Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MARINE SCIENCE **9693/23**

Paper 2 AS Data-Handling and Free-Response **May/June 2020**

1 hour 15 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 50.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **12** pages. Blank pages are indicated.

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Section A

Answer **both** questions in this section.

1 Fig. 1.1 shows mangroves growing in a tropical delta ecosystem.

Fig. 1.1

Samples of surface water were taken from the same location in this delta at regular intervals each day over a seven day period. The salinity levels in each sample were tested and recorded in parts per thousand (‰). Fig. 1.2 shows the results.

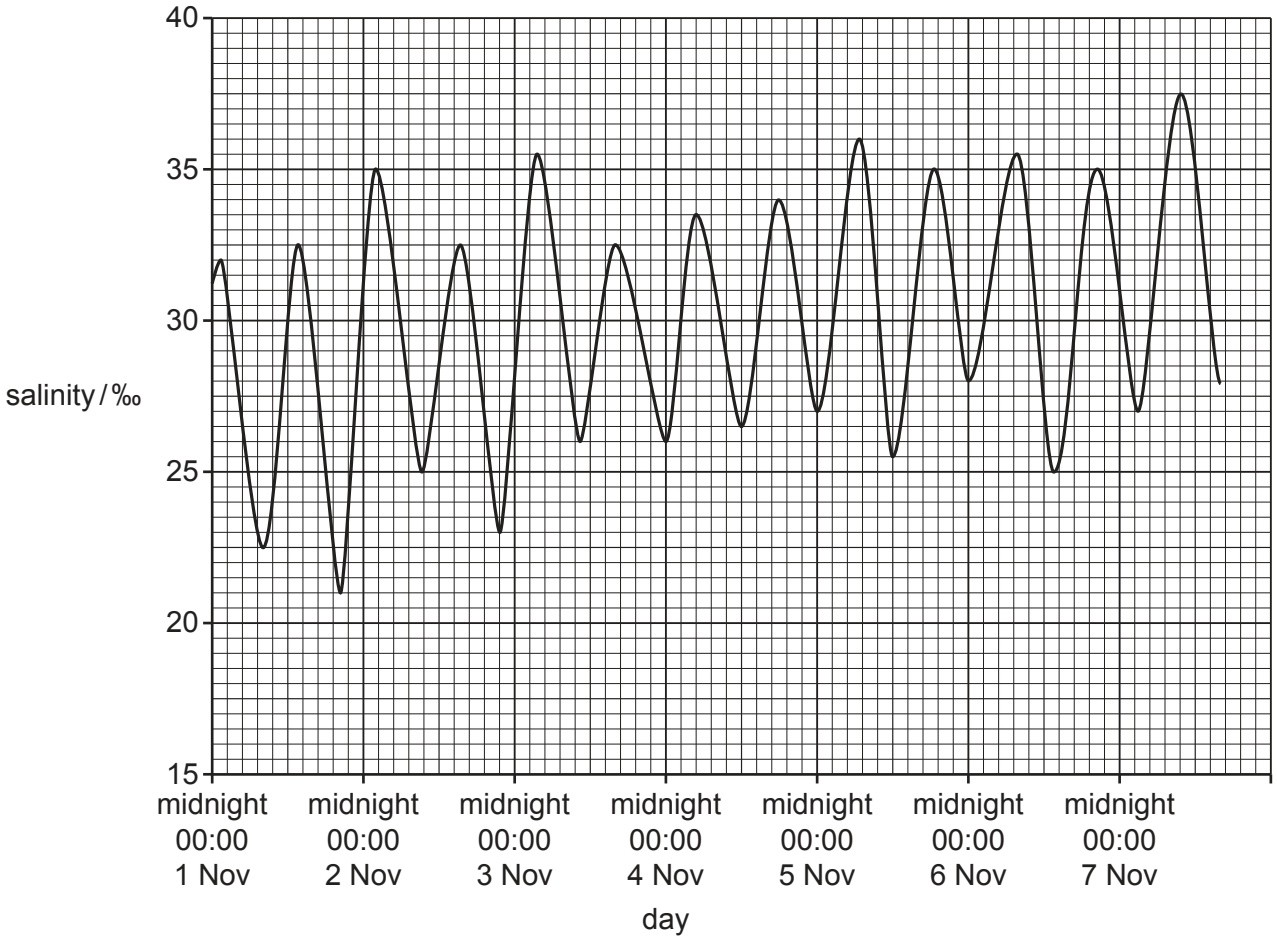

Fig. 1.2

(a) (i) Use Fig. 1.2 to state the maximum **and** minimum salinity on the 5 November.

maximum ..... ‰

minimum ..... ‰

[1]

(ii) Describe the patterns shown by the data in Fig. 1.2.

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(iii) Explain reasons for the patterns shown in Fig. 1.2.

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(b) Suggest why this ecosystem has a very specific community that can survive there.

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[Total: 10]

2 Small sections of coral can be grown attached to steel frames.

Fig. 2.1 shows a small section of staghorn coral growing on a steel frame.

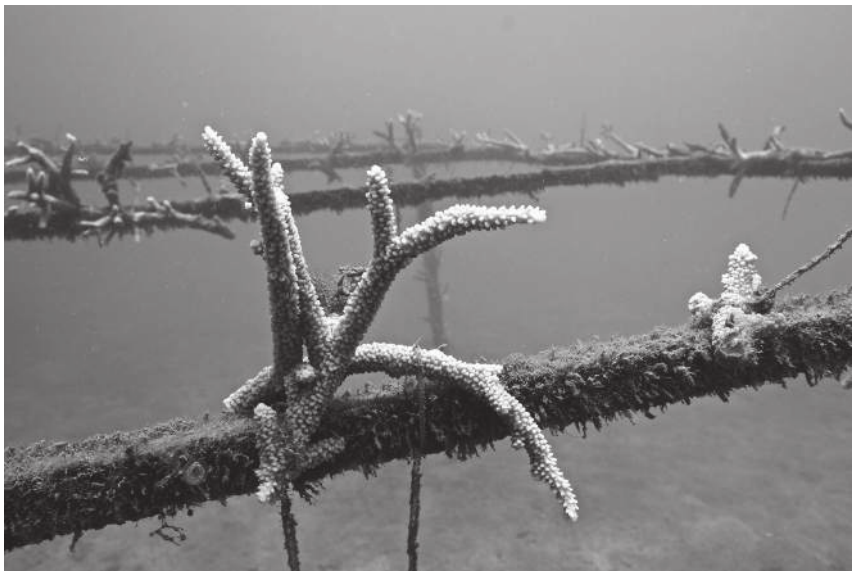

Fig. 2.1

Scientists monitored the survival of three species of coral grown in this way.

The results are shown in Table 2.1.

Table 2.1

species	number of coral sections attached	number of sections surviving after three months	number of sections surviving after six months	percentage survival after six months
staghorn coral	47	44	29	61.7
elkhorn coral	42	32	30	71.4
finger coral	44	34	26	

(a) (i) Calculate the percentage survival of finger coral after six months.

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(ii) Compare the survival of staghorn coral and elkhorn coral.

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(b) Describe a laboratory-based experiment that could be used to test the following hypothesis.

Sea temperature affects the rate of growth of coral.

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[Total: 10]

Section B

Answer **both** questions in this section.

3 Tuna and sardines are examples of fish that survive in the open ocean.

(a) Research has shown that the populations of tuna and sardines have fluctuated greatly over the last 500 years, showing periods of rapid decline and then subsequent recovery.

Explain how in some years upwelling may cause the population sizes of tuna and sardines to increase and not in other years.

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(b) Both tuna and sardines use shoaling as a survival strategy in the open ocean.

Compare the benefits of shoaling to tuna and to sardines.

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(c) With reference to tuna, explain the meaning of the term *parasitism*.

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(d) Tuna occupy a general ecological niche.

Explain how a general ecological niche differs from the niche of many coral-eating butterfly fish.

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[Total: 15]

4 Hunga Tonga is an underwater volcano in the tropical South Pacific Ocean near Tonga.

(a) Use the theory of plate tectonics to describe how the Hunga Tonga volcano formed.

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(b) In January 2015 the Hunga Tonga volcano created a new island. It measured 500 m across and 250 m high.

Use the Darwin-Dana-Daly theory to suggest what might eventually happen to the new island over time.

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(c) Describe **and** explain how volcanic activity and other factors can affect the concentration of dissolved gases in sea water.

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[Total: 15]

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