Cambridge Assessment International Education

Cambridge International AS Level

CANDIDATE NAME

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8433196363

ENVIRONMENTAL MANAGEMENT **8291/22**

Paper 2 Management in Context **May/June 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 **20** pages. Any blank pages are indicated.

[Turn over

1 **(a)** Fig. 1.1 shows the total fertility rate for 2020. Total fertility rate is the number of children born per woman.

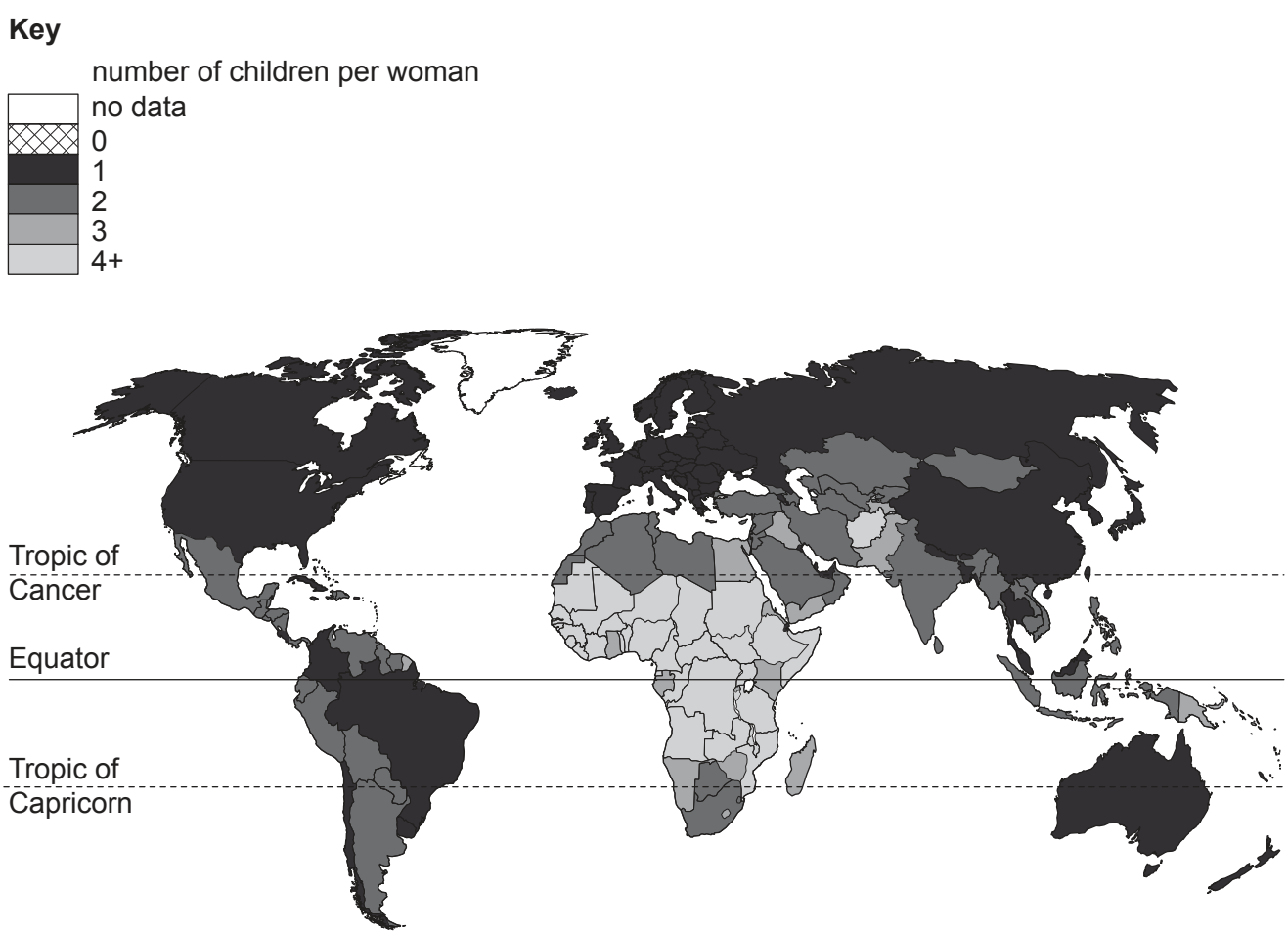

Fig. 1.1

(i) Describe the distribution shown in Fig. 1.1.

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..... [3]

(ii) Explain why a lower fertility rate reduces the impact of climate change.

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..... [3]

(iii) State **three** factors that affect fertility rate.

1 .....

2 .....

3 .....

[3]

(b) Table 1.1 shows the dependency ratio for Bangladesh in 2001 and 2021.

Table 1.1

year	dependency ratio
2001	75
2021	44

Suggest **two** reasons why the dependency ratio has decreased.

1 .....

.....

2 .....

.....

[2]

(c) A report estimated that adapting to the impacts of climate change will cost countries with low-income economies $300 billion a year by 2030.

The photograph in Fig. 1.2 shows a road across a shallow river.

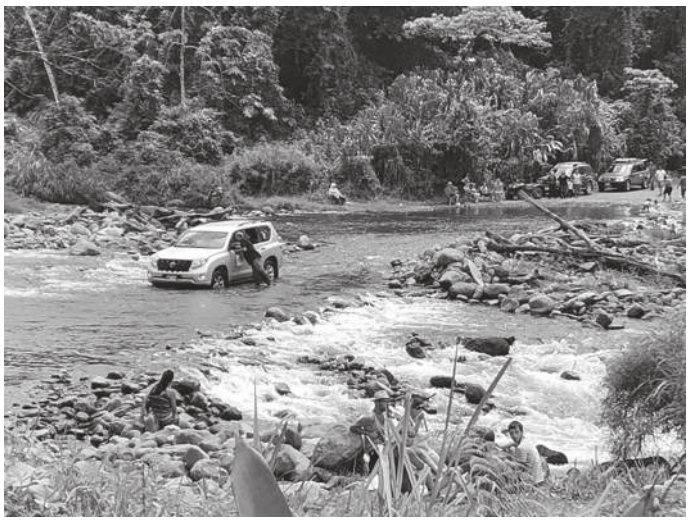

Fig. 1.2

Explain why the impacts of climate change will require the road to be adapted.

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..... [2]

(d) The divided bar chart in Fig. 1.3 shows information about the number of carbon capture and storage (CCS) facilities from 2010 to 2021.

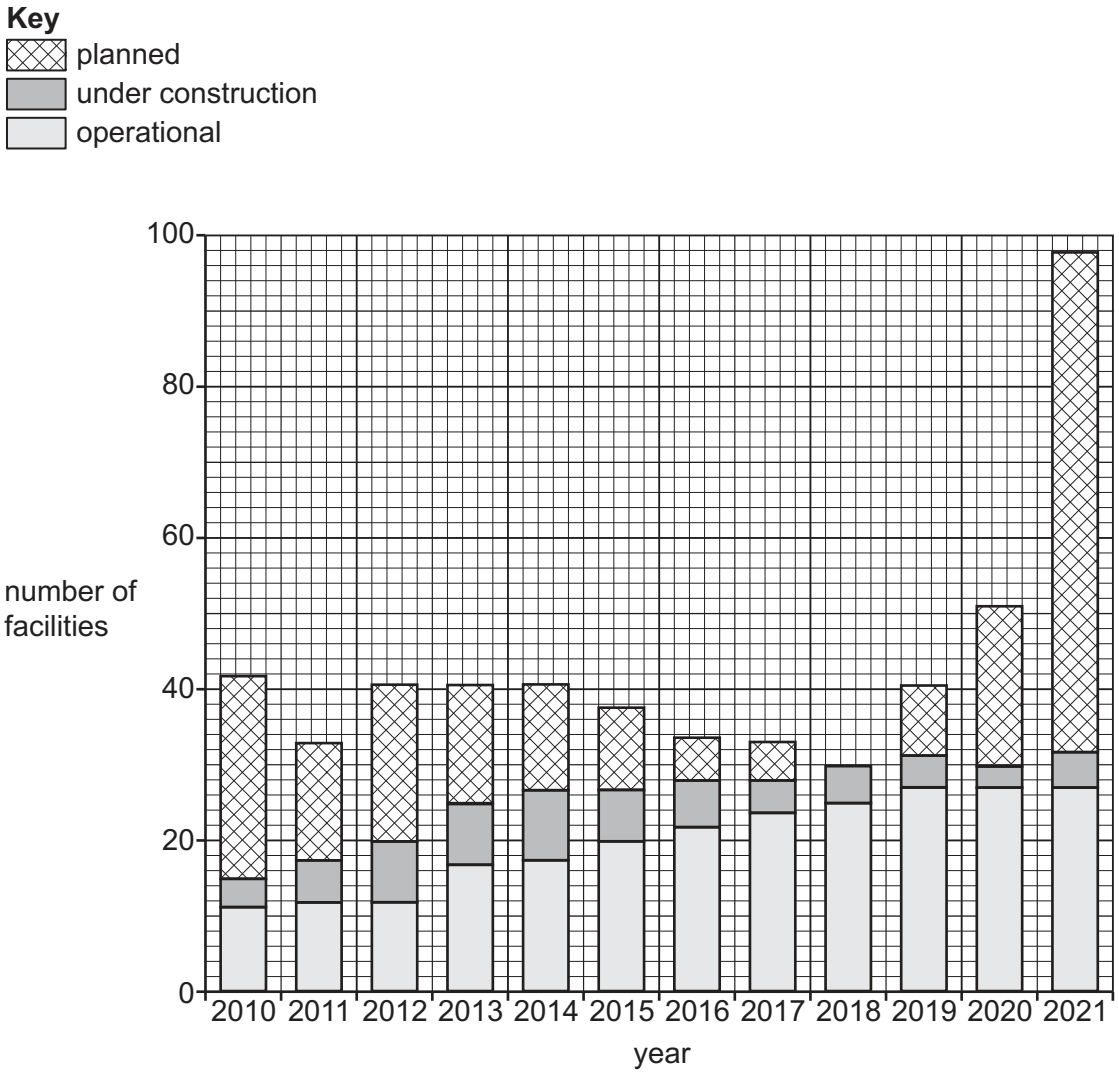

Fig. 1.3

(i) Complete the bar on Fig. 1.3 for 2018 to show there were 15 planned CCS facilities. [2]

(ii) State which years had the most operational CCS facilities.

..... [1]

(iii) State the number of CCS facilities that were under construction in 2016.

..... [1]

(iv) Suggest **two** reasons why the number of planned CCS facilities in 2010 was fewer than the number of planned CCS facilities in 2021.

1 .....

.....

2 .....

.....

[2]

(e) Describe how carbon capture and storage (CCS) reduces the carbon dioxide concentration in the atmosphere.

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..... [3]

(f) Solar radiation management (SRM) is a strategy which aims to reduce the impact of climate change.

State **two** examples of SRM.

1 .....

2 .....
[2]

[Total: 24]

2 **(a)** Scientists use tree ring data to investigate tree growth in a local area.

Each year a tree grows, a new tree ring forms. Wider tree rings form when trees grow more rapidly.

The scientists make this hypothesis:

'Emissions from a factory have a negative impact on tree growth in the local area.'

Fig. 2.1 shows tree ring data for one species of tree over an 80-year period in the local area. The factory was opened at the start of the 80-year period.

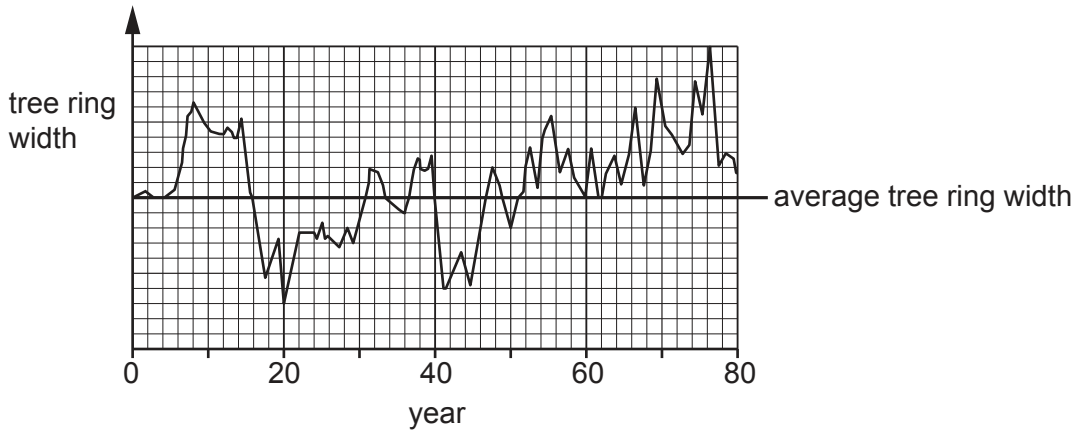

Fig. 2.1

The horizontal line represents the average tree ring width for this species of tree.

Values above the horizontal line indicate higher than average tree ring width.

(i) Discuss whether the data in Fig. 2.1 supports the scientists' hypothesis.

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..... [3]

(ii) Tree ring data is also used to reconstruct past climate conditions.

State **two** other methods for reconstructing past climate conditions.

1 .....

2 .....

[2]

(b) A scientist uses a computer model to predict the effect of ground level ozone on plant growth over a 3-year period.

The model:

- uses two concentrations of ozone, 20 and 120 parts per million (ppm)
- predicts the mass of the plant stem every month for 3 years.

Fig. 2.2 shows the results of the model.

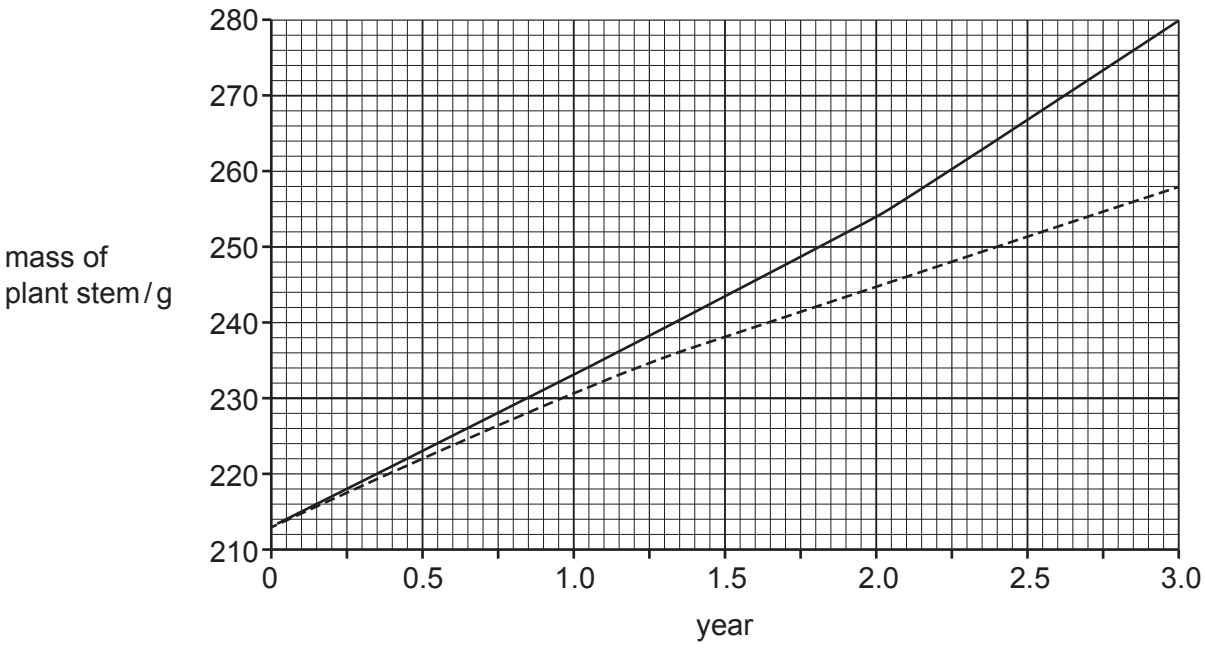

Fig. 2.2

(i) Describe the results of the model shown in Fig. 2.2.

.....

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..... [2]

(ii) Another scientist wants to repeat the computer model.

Suggest **three** pieces of additional information needed for the model to be repeated.

1 .....

2 .....

3 .....

[3]

(c) Ground level ozone can form photochemical smog.

(i) State the layer of the atmosphere which contains ground level ozone.

..... [1]

(ii) Describe the formation of photochemical smog.

.....

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.....

.....

..... [3]

(iii) State **two** impacts of photochemical smog on human health.

1 .....

2 .....

[2]

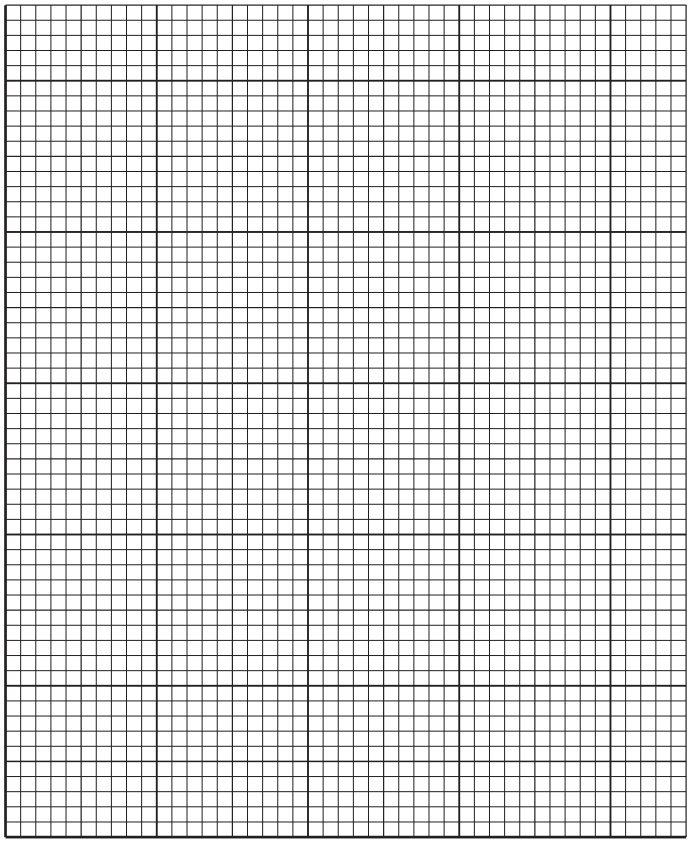
(d) Table 2.1 shows the concentration of ground level ozone in ppm for a 24-hour period in a USA city.

Table 2.1

time /hour	ozone concentration /ppm
0	0.10
3	0.10
6	0.30
9	0.34
12	0.62
15	0.92
18	0.84
21	0.18
24	0.10

(i) Plot the data as a line graph on the grid.

Join each point with a straight line.



[5]

(ii) Calculate the range for ground level ozone concentration in the 24-hour period.

range = ... ppm [1]

(iii) A student concludes that the maximum ozone concentration in the 24-hour period is 0.92 ppm.

State whether the student's conclusion is sensible. Justify your answer.

.....

..... [1]

[Total: 23]

3 **(a)** Fig. 3.1 shows the European bee-eater bird.

Fig. 3.1

A scientist investigates whether the number of European bee-eaters can be predicted using sound recordings.

The scientist:

- counts the number of individual birds observed in 30 different populations of European bee-eaters over a 3-day period
- records the songs for each of the 30 populations of European bee-eaters over the 3-day period
- identifies the number of songs per minute for each population.

The results are shown in Fig. 3.2.

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Fig. 3.2

(i) Suggest why the scientist investigates more than one population of European bee-eater.

.....

..... [1]

(ii) Circle **one** result that is most likely to be anomalous on Fig. 3.2. [1]

(iii) Write a suitable conclusion for the results.

.....

..... [1]

(iv) The scientist identifies the number of songs per minute for each population of European bee-eaters by listening to the recordings over the 3-day period.

Suggest the limitations of this method.

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..... [2]

(v) Suggest the benefit of using sound recordings to investigate populations of endangered birds.

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..... [1]

(b) The scientist uses the Lincoln index to estimate the number of European bee-eaters in the local area.

Table 3.1 shows the data the scientist uses.

Table 3.1

number of individuals captured in first sample, n_1	250
total number of individuals captured in second sample, n_2	235
number of marked individuals recaptured in second sample, m_2	124

(i) Calculate the population size, *N*, of the European bee-eaters in the local area using the Lincoln index formula.

Give your answer to the nearest whole number.

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

N = ... [2]

(ii) The population of European bee-eaters in the local area increases.

Suggest the impact this increase has on the number of marked individuals recaptured in the second sample, m_2.

Give a reason for your answer.

.....

..... [1]

(c) Rewilding is a strategy used to increase biodiversity.

(i) Explain how rewilding increases biodiversity.

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..... [3]

(ii) Suggest **two** reasons why the population of European bee-eaters in the local area increases, other than rewilding.

1 .....

2 .....
[2]

[Total: 14]

4 **(a)** More than 3 billion people every year are affected by water insecurity.

(i) Define the term water insecurity.

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.....

.....

..... [3]

(ii) State **three** impacts of water insecurity.

1 .....

2 .....

3 .....

[3]

(b) Desalination produces fresh water from salt water.

One method of desalination is reverse osmosis (RO).

(i) 2.5 dm^3 of sea water is needed to produce 1 dm^3 of fresh water.

Calculate the percentage of fresh water produced from sea water.

fresh water = ... % [1]

(ii) Calculate the volume of sea water needed to produce 200 000 000 dm^3 of fresh water.

volume of sea water = ... dm^3 [1]

(c) Fig. 4.1 shows the process of RO.

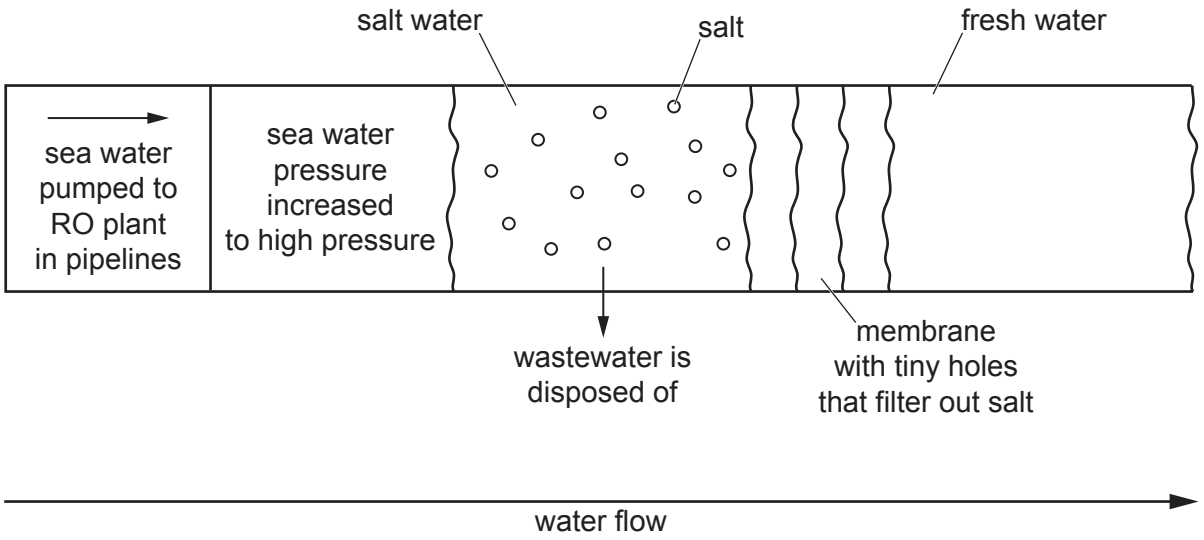

Fig. 4.1

RO desalination plants are located next to the sea and need a minimum of 10 hectares of land.

The membrane has a 3-year lifetime.

(i) Suggest why RO desalination is an expensive process.

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..... [4]

(ii) Wastewater from RO desalination has a very high concentration of salt.

Suggest the impacts of disposing of the wastewater back into the sea.

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..... [2]

(d) Fig. 4.2 shows countries who use desalination to produce fresh water.

Fig. 4.2

Suggest why desalination is **not** used by more countries.

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..... [2]

(e) One strategy for managing water insecurity is to relocate populations from areas of high water-usage to areas of low water-usage.

Suggest **one** limitation of this strategy.

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..... [1]

(f) Fig. 4.3 shows a strategy to manage water insecurity.

Fig. 4.3

Name the strategy shown in Fig. 4.3.

..... [1]

(g) Swamps are one source of surface fresh water.

State **one** other source of surface fresh water.

..... [1]

[Total: 19]

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