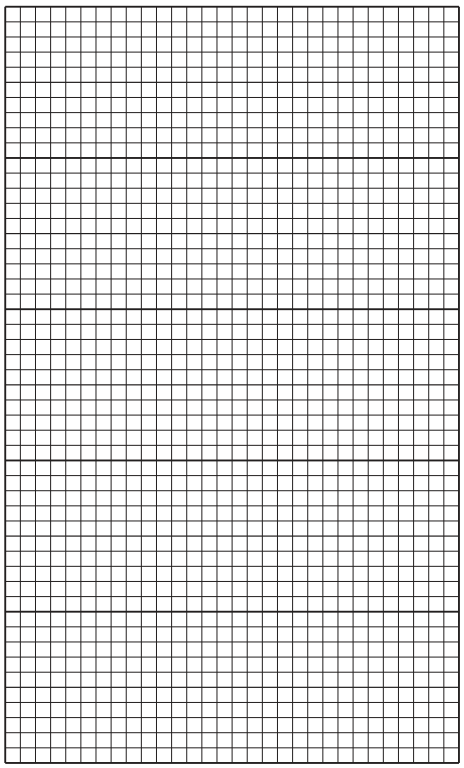
Table 3.1 shows the results.

Table 3.1

country	mercury concentration /μg per g*
China	4.5
Ghana	5.0
Peru	44.0
Tanzania	9.0
Venezuela	27.0

* μg of mercury per g of soil

Plot the data as a bar chart on the grid.



[4]

(c) Many gold reserves are buried under areas of tropical rainforest.

Fig. 3.2 shows an illegal gold mine in the Amazon rainforest.

Fig. 3.2

Describe the impact of gold mining on the rainforest in Fig. 3.2.

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..... [4]

(d) The polluter pays principle is a strategy for managing the impacts of pollution.

(i) Describe how the polluter pays principle could manage the impacts of gold mining.

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..... [2]

(ii) State **two** limitations of this principle for dealing with the impacts shown in Fig. 3.2.

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2 .....

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[2]

(e) Sustainable management of resources is an environmental management strategy.

(i) Define the term sustainability.

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(ii) Suggest **two** strategies for managing gold as a resource.

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2 .....

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[2]

[Total: 20]

4 **(a)** Fig. 4.1 shows areas of tundra biome.

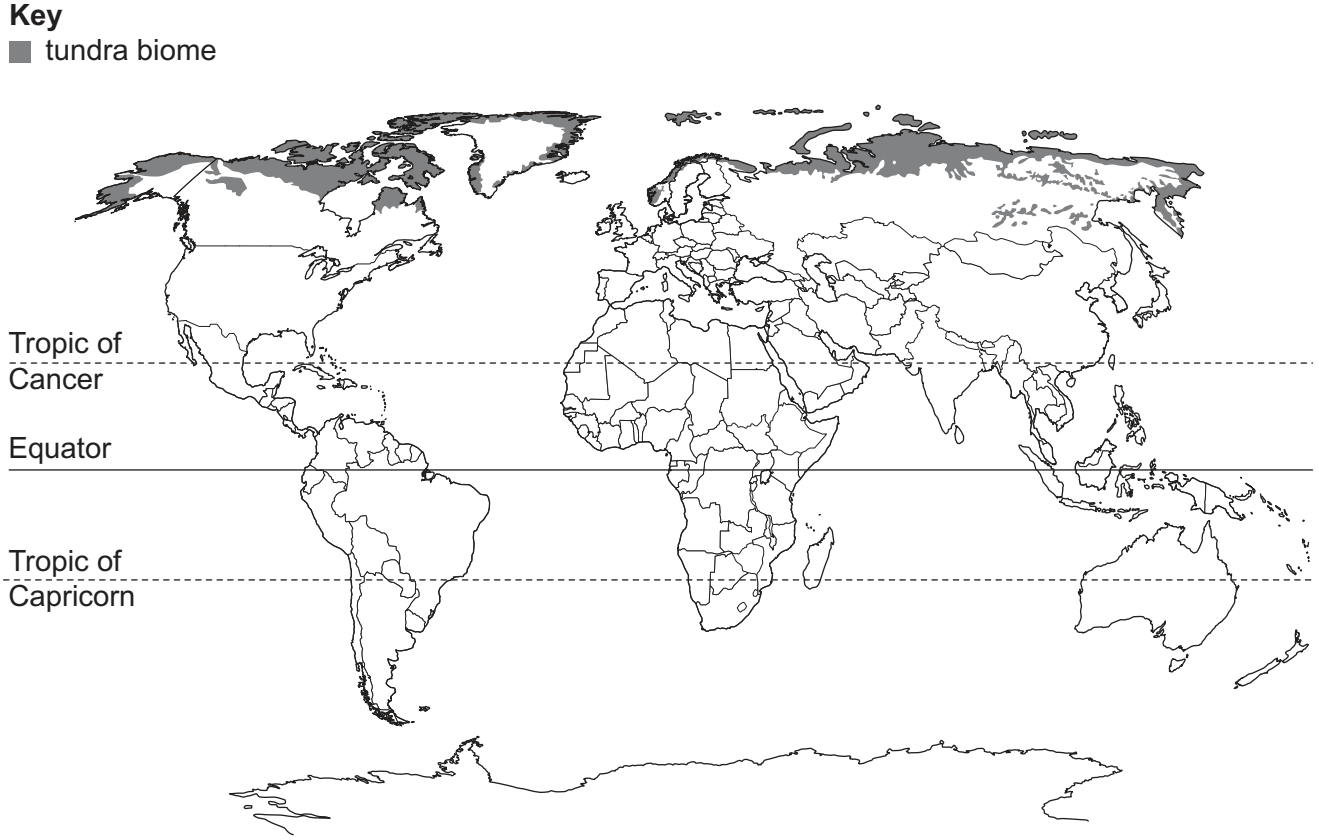

Fig. 4.1

Describe the distribution of tundra biome shown on Fig. 4.1.

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..... [3]

(b) Fig. 4.2 shows climate data for a tundra biome.

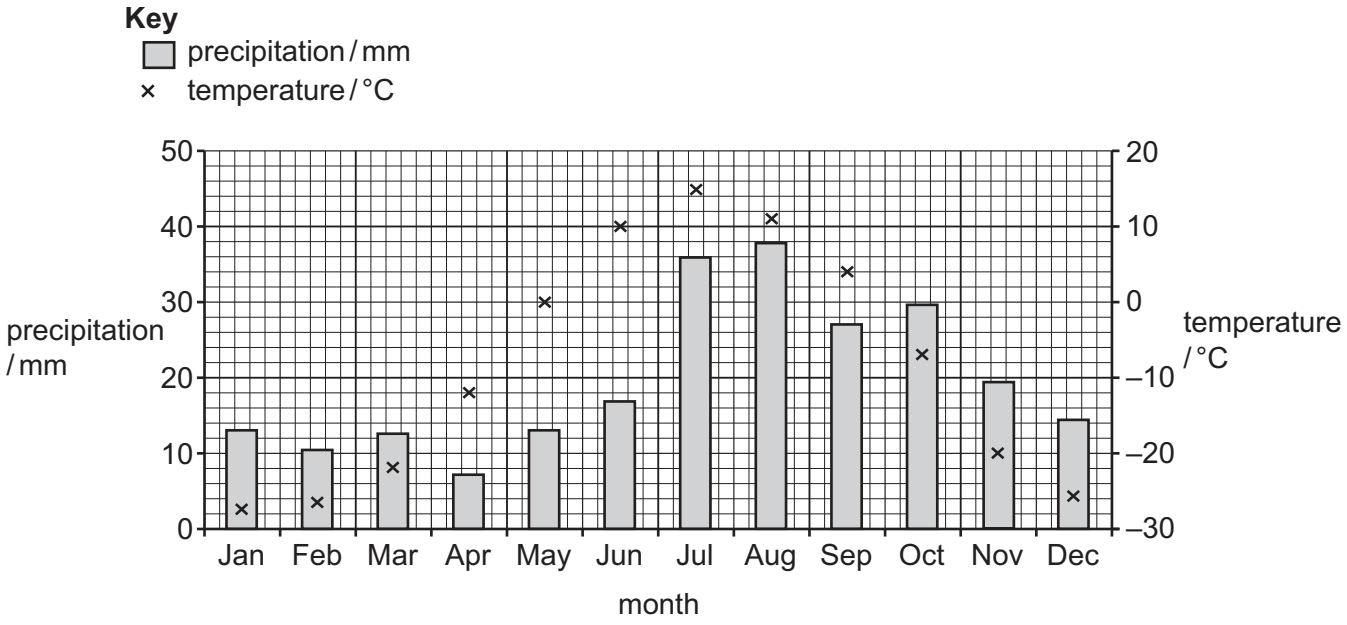

Fig. 4.2

(i) Complete Fig. 4.2 by drawing a line between data points for the temperature data. [1]

(ii) Calculate the range in precipitation for the tundra biome in Fig. 4.2.

..... mm [1]

(iii) A tundra biome receives 250 mm of precipitation a year.

A rainforest biome receives 2000 mm of precipitation a year.

Calculate the simplest whole number ratio for precipitation in the tundra biome compared to the rainforest biome.

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

(iv) Circle **all** the types of vegetation associated with a tundra biome.

cactus **fern** **lichen** **moss** **palm tree** **vine**

[1]

(v) Suggest why crops are **not** grown in tundra biomes.

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..... [4]

(c) A scientist uses a quadrat to investigate plant biodiversity in a tundra biome.

(i) The scientist randomly selects one location on one day.

Suggest how the location is selected at random.

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..... [2]

(ii) The scientist uses a systematic sampling strategy to position 5 quadrats along a 10 m sampling line (transect).

Complete Fig. 4.3 to show suitable positions for the 5 quadrats.

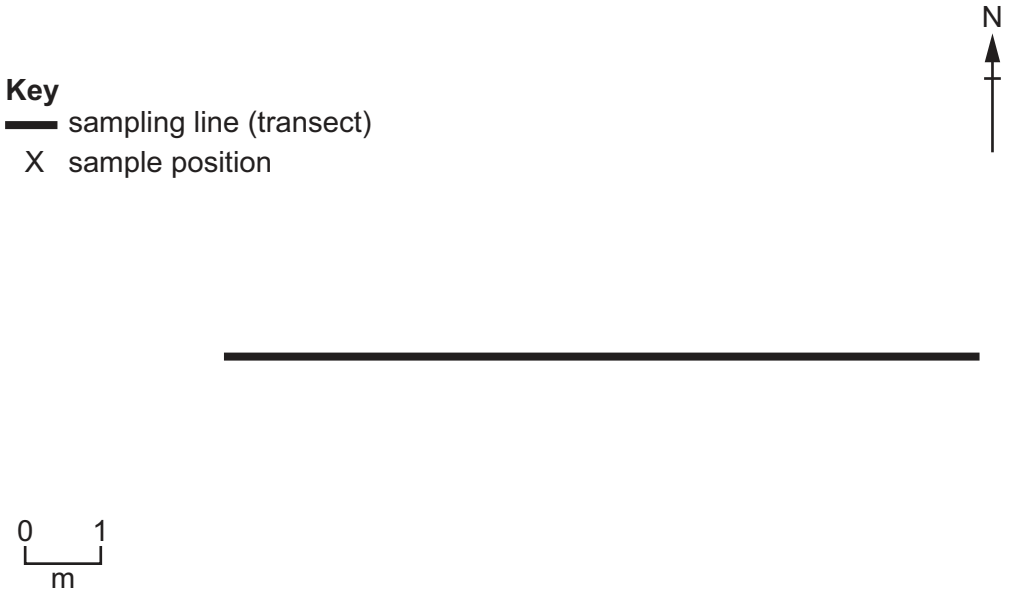

Fig. 4.3

[2]

(iii) Describe limitations of the scientist's method of investigating plant biodiversity in the tundra biome.

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..... [3]

(d) Table 4.1 shows the results of the investigation.

Table 4.1

plant species	number of plants (n)
U	2
V	9
W	1
Y	3
Z	1

The scientist uses Simpson's index of diversity to reach a conclusion about the biodiversity of plant species in the tundra biome.

(i) Use the following steps to calculate Simpson's index of diversity (D).

- Calculate the total number of plants (N).

N = ...

- Calculate $\left(\frac{n}{N}\right)^2$ for each plant species.

U = ...

V = ...

W = ...

Y = ...

Z = ...

- Calculate $\Sigma\left(\frac{n}{N}\right)^2$.

$\Sigma\left(\frac{n}{N}\right)^2$ = ...

- Calculate D using the formula shown.

$$D = 1 - \left(\Sigma\left(\frac{n}{N}\right)^2\right)$$

D = ...

[4]

(ii) Suggest how the value of D for a tundra biome would be different for a rainforest biome. Give a reason for your answer.

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..... [1]

[Total: 23]

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