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Cambridge International AS Level

ENVIRONMENTAL MANAGEMENT **8291/11**

Paper 1 Principles of Environmental Management **October/November 2023**

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. Any blank pages are indicated.

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Section A

Answer **all** questions in this section.

1   The oceans around Antarctica are abundant in marine organisms. Some of these organisms are harvested by humans and form important fisheries. One of these fisheries is the Antarctic krill.

Fig. 1.1 shows the distribution of Antarctic krill in Antarctica.

Key

high density of Antarctic krill

low density of Antarctic krill
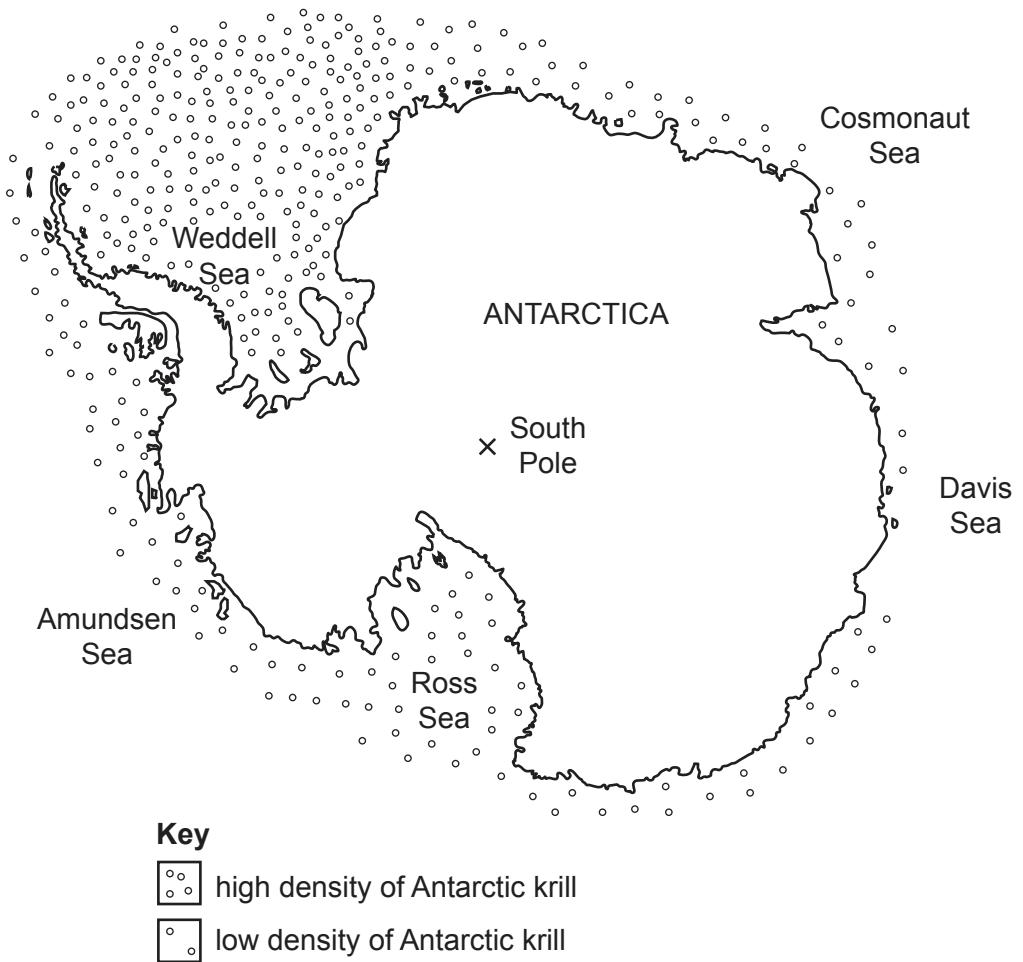
Fig. 1.1

(a) Describe the distribution of Antarctic krill.

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.... [2]

(b) Antarctic krill play an important role in food chains. A food chain involving Antarctic krill is shown.

phytoplankton → Antarctic krill → squid → icefish → human

(i) Construct and label a pyramid of biomass for this food chain.

[2]

(ii) Explain why humans consuming icefish is **not** an efficient use of the gross primary production in this food chain.

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(iii) Harvested Antarctic krill are used as a feed in the aquaculture industry.

Suggest why harvesting Antarctic krill can have positive and negative impacts on global food security.

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(c) The population of Antarctic krill is measured using hydroacoustic surveys. Ships use echosounders to reflect sound waves off the krill. The strength of the echo is mathematically converted to a population estimate.

Suggest **two** ways this method can be improved to collect more representative data on population size.

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[Total: 12]

2 The mean sea surface temperature was measured each year and compared to the 100-year average. Fig. 2.1 shows the data from 1880 to 2020 between 60°N and 60°S.

temperature difference of mean sea surface temperature compared to the 20th century average / °C
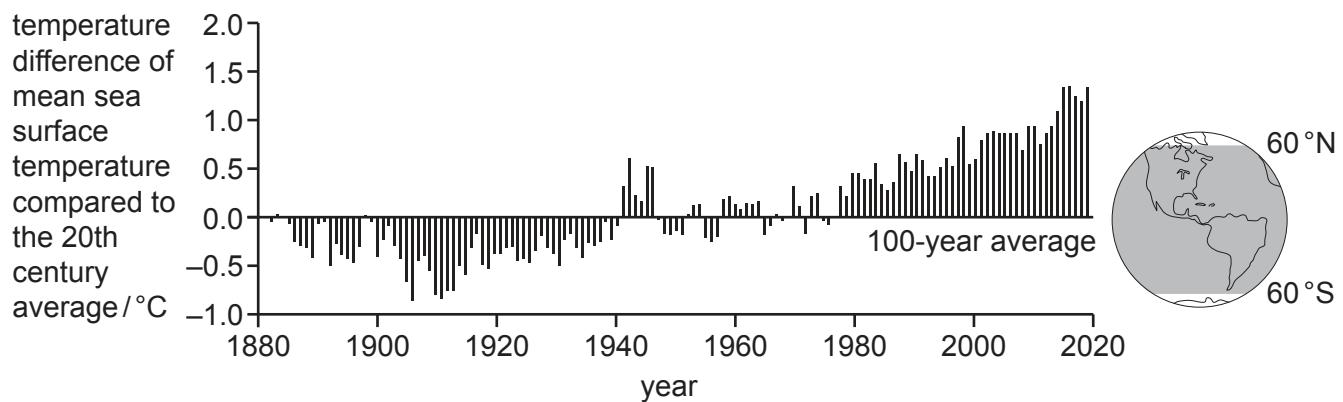
Fig. 2.1

(a) Describe the trends in the mean sea surface temperatures shown in Fig. 2.1.

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(b) One impact of changing sea temperatures is a change in the location of marine organisms. Fig. 2.2 shows an American lobster.

Fig. 2.2

Fig. 2.3 shows the location of a population of American lobster in the North Atlantic, compared to their location in 1980.
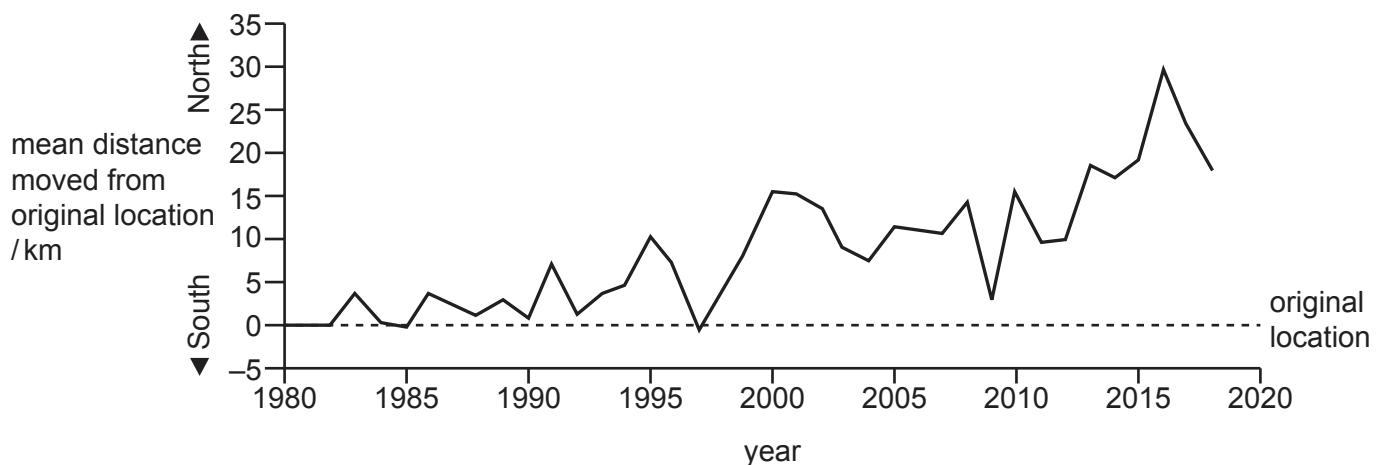
Fig. 2.3

(i) Suggest reasons for the change in location of American lobster. Use data from Fig. 2.1 and Fig. 2.3 in your answer.

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(ii) Climate change and sea temperatures impact the marine environment.

Describe **other** impacts that climate change can have on the marine environment.

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(c) Climate monitoring has shown an increase in average global temperatures. One potential strategy to counteract climate change is through solar radiation management (SRM) using stratospheric aerosols.

(i) Outline how stratospheric aerosols could reduce further climate change.

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(ii) Evaluate the use of stratospheric aerosols for counteracting climate change.

benefits ....

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limitations ....

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[6]
[Total: 18]

3 **(a)** The World Health Organization estimated that, in 2019, approximately 9% of the world population was living with food insecurity. One cause of food insecurity is an increase in homogeneity of global food supplies.

(i) Explain how an increase in homogeneity of global food supplies can increase food insecurity.

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(ii) Describe causes of food insecurity, other than homogeneity of global food supply.

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(b) One strategy for reducing food insecurity is the use of genetically modified (GM) crops. Varieties of soya bean, corn and cotton have been genetically modified to give them resistance to herbicides.

(i) Suggest why having resistance to herbicides may increase food security.

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(ii) Fig. 3.1 shows the percentage of planted land for GM crops in the USA between 2000 and 2014.
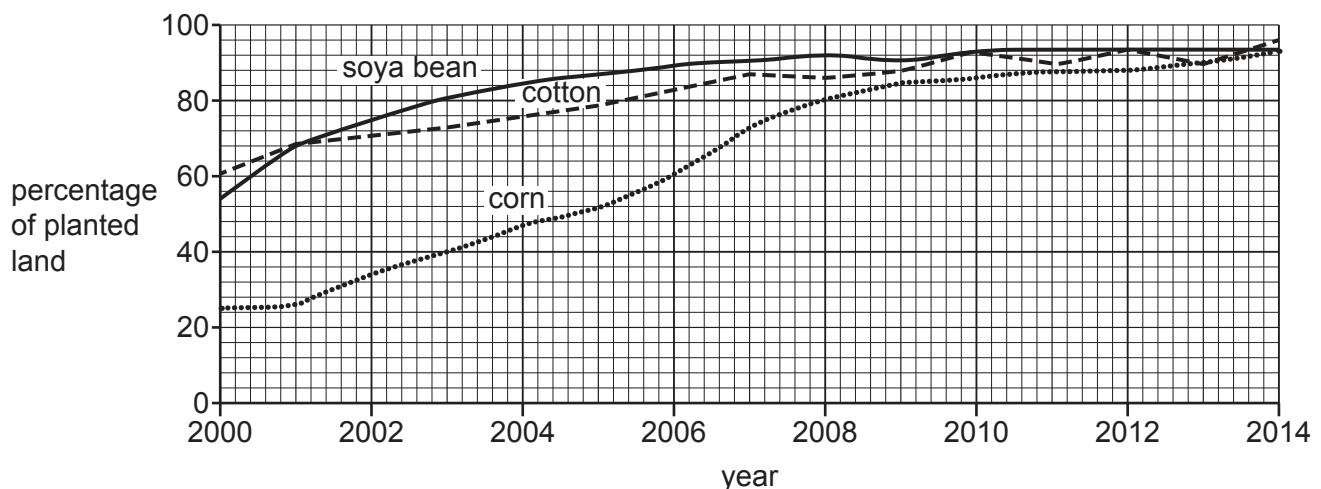

Fig. 3.1

Calculate the mean annual change in the percentage of planted land of GM corn between 2000 and 2012.

Show your working and give your answer to **two** significant figures.

mean annual change = ... [2]

(iii) Selective breeding can also be used as a strategy for managing food security.

Evaluate selective breeding as a strategy for managing food security.

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[Total: 18]

4 Fig. 4.1 shows a population pyramid for Uruguay in 2020. Uruguay is a country in South America.
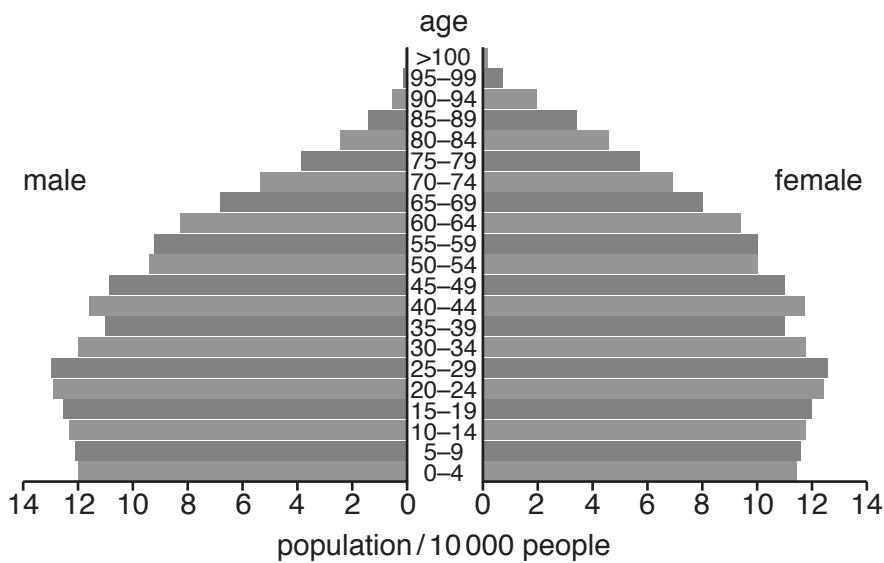
Fig. 4.1

(a) Compare the population structures of males and females in Uruguay in 2020.

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(b) Birth rate has decreased in the last 30 years in Uruguay.

(i) Identify the evidence in Fig. 4.1 which shows this decrease.

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(ii) Suggest reasons for this decrease in birth rate.

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(c) Table 4.1 shows the dependency ratio of Uruguay and Senegal in 2019. Senegal is a country in Africa.

Table 4.1

country	dependency ratio
Uruguay	58
Senegal	85

(i) Explain what the data shows about the population of Uruguay compared to Senegal's in 2019.

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(ii) One factor that affects the dependency ratio is the proportion of aging people in the population.

Describe the impacts that an aging population can have on a country.

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[Total: 12]

Section B

Answer **one** question.

Either

5 'Improved agricultural techniques will ensure global food security by 2040.'

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 captive breeding and release as a method of conserving biodiversity.

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

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