Cambridge Assessment International Education

Cambridge International AS Level

CANDIDATE NAME									
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2950264744

ENVIRONMENTAL MANAGEMENT **8291/21**

Paper 2 Management in Context **October/November 2022**

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 is a map of Singapore, Southeast Asia.

Singapore is comprised of 63 islands, with a total surface area of land of 721.5 km^2.

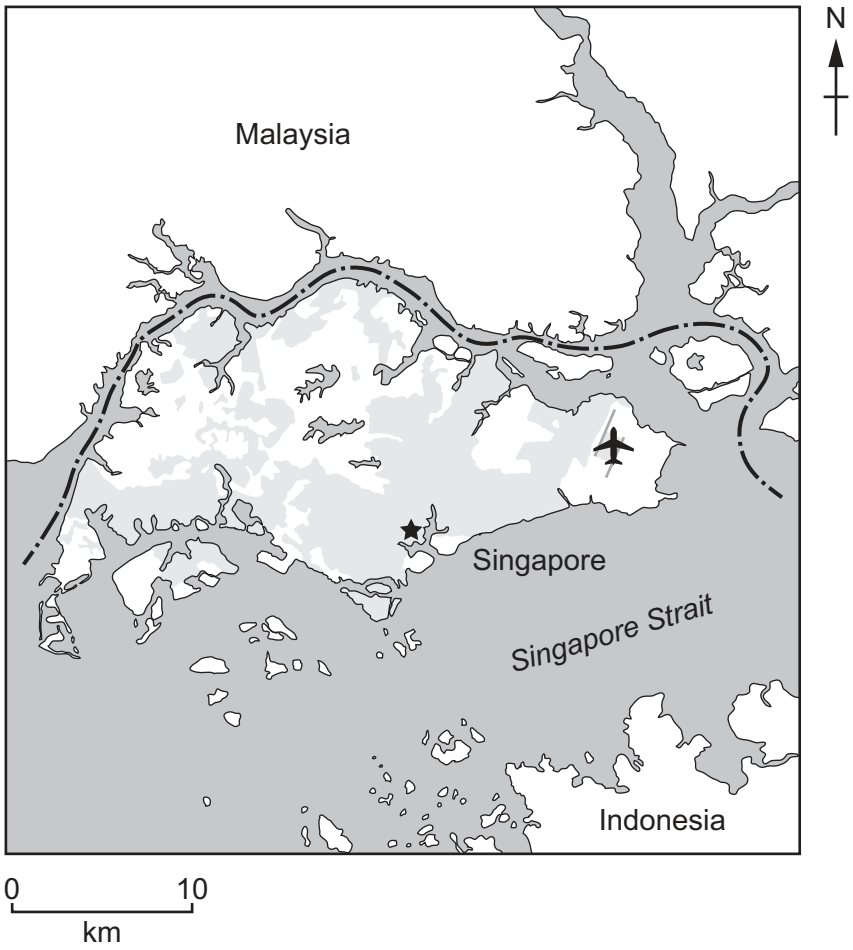

Fig. 1.1

In 2020, the population of Singapore was 5 850 000.

(a) Singapore has a high population density.

(i) Calculate the population density for Singapore in 2020.

..... people km^{-2} [1]

(ii) Explain the challenges that a high population density can cause a country.

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..... [3]

(b) Fig. 1.2 shows the population pyramid for Singapore in 2020.

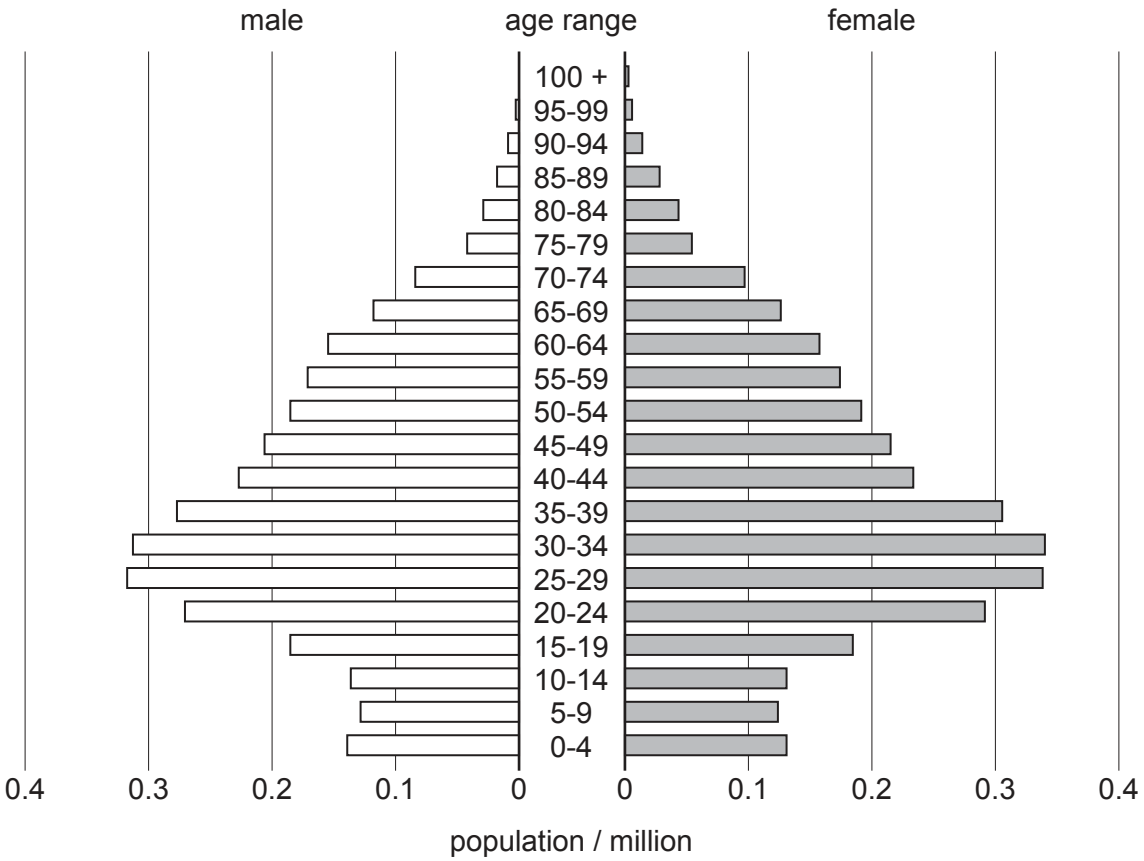

Fig. 1.2

(i) Compare the population structure of males and females in Singapore.

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..... [4]

(ii) Suggest how this population pyramid indicates that Singapore has an economy of a high income country (HIC).

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..... [2]

(c) Suggest why Singapore is at high risk from the effects of climate change.

Give reasons for your answer.

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..... [2]

(d) Solar radiation management (SRM) is a theoretical strategy to reduce the impact of climate change.

(i) One SRM strategy is to spray sulfate aerosol particles into the stratosphere.

Explain how this could reduce the impact of climate change.

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..... [2]

(ii) Suggest why some scientists think investing in technology to reduce the combustion of fossil fuels is more important than investing in SRM technology.

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..... [2]

[Total: 16]

[Turn over

2 **(a)** Fig. 2.1 shows a photograph of an area of densely forested land affected by human activity.

Fig. 2.1

(i) Suggest reasons why there is a reduction in forest cover shown in Fig. 2.1.

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..... [2]

(ii) Explain why forest fragmentation can lead to loss of biodiversity.

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..... [3]

(b) Explain how trees absorb carbon dioxide from the atmosphere.

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..... [3]

(c) Two types of tree, conifer and broadleaf, are considered for planting in a managed forest.

The graph in Fig. 2.2 shows predicted data for the quantity of carbon stored by the two types of tree in a 50-hectare forest.

The quantity of carbon stored is measured in carbon dioxide equivalent tonnes, tCO_2e.

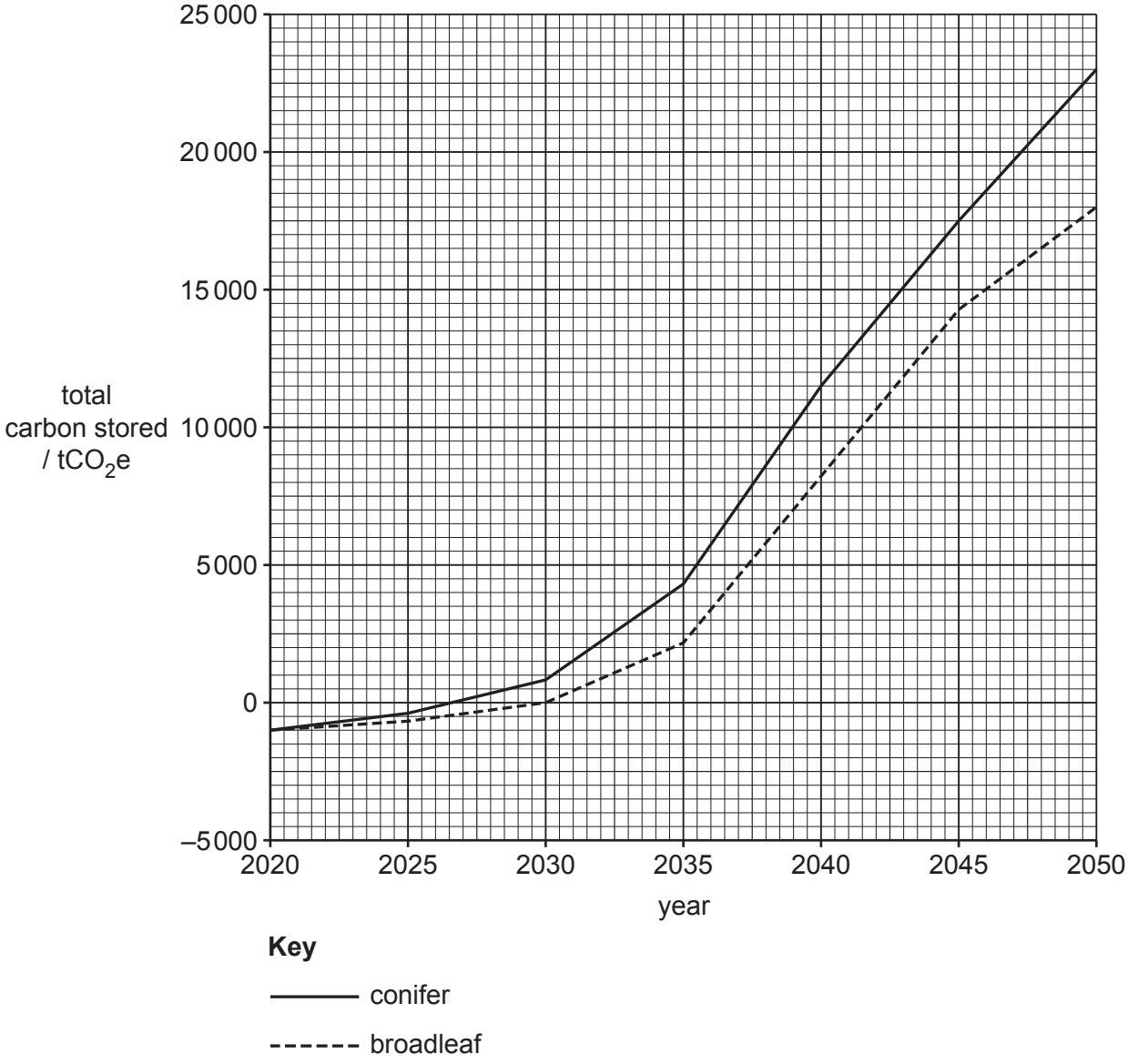


Fig. 2.2

(i) Use Fig. 2.2 to calculate the percentage increase in quantity of carbon stored from 2020 to 2050 for conifer trees.

percentage = ... [2]

(ii) Recommend which type of tree, conifer or broadleaf, should be planted in the managed forest.

Give a reason for your answer.

.....

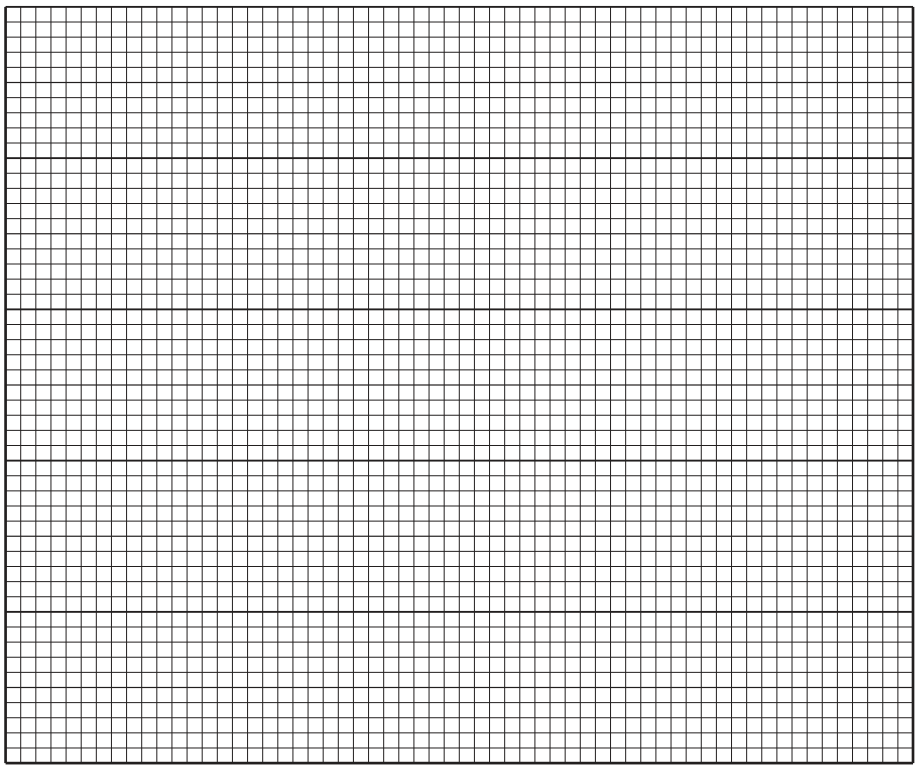
..... [1]

(d) Table 2.1 shows historical data for forest areas planted in eight countries in 2015.

Table 2.1

country	forest area / million ha
Brazil	8
China	79
India	12
Japan	10
Russia	20
Sweden	14
UK	3
USA	26

(i) Plot the data as a bar chart.



[4]

(ii) Suggest why some countries plant more trees than other countries.

.....

..... [1]

[Total: 16]

3 Fig. 3.1 shows a photograph of Stockton mine, a large coal mine in New Zealand.

Fig. 3.1

(a) Coal is a fossil fuel. It is a non-renewable energy resource.

(i) State **one** non-renewable energy resource, other than coal.

..... [1]

(ii) Explain why fossil fuel depletion can lead to energy insecurity.

.....

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..... [2]

(iii) Rationing fossil fuels is a strategy to manage energy insecurity.

Outline **one** advantage and **one** disadvantage of this strategy.

advantage .....

.....

disadvantage .....

.....

[2]

(b) The location of the coal mine was the only known habitat of a species of snail, the Mount Augustus snail.

Fig. 3.2 is a drawing of a Mount Augustus snail.

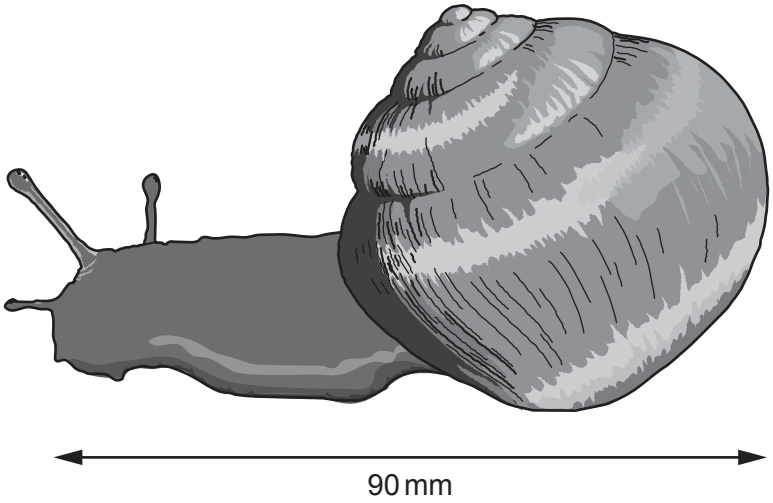

Fig. 3.2

Before mining started, the mining company was required to move Mount Augustus snails from the area of the planned coal mine. This took two years.

4000 snails were moved to locations nearby. The population of the snails was monitored using a capture-mark-recapture method. Pitfall traps were used to collect the snails.

(i) Describe a capture-mark-recapture method to estimate the population of the Mount Augustus snails using a pitfall trap.

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..... [5]

(ii) Assumptions are made when using capture-mark-recapture methods of estimating populations.

One assumption is that during the survey period there are no deaths or births within the population surveyed.

State **two** other assumptions.

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..... [2]

(c) The results of a snail capture-mark-recapture survey are shown in Table 3.1.

Table 3.1

recapture date	number of snails in first sample, n_1	numbers of marked and unmarked snails in second sample, n_2	number of marked snails in second sample, m_2	estimate of population size, N
July 2010	148	160	6	3947
July 2011	151	135	5	.....
July 2012	130	145	5	3770
July 2013	142	152	6	3597
July 2014	133	147	8	2444
July 2015	75	60	2	2250

The Lincoln index is used to estimate population size using the formula shown.

$$N = \frac{n_1 \times n_2}{m_2}$$

(i) Complete Table 3.1 by calculating the estimated population size, N, for July 2011. [1]

(ii) Use Table 3.1 to write a suitable conclusion about the population of snails.

.....

..... [1]

(iii) 50 snails were tagged with a radio tracking device to record their location after they were released back into the wild.

After 18 months, 30% of the snails had died.

Calculate the number of snails that were alive after 18 months.

..... [2]

(iv) 2000 Mount Augustus snails were **not** released back into the wild. These snails were kept in captivity.

Suggest reasons why.

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..... [2]

(d) A food chain for the Mount Augustus snail is shown.

grass → earthworm → Mount Augustus snail → rat

(i) Identify the primary consumer in this food chain.

..... [1]

(ii) Rats can spread diseases. Poison is used to control rats.

Suggest the disadvantage of using poison to control rats.

.....

..... [1]

(e) A scientist wanted to investigate the best diet to feed the Mount Augustus snails kept in captivity.

The scientist used this method:

- select 10 snails
- label the snails 1 to 10
- record the mass of each snail at the start
- feed five snails diet **A** for 10 weeks
    - diet **A** – earthworms
- feed five different snails diet **B** for 10 weeks
    - diet **B** – earthworms and calcium
- record the mass of each snail after 10 weeks.

Table 3.2 shows the results.

Table 3.2

snail	diet **A**		change in mass / g	snail	diet **B**		change in mass / g
	mass of snail				mass of snail		
	at start / g	after 10 weeks / g			at start / g	after 10 weeks / g	
1	80	80	0	6	75	79	+4
2	81	82	+1	7	72	80	+8
3	93	91	.....	8	87	95	+8
4	73	75	+2	9	93	97	+6
5	79	55	-24	10	85	92	+7

(i) Complete Table 3.2 for snail 3, diet **A**. [2]

(ii) Calculate the average change in mass for diet **B**.

..... g [1]

(iii) Suggest a reason for the result for snail 5, diet **A**.

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..... [1]

(iv) Use Table 3.2 to write a conclusion for the investigation.

Give a reason for your conclusion.

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..... [1]

[Total: 25]

4 **(a)** Fig. 4.1 shows the variation in minimum daily ozone over Antarctica from 1980 to 2019.

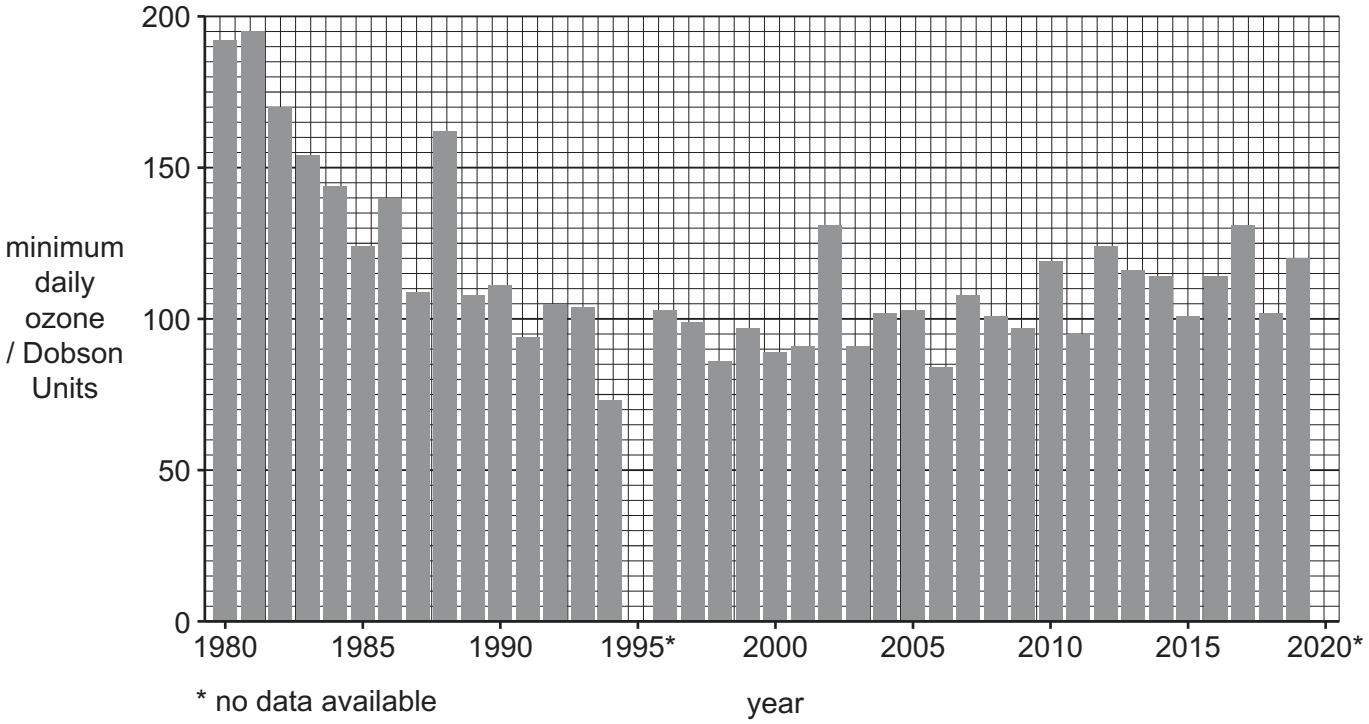

Fig. 4.1

(i) Describe the trend in minimum daily ozone over Antarctica from 1980 to 2019.

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..... [3]

(ii) Give reasons for the trend shown by the data in Fig. 4.1.

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..... [2]

(iii) The ozone hole is defined as an area where the average concentration of ozone is less than 100 Dobson Units.

Use the data in Fig. 4.1 to state the number of years where an ozone hole existed over Antarctica.

..... years [1]

(iv) State **two** impacts of ozone depletion on human health.

1 .....

2 .....
[2]

(b) Scientists study data from Antarctic ice cores for information on climate change.

Fig. 4.2 shows the estimated historic concentration of carbon dioxide in the atmosphere.

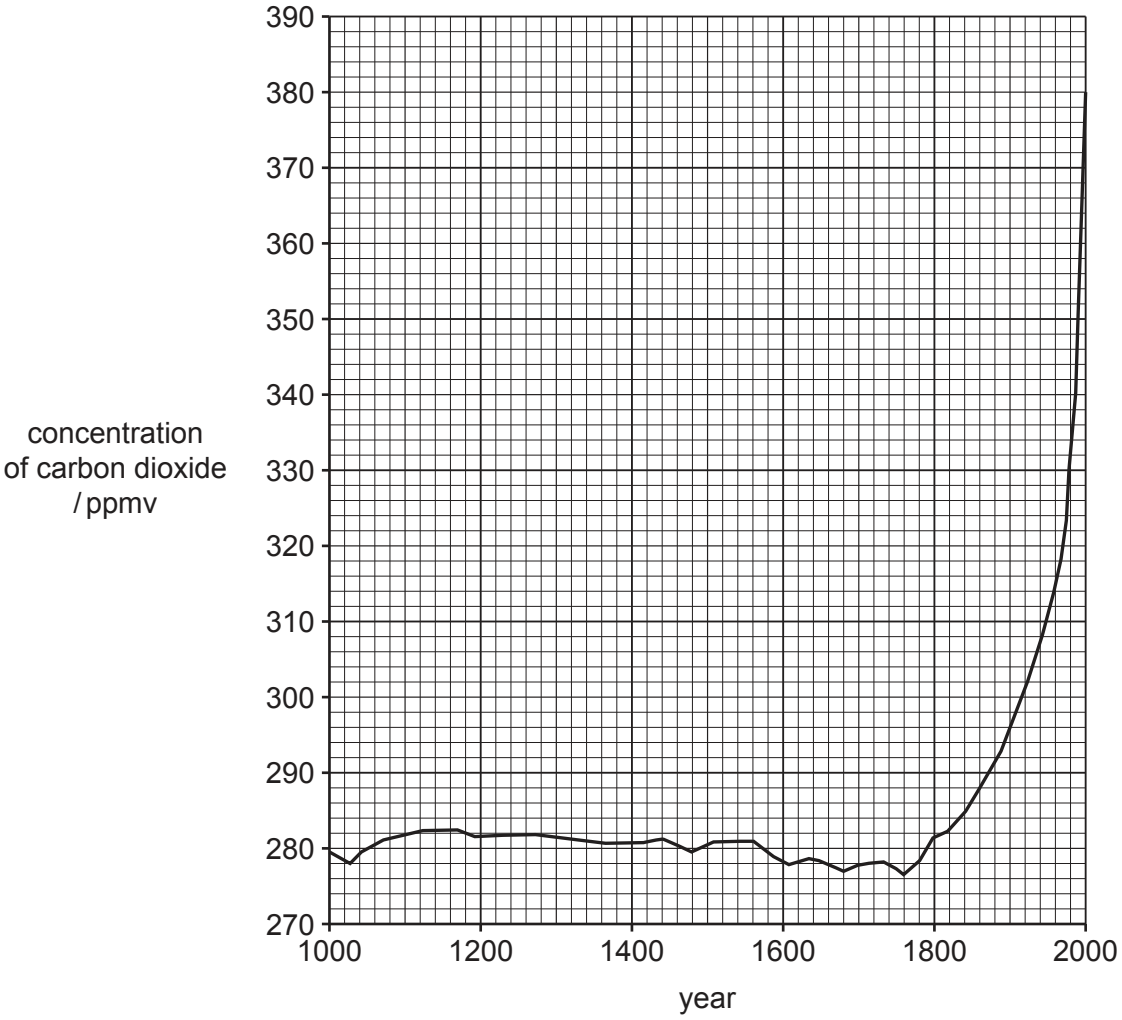

Fig. 4.2

(i) Use Fig. 4.2 to describe the trend shown by the data for the concentration of carbon dioxide.

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..... [2]

(ii) Mathematical models are used to predict future atmospheric concentrations of carbon dioxide.

Outline the difficulties of predicting future atmospheric carbon dioxide concentrations.

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..... [3]

(iii) Fig. 4.3 shows the estimated historic concentration of methane in the atmosphere from the year 1000 to 1600.

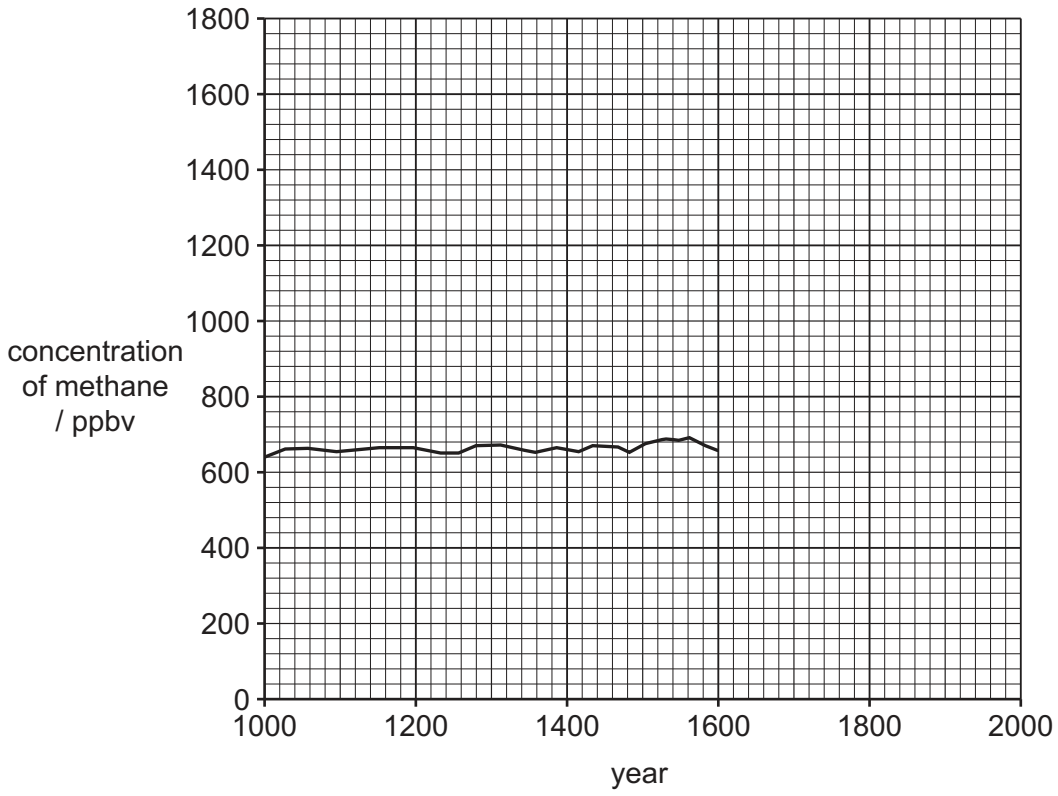

Fig. 4.3

Complete Fig. 4.3 to suggest the shape of the graph for the concentration of methane from 1600 to 2000. [1]

[Total: 14]

5 Approximately 623 million people practise open defecation. Open defecation is going to the toilet outside in fields, water bodies and open spaces.

(a) A recent report said:

'Eliminating open defecation is an important part in the effort to eliminate poverty.'

Suggest why stopping open defecation can help reduce poverty.

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..... [3]

(b) Fig. 5.1 shows the EcoSan toilet used in rural locations in India.

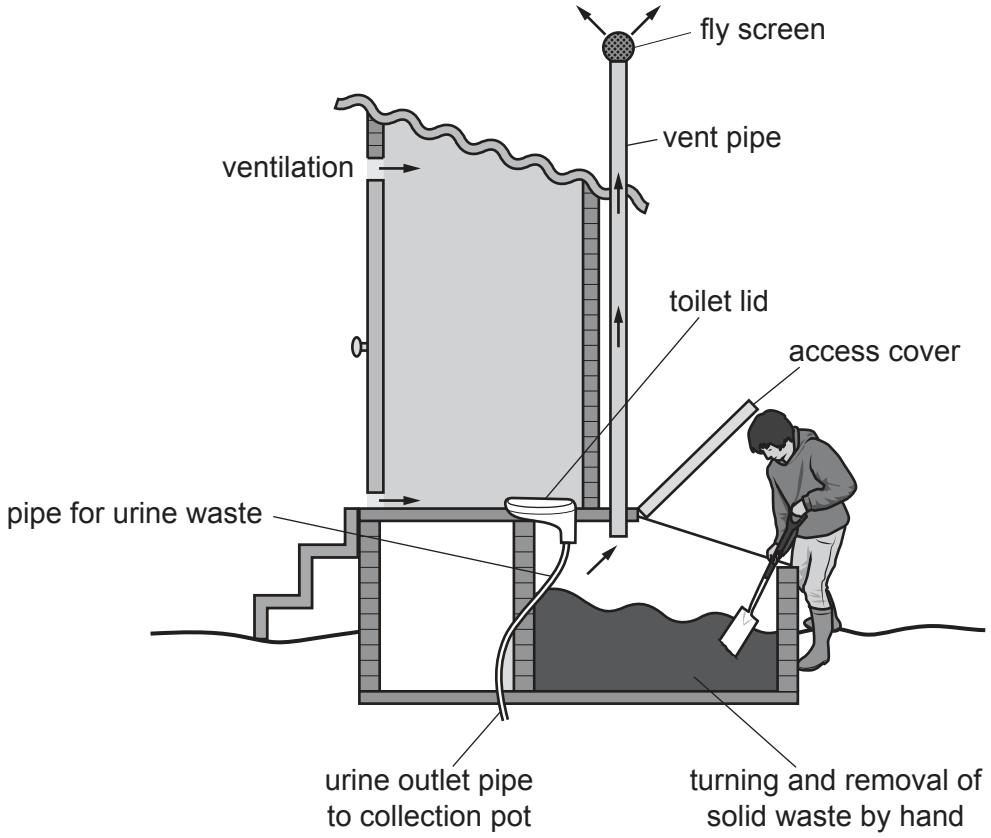

Fig. 5.1

(i) The EcoSan toilet does **not** use any water.

Suggest reasons why a toilet that does **not** use water is a benefit to rural communities in India.

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..... [2]

(ii) Urine and solid waste are separated in the EcoSan. Every time the toilet lid is opened, the solid waste is automatically moved. The solid waste is regularly turned by hand.

This process dries the waste. After 25 days the dried waste is reduced in mass by 5–10% and can be collected in bags.

Suggest why drying the waste is a benefit of the EcoSan.

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..... [1]

(iii) Suggest why some local people do **not** use the EcoSan even though it is available in their community.

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..... [2]

(iv) Suggest a use for the dried solid waste from the EcoSan.

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..... [1]

[Total: 9]

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