Cambridge International AS & A Level

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Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

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9473006117

MARINE SCIENCE **9693/11**

Paper 1 AS Structured Questions **May/June 2019**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

This document consists of **14** printed pages and **2** blank pages.

Cambridge Assessment International Education

Answer **all** the questions in the spaces provided.

1 Fig. 1.1 shows a simple marine food chain.

phytoplankton → zooplankton → mackerel → tuna → shark

Fig. 1.1

Phytoplankton convert energy from one form to another, which makes it available to the rest of the food chain.

(a) (i) State the original source of energy which the phytoplankton use.

..... [1]

(ii) State the process in phytoplankton that converts this energy to a form that can be used by the rest of the food chain.

..... [1]

(b) (i) From Fig. 1.1, name the:

- producer .....
- organism in trophic level four. .....

[2]

(ii) Tuna are predators. Define the term *predator*.

.....

.....

..... [2]

(c) Tuna can have parasitic nematodes living internally.

Suggest **and** explain how this could affect the efficiency of energy transfer from tuna to sharks.

.....

.....

.....

..... [2]

[Total: 8]

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[Turn over

2 The age of a coral reef can be estimated by using carbon dating.

(a) Name the radioactive carbon isotope that is measured in carbon dating.

..... [1]

(b) Fig. 2.1 shows how the percentage of the radioactive carbon isotope remaining in a sample changes over time.

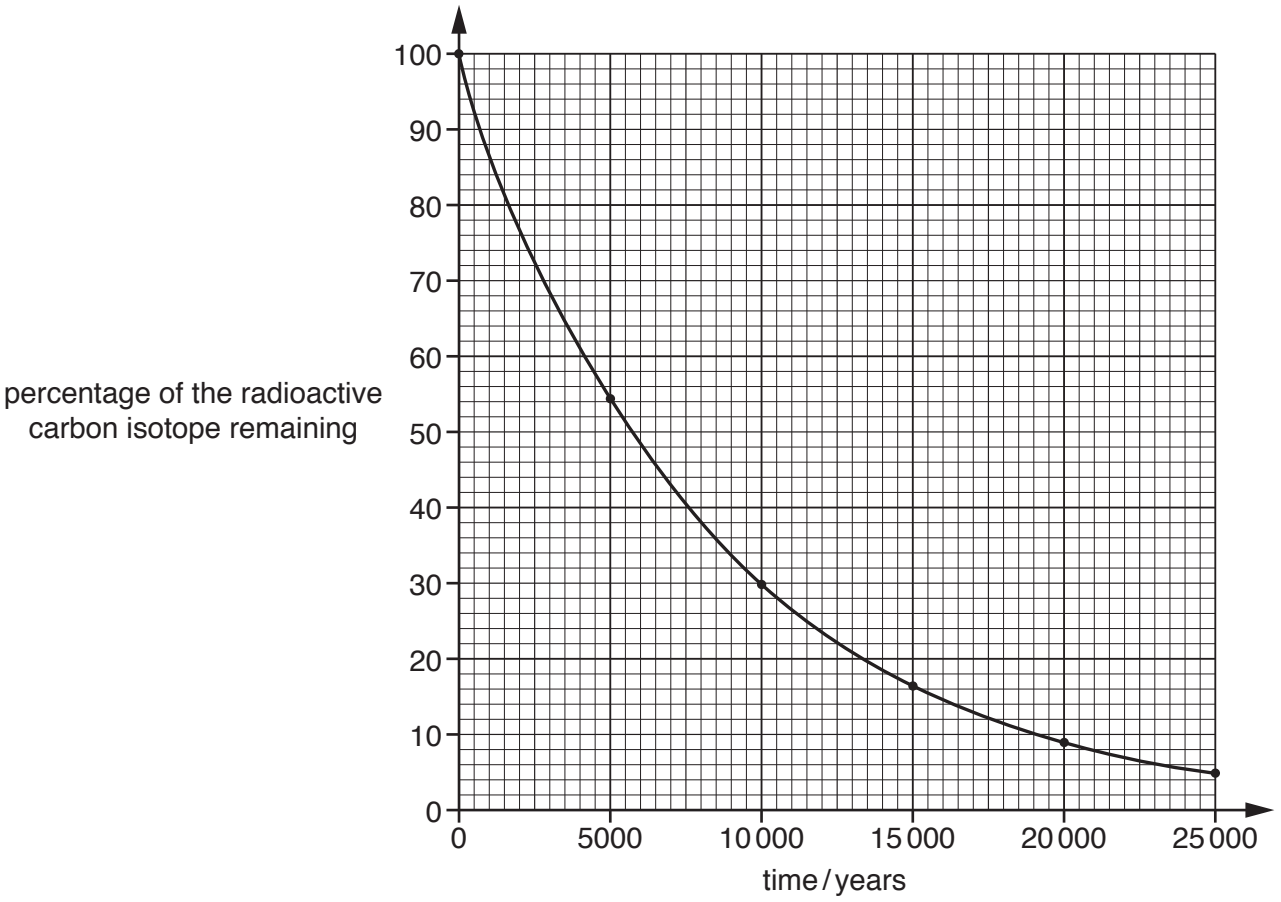

Fig. 2.1

To investigate the growth rate of a coral reef, a core was drilled from the coral reef.

(i) A sample was taken from 2 m below the top of the core.

This showed that 35% of the original radioactive carbon isotope remained.

Use Fig. 2.1 to estimate the age of the sample.

..... years
[1]

(ii) A sample at a depth of 12 m, from the same core, was dated at 11 400 years old.

Determine the average annual growth rate of the coral.

Show your working, and state the unit.

.....

[3]

(iii) Suggest **one** reason why the actual growth rate may have been greater than your answer to **(b)(ii)**.

.....

..... [1]

[Total: 6]

3 Fig. 3.1 shows the regions of the Earth that have tropical, temperate or polar climates.

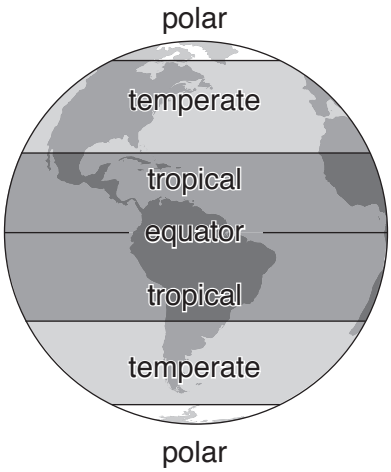

Fig. 3.1

Fig. 3.2 shows the average temperature profiles of different regions of an ocean in the northern hemisphere in early March.

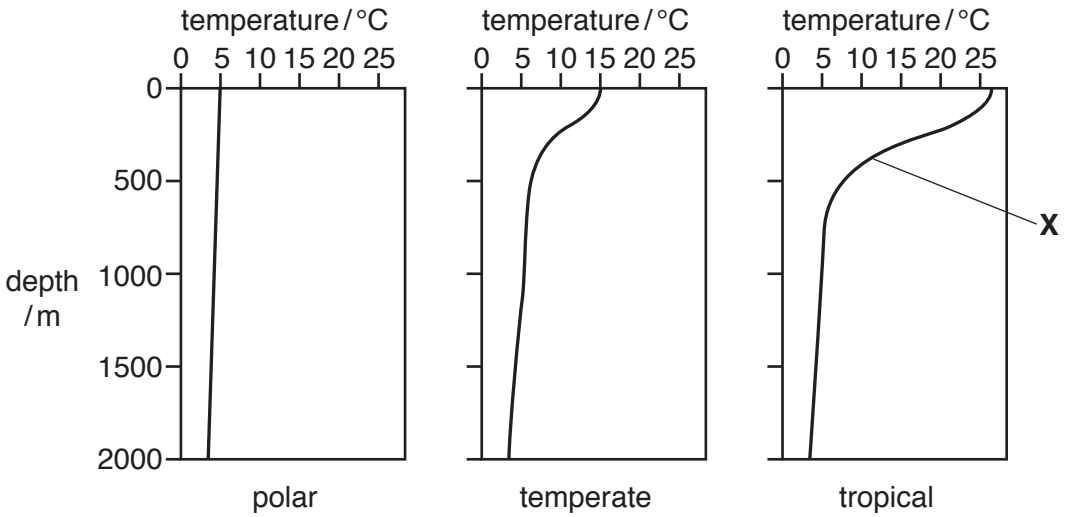

Fig. 3.2

(a) Name the feature labelled **X** in Fig. 3.2.

.....

[1]

(b) (i) Describe how the temperature profile of the temperate region of the ocean differs from the temperature profile of the tropical region shown in Fig. 3.2.

.....

.....

.....

.....

.....

..... [3]

(ii) Suggest reasons for the differences you have described in **(b)(i)**.

.....

.....

.....

..... [2]

(c) Suggest why feature **X** is absent from the temperature profile of the polar region of the ocean.

.....

.....

.....

..... [2]

[Total: 8]

[Turn over

4 Antarctica is separated from the rest of the world's continents by the circumpolar current, which flows around the Southern Ocean. Upwelling supports the high biodiversity in the Southern Ocean.

(a) Explain what is meant by each of the following terms.

(i) *current*

.....

.....

.....

..... [2]

(ii) *upwelling*

.....

.....

.....

.....

.....

..... [3]

(b) Fig. 4.1 shows a food chain from the Southern Ocean and the biomass at each trophic level on a single day, in arbitrary units.

Fig. 4.1

Sketch and label a pyramid of biomass for this food chain.

[3]

[Total: 8]

5 Fig. 5.1 shows a cross-section of an ocean.

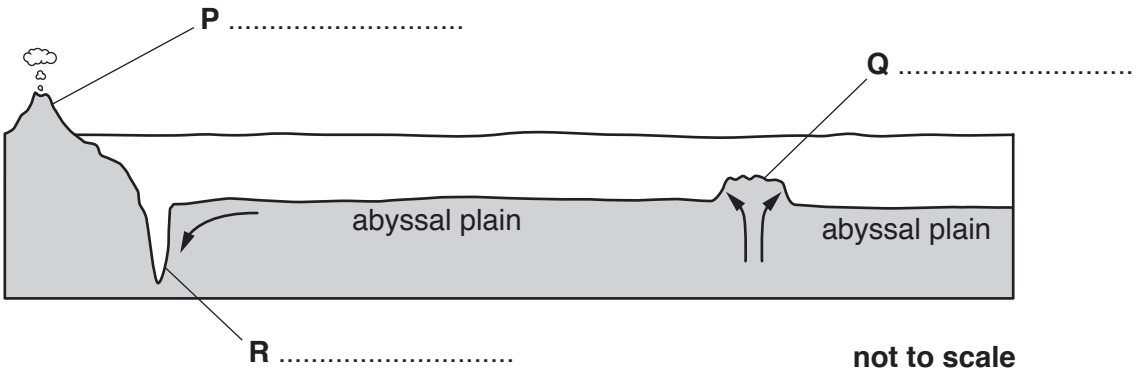

Fig. 5.1

(a) (i) On Fig. 5.1, name features **P**, **Q** and **R**. [3]

(ii) Name the type of tectonic boundary at feature **R** in this ocean.

..... [1]

(b) (i) Outline how the abyssal plain, shown in Fig. 5.1, was formed.

.....

.....

.....

.....

.....

..... [3]

(ii) State **one** piece of evidence that supports the theory of abyssal plain formation described in **(b)(i)**.

.....

..... [1]

(iii) Explain the scientific meaning of the term *theory*.

.....

.....

.....

..... [2]

(c) Hydrothermal vents are found at great depths in the ocean.

Describe why hydrothermal vents are considered extreme environments.

.....

.....

.....

.....

.....

..... [3]

[Total: 13]

6 **(a)** Table 6.1 shows some of the nutrients that marine organisms use for a variety of purposes.

Complete Table 6.1 by:

- stating **one** substance that marine organisms make using each nutrient. Each substance should be different.
- stating **one** use that marine organisms make of each substance. Each use should be different.

Table 6.1

nutrient	substance	use
magnesium		
calcium	calcium carbonate	
nitrogen		growth

[4]

(b) Carbon is another nutrient required by organisms for growth and reproduction.

Explain how carbon is cycled in the ocean.

.....

.....

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.....

.....

..... [4]

[Total: 8]

7 Fig. 7.1 shows how the dissolved oxygen concentration changes with depth in a tropical ocean.

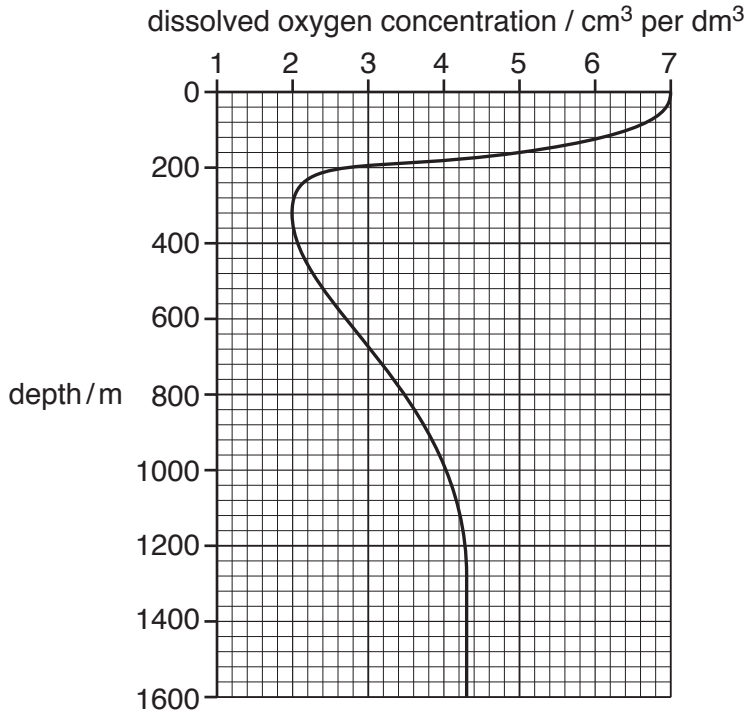

Fig. 7.1

(a) Explain why dissolved oxygen concentration is high in the surface waters of the ocean.

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..... [4]

(b) Table 7.1 shows the minimum dissolved oxygen requirements of some fish species found in a tropical ocean.

Table 7.1

species	minimum dissolved oxygen requirement / cm^3 per dm^3
A	7
B	5
C	3
D	3
E	2

(i) Use information from Fig. 7.1 and Table 7.1 to state which species can only be found in the top 10 m of water.

..... [1]

(ii) Suggest the maximum depth at which species **B** could live. ..... [1]

(c) Suggest why it is unusual for fish that live at depths of over 800 m to be found in surface waters.

.....

.....

.....

..... [2]

[Total: 8]

8 Table 8.1 shows the total area of mangrove forest in three continents in 1980, 1990 and 2000. It also shows the percentage loss of mangrove forest from 1980 to 2000.

Table 8.1

continent	total area of mangrove forest / thousand hectares			percentage loss of mangrove forest 1980 – 2000
	1980	1990	2000	
Asia	7857	6689	5833	25.8
South America	3802	2202	1974	48.1
Africa	3659	3470	3350	

(a) (i) Use the information in Table 8.1 to calculate the percentage loss of mangrove forest in Africa from 1980 to 2000.

Show your working.

.....
[2]

(ii) Suggest **two** reasons for the global loss of mangrove forest from 1980 to 2000.

1 .....

.....

2 .....

.....
[2]

(b) Mistletoe plants grow on the branches of some mangrove trees. The mistletoe takes nutrients from the mangrove tree, which may reduce the growth of the mangrove tree.

Name the type of inter-relationship between mistletoe and a mangrove tree.

..... [1]

[Total: 5]

9 **(a)** Explain why tropical cyclones (typhoons / hurricanes) weaken when they move inland.

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..... [3]

(b) Explain how tropical cyclones can cause damage to a coral reef.

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..... [4]

(c) Tropical cyclones can also have an impact on nearby human coastal communities.

Suggest **two** such impacts and for each impact describe its effect on the community.

1 .....

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2 .....

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[4]

[Total: 11]

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