Cambridge Assessment International Education

Cambridge International AS Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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3038990102

ENVIRONMENTAL MANAGEMENT **8291/21**

Paper 2 Management in Context **May/June 2023**

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 **16** pages. Any blank pages are indicated.

DC (CJ/CB) 317056/4

[Turn over

1 Oil sands contain deposits of oil.

Fig. 1.1 is an enlarged sketch of an oil sands sample. Each grain of sand is surrounded by a layer of water and a type of oil called bitumen.

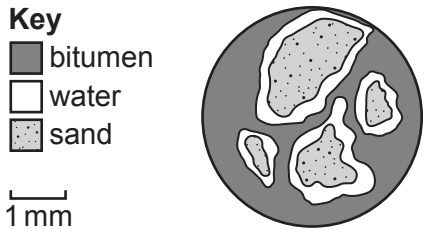

Fig. 1.1

(a) Oil is a fossil fuel.

State **two** other fossil fuels.

1 .....

2 .....
[2]

(b) Extracting oil from oil sands uses large volumes of water. The waste water is stored in tailing ponds.

75% of the water in the tailing ponds is recycled back into the extraction process.

(i) Suggest why the water is recycled back into the extraction process.

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(ii) Suggest why some people are concerned about the storage of waste water in tailing ponds.

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(c) Fig. 1.2 shows the location of oil sands deposits in Canada. These are some of the largest deposits of oil on Earth.

Fig. 1.2

Use Fig. 1.2 to suggest the challenges of exporting oil from these oil sands locations.

Give reasons for your answer.

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(d) (i) Fig. 1.3 shows the oil production from oil sands and conventional oil sources in Canada from 2006 to 2019.

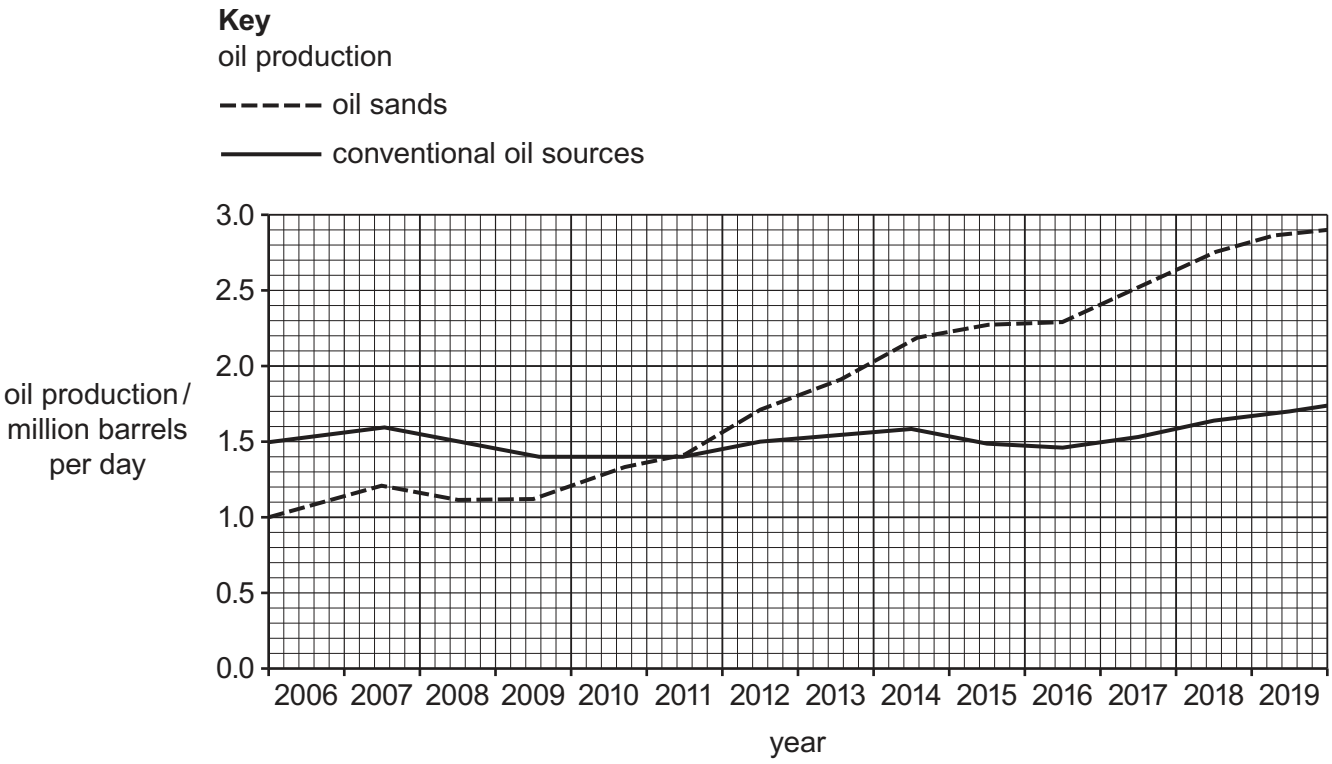

Fig. 1.3

Use Fig. 1.3 to compare the trends in oil production from oil sands and oil production from conventional oil sources.

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..... [3]

(ii) These oil sands deposits cover 142 200 km^2. 4800 km^2 of the oil sands deposits can be mined. The remaining area currently **cannot** be mined.

Calculate the percentage of the oil sands deposits that can be mined. Give your answer to **one** decimal place.

..... % [2]

(iii) Explain how a reliance on fossil fuels, such as oil, can lead to energy insecurity.

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..... [2]

(e) A report stated that from 2000 to 2018 the emission rate of greenhouse gases in Canada from oil sands extraction decreased by 36%. These emissions account for 12% of Canada's total greenhouse gas emissions.

(i) Explain why greenhouse gas emissions are a concern.

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..... [3]

(ii) Canada was one of the countries that signed the Paris Agreement in 2016.

Explain why international agreements help to control greenhouse gas emissions.

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..... [2]

(iii) International agreements have helped to reduce the emission rate of greenhouse gases.

Suggest **two** other reasons why the emission rate of greenhouse gases from oil sands extraction has decreased.

1 .....

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2 .....

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[2]

(f) A pipeline for transporting oil was planned to run from Canada to the USA. Many people objected to the building of this pipeline.

Suggest reasons why some people were in **favour** of building this pipeline.

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..... [3]

[Total: 28]

2 The Sous reservoir in the Czech Republic is a source of drinking water for 100 000 people in the region.

The area has been affected by acid deposition.

(a) (i) Define acid deposition.

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..... [1]

(ii) Outline the formation of acid deposition from sulfur compounds.

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..... [3]

(iii) Describe strategies for reducing the emissions of gases that cause acid deposition.

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..... [3]

(b) Water samples at three locations, **A**, **B** and **C**, in the reservoir were analysed for pH value and sulfate concentration every month for three years. Samples of clean drinking water were also analysed.

Table 2.1 shows the results.

Table 2.1

water source	pH			sulfate concentration / mg per litre		
	min	max	mean	min	max	mean
A	4.6	5.5	5.2	6.2	15.5	10.4
B	4.5	6.1	5.5	3.8	10.0	6.9
C	4.7	5.3	5.0	11.3	580.2	14.2
drinking water	7.1	7.3	7.2	3.2	3.4	3.3

(i) Calculate the pH range for water source **B**.

range = ... [1]

(ii) Suggest why the maximum value recorded for sulfate concentration at water source **C** was **not** used to determine the mean value.

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..... [1]

(iii) Use the mean data in Table 2.1 to write a conclusion about the water in the reservoir.

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..... [2]

(iv) The water samples from the reservoir are collected in bottles.

Suggest why each bottle is filled and then emptied with water from the reservoir six times before the final sample is taken.

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..... [1]

(v) The sample bottles are labelled with the:

- initials of the person collecting the sample
- sample location
- date.

Suggest **two** other details that should be recorded to ensure the results are comparable.

1 .....

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2 .....

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[2]

(vi) Fig. 2.1 is a diagram of the Sous reservoir with the three locations, **A**, **B** and **C**, marked.

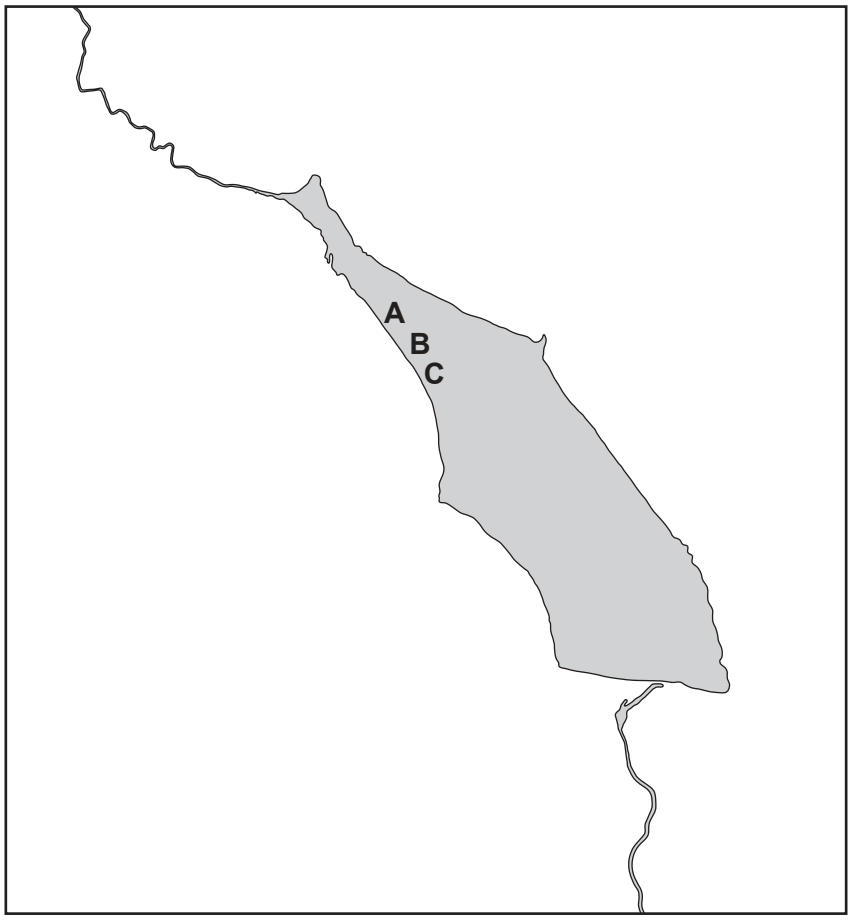

Fig. 2.1

Suggest how the sampling of water from the reservoir can be improved.

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..... [2]

(c) A food chain for the reservoir is shown.

plankton → mayfly → crayfish → trout → otter

(i) State the producer in this food chain.

..... [1]

(ii) State the trophic level of the mayfly.

..... [1]

(iii) Explain how energy is lost in food chains.

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..... [3]

[Total: 21]

3 **(a)** Brazil's Atlantic forest contains approximately 6000 plant species, 263 amphibian species and 160 species of mammal, which are found nowhere else in the world.

Rio de Janeiro and São Paulo are two of the world's largest cities. These two cities are within the Atlantic forest.

(i) The bar chart in Fig. 3.1 shows the area of Atlantic forest that is lost each year.

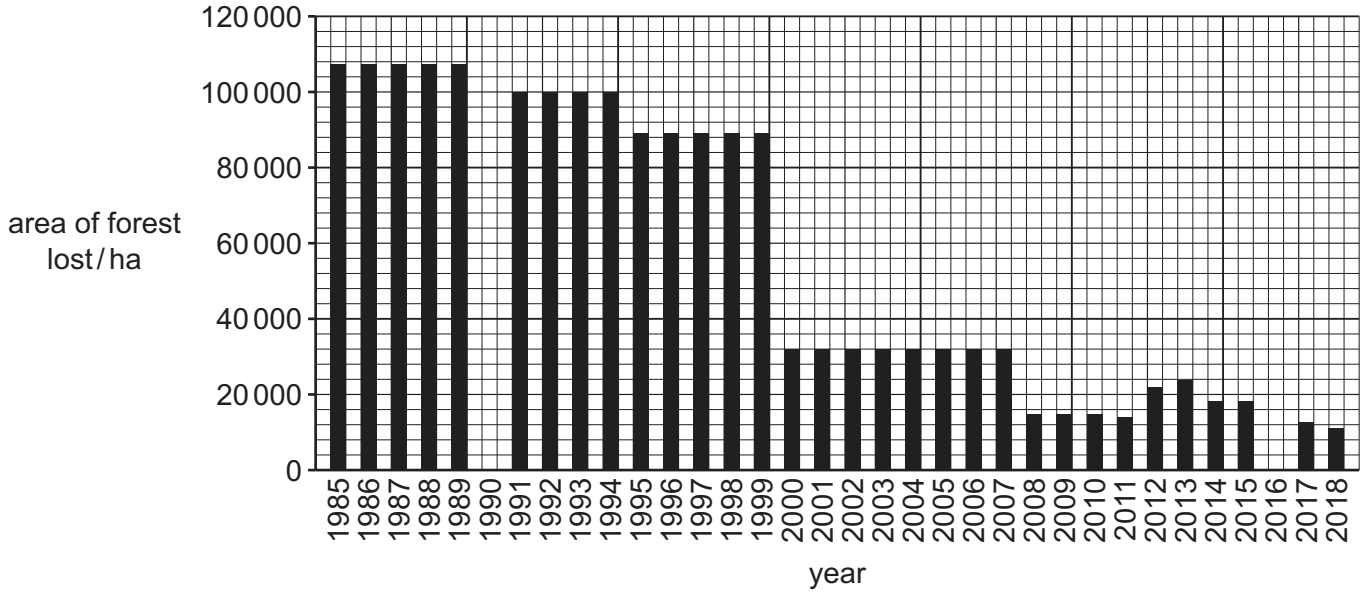

Fig. 3.1

Complete Fig. 3.1 by plotting the data in Table 3.1.

Table 3.1

year	area of forest lost / ha
1990	100 000
2016	28 000

[2]

(ii) State the **two** consecutive years which had the greatest difference in the area of forest lost.

between ..... and ..... [1]

(iii) Suggest reasons for the loss of Brazil's Atlantic forest.

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(b) In 2010, the USA and Brazil signed a 5-year debt for nature swap worth $21 million.

Explain how a debt for nature swap can protect Brazil's Atlantic forest.

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(c) The local government use a questionnaire to find out if local people have benefited from the debt for nature swap.

(i) The method used to select the people was:

- select one street in São Paulo at random
- select every female aged between 20 and 30 in each house on the street.

Describe the limitations of this selection method.

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..... [3]

(ii) One of the questions on the questionnaire is shown.

question	**response**	
	yes	no
Did you benefit from the debt for nature swap?		

Describe **one** reason why yes / no response questions are used in a questionnaire.

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..... [1]

[Total: 13]

4 Scientists on the international space station (ISS) get some of their water from the Water Recovery System (WRS). WRS uses waste water from respiration, sweat and urine and recycles this into drinkable water. It can produce up to 127 litres of recycled drinking water each day and can recycle 93% of the waste water.

Each scientist on the ISS uses 49 litres of water per week for drinking, preparing food and personal hygiene.

(a) (i) On a 60-day ISS mission there are five scientists.

Calculate whether the WRS can provide all of the water the five scientists need. Show your working.

[2]

(ii) One litre of water has a mass of 1 kg.

Suggest reasons why the water required by the scientists is **not** transported from Earth to the ISS.

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..... [2]

(iii) Some of the waste water used by the WRS comes from respiration.

Explain the meaning of aerobic respiration.

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..... [3]

(b) The WRS uses a process called distillation to remove impurities from the waste water. Electricity is used to break down any organic matter. The process needs very high temperatures and pressures.

Globally, one in three people do not have access to safe drinking water.

Discuss the benefits and limitations of using the WRS to provide safe drinking water to people on Earth.

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..... [5]

(c) Fig. 4.1 shows a solar still. A solar still uses processes in the water cycle to produce drinking water.

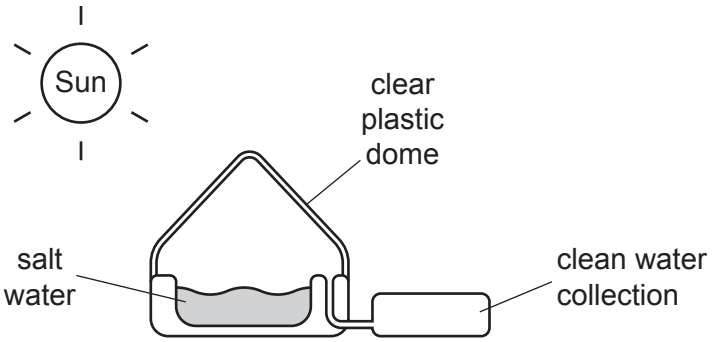

Fig. 4.1

Use Fig. 4.1 and processes in the water cycle to explain how the solar still can produce drinking water.

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(d) Explain how a lack of water can lead to malnutrition.

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[Total: 18]

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