Cambridge Assessment International Education

Cambridge International AS Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ENVIRONMENTAL MANAGEMENT **8291/11**

Paper 1 Principles of Environmental Management **May/June 2025**

1 hour 45 minutes

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Section A: answer **all** questions.
- Section B: answer **one** question.
- 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.

[Turn over

Section A

Answer **all** questions in this section.

1 **(a)** Evaporation is a process in the water cycle.

State what is meant by evaporation of water.

.....

..... [1]

(b) Fig. 1.1 shows interception of water.

Fig. 1.1

(i) Describe how interception affects the water cycle.

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.....

..... [2]

(ii) Table 1.1 shows processes in the water cycle.

Place a tick (✓) in Table 1.1 to show which processes add water to ground water stores.

Table 1.1

process	add water to ground water stores
evaporation	
infiltration	
precipitation	
surface run-off	
transpiration	

[2]

(c) Table 1.2 shows the percentage of fresh water withdrawn from water sources by industry in countries from different income groups.

Table 1.2

country	percentage of fresh water withdrawn by industry	income group
China	22	MIC
France	71	HIC
Germany	81	HIC
Haiti	4	LIC
Malaysia	30	MIC
Rwanda	11	LIC

(i) Use Table 1.2 to describe the relationship between income group and the percentage of fresh water withdrawn from water sources by industry.

.....

..... [1]

(ii) Mongolia is a MIC.

Predict the percentage of fresh water withdrawn from water sources by industry in Mongolia.

Use Table 1.2 to explain your prediction.

prediction .....

explanation .....

.....

.....

[2]

(d) Permafrost is a water source.

Permafrost can be classified as continuous and discontinuous.

A location with:

- continuous permafrost has 90% of the area with permafrost
- discontinuous permafrost has between 50% and 90% of the area with permafrost.

Fig. 1.2 shows the distribution of permafrost in the Arctic in 2015.

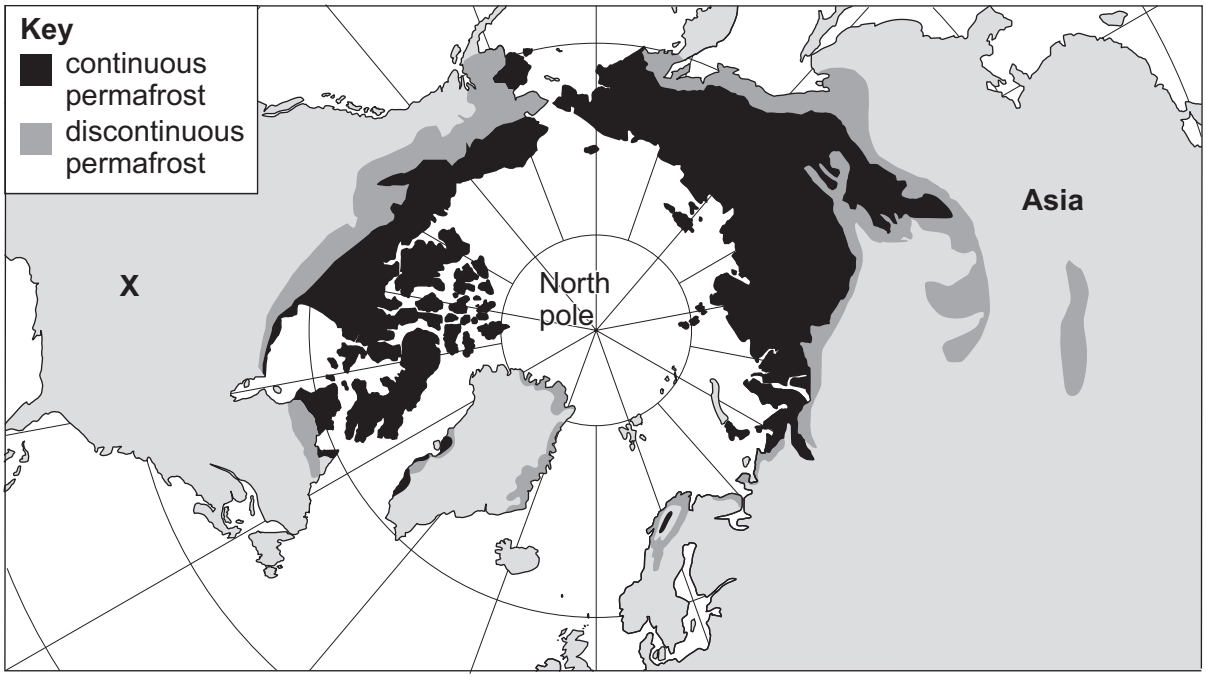

Fig. 1.2

(i) Identify continent **X**.

..... [1]

(ii) Describe the distribution of permafrost shown in Fig. 1.2.

.....

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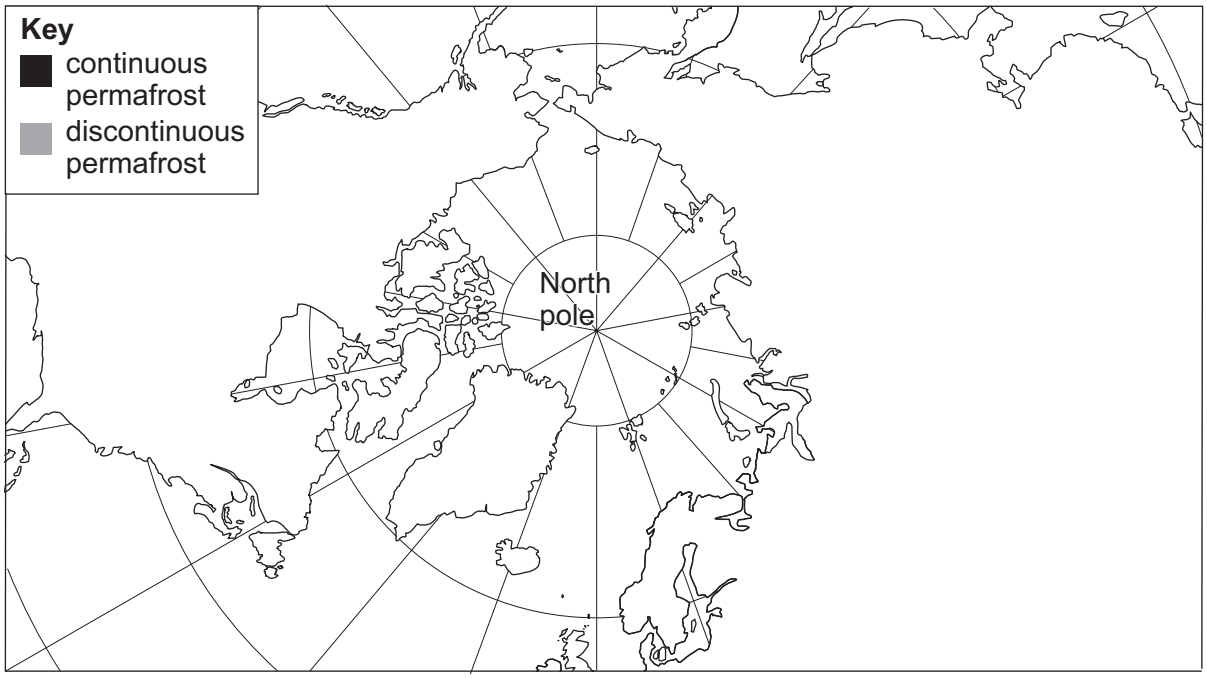
..... [3]

(iii) Global temperatures are predicted to increase.

Predict the distribution of permafrost in the Arctic in 2035.

Use the key to draw your prediction on Fig. 1.3. Label the distribution.



[2]

Fig. 1.3

(iv) Methane is trapped in permafrost.

Explain how methane increases global temperatures.

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.....

.....

.....

.....

..... [3]

[Total: 17]

2 **(a)** A scientist investigates the biodiversity of a grassland biome.

(i) Describe how a quadrat is used in a random sampling strategy to estimate the populations of plant species in a 1 km^2 area.

In your answer include:

- how you will randomly sample the area with a quadrat
- the variables to control
- how to ensure the results are reliable
- how the total population will be estimated.

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..... [6]

(ii) State **two** limitations of using a quadrat to estimate the populations of plant species in random sampling strategies.

1 .....

.....

.....

2 .....

.....

.....

[2]

(b) Table 2.1 shows the populations of the plant species in the grassland biome.

Table 2.1

species	population (number of individuals *n*)	$\frac{n}{N}$	$\left(\frac{n}{N}\right)^2$
shiny star grass	35		
butter gerbera	360		
heart vine	95		
sheepfig	230		
hairy crabgrass	120		
	***N* =**		$\Sigma\left(\frac{n}{N}\right)^2$ **=**

n = number of individuals
N = total number of individuals

(i) Complete Table 2.1. [4]

(ii) Calculate Simpson's index of diversity, *D*, using the formula:

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

D = ... [1]

(iii) The scientist compared the Simpson's index of diversity of a different grassland biome to a tundra biome. The values are shown in Table 2.2.

Table 2.2

biome	Simpson's index of diversity
grassland	0.81
tundra	0.33

Compare the biodiversity of the two biomes.

.....

..... [1]

(iv) Table 2.3 describes the climate, soil type and vegetation in grassland and tundra biomes.

Complete Table 2.3.

Table 2.3

	biome	
	grassland	**tundra**
climate	different seasons with moderate temperatures	
soil type		thin (shallow) soil with few nutrients
vegetation	grasses, shrubs and small trees	

[3]

[Total: 17]

3 **(a)** Table 3.1 shows information about three cities in China in 2022.

Table 3.1

	city		
	Shanghai	**Tianjin**	**Beijing**
population / million people	28.517	13.866	21.893
area of city / km^2	6340	11 946	16 410
population density / people km^{-2}		1161	1334

(i) Calculate the population density of Shanghai in 2022.

Give your answer as a whole number.

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

(ii) Suggest **three** factors that explain the difference in population density between Beijing and Tianjin.

1 .....

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2 .....

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3 .....

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[3]

(b) Fig. 3.1 shows the annual percentage population change against median age for ten countries.

The median age has the same number of people above and below that age.

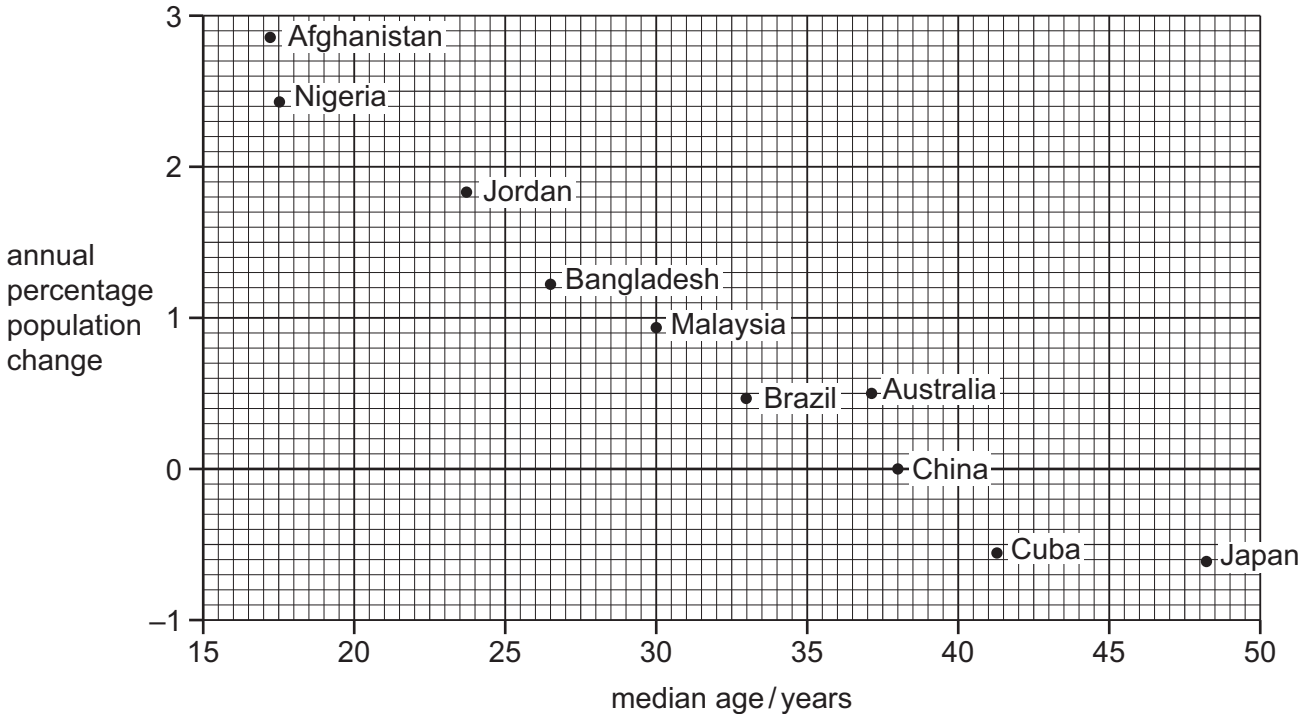

Fig. 3.1

(i) Use Fig. 3.1 to determine the:

- median age for China

  .....

- annual percentage population change for Australia.

  .....

[2]

(ii) Describe the relationship between the annual percentage population change and the median age for the countries shown in Fig. 3.1.

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..... [1]

(c) State **three** factors that affect population change.

1 .....

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2 .....

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3 .....

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[3]

(d) Japan has an ageing population.

State **three** impacts of ageing populations.

1 .....

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2 .....

.....

3 .....

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[3]

[Total: 14]

4 **(a)** Fig. 4.1 shows a crop grown for biofuel.

Fig. 4.1

(i) The biofuel crop is combusted to release thermal energy.

Name **two** other types of biofuel.

1 .....

2 .....
[2]

(ii) Explain why biofuels are a renewable energy resource.

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.....

..... [2]

(iii) State **two** benefits of using biofuel as an energy resource, other than being renewable.

1 .....

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2 .....

.....
[2]

(iv) Explain how the biofuel crop in Fig. 4.1 reduces biodiversity.

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..... [2]

(v) Explain how biofuels decrease food security.

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..... [3]

(b) Table 4.1 shows the global production of energy from biofuels between 2000 and 2022.

Table 4.1

year	production of energy from biofuels / 10^9 kilowatt hours
2000	110
2005	230
2010	700
2015	900
2020	1050
2022	1020

Use Table 4.1 to identify the 5-year period with the greatest increase in energy production from biofuels.

from ..... to ..... [1]

[Total: 12]

Section B

Answer **one** question.

EITHER

5 'Generating electricity using nuclear energy is the most effective strategy for managing energy security.'

To what extent do you agree with this statement?

Give reasons and include information from relevant examples to support your answer. [20]

OR

6 Evaluate the success of strategies for managing air pollution.

Give reasons and include information from relevant examples to support your answer. [20]