



Cambridge International AS & A Level

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MARINE SCIENCE

9693/11

Paper 1 AS Level Theory

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 75.
- The number of marks for each question or part question is shown in brackets [].

This document has **16** pages. Any blank pages are indicated.

Section A

Answer **all** questions in this section.

- 1 (a) Complete Fig. 1.1 by sorting the features of seagrass and macroalgae shown in the box below.

blade	flowers	gas bladder	holdfast	photosynthetic
	primary producer	rhizome	stipe	

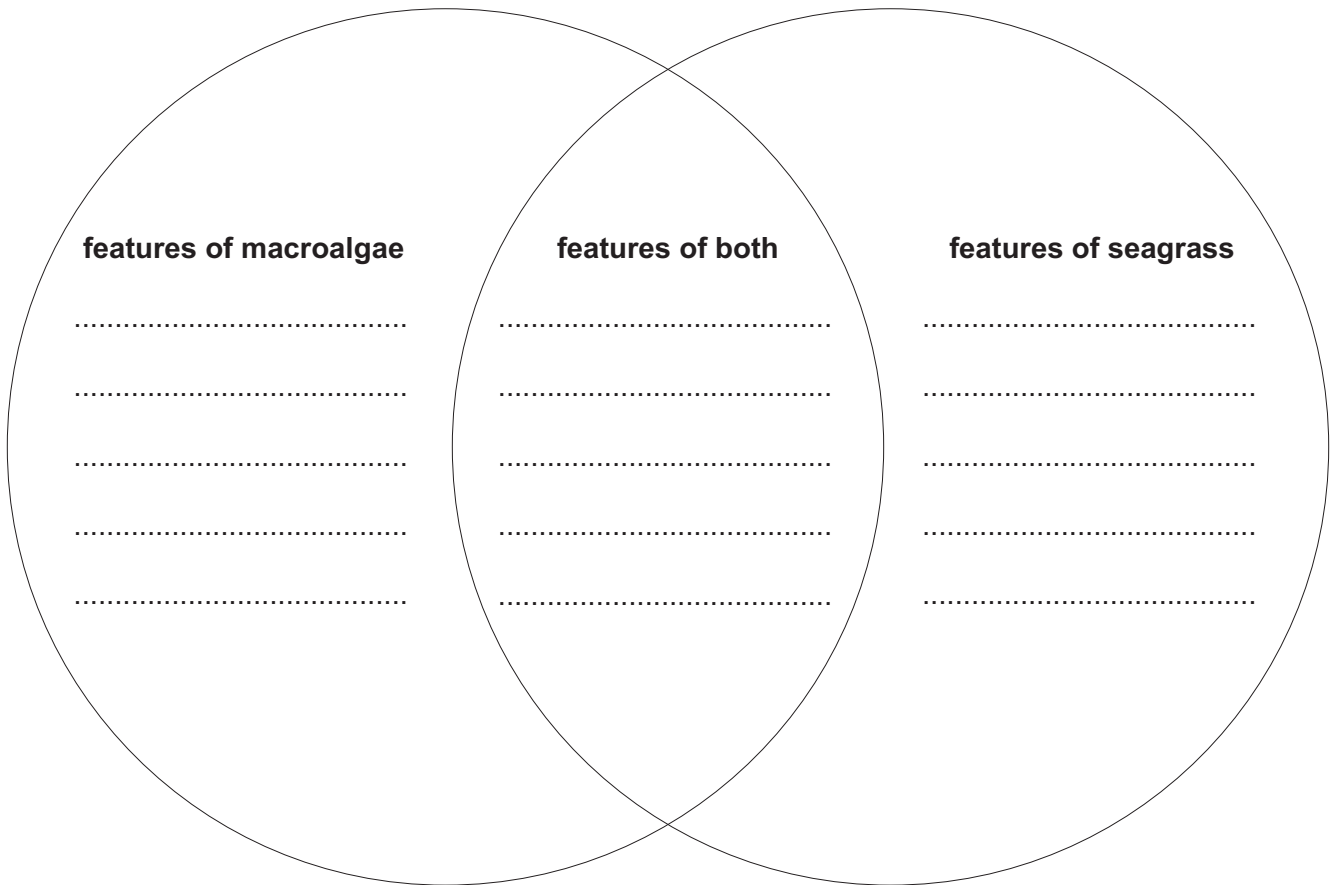


Fig. 1.1

[2]

(b) Describe how seagrasses are of economic importance.

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..... [4]

(c) A scientist states that an ecosystem has a high species diversity of macroalgae.

Explain what this statement means.

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..... [2]

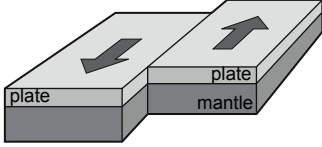
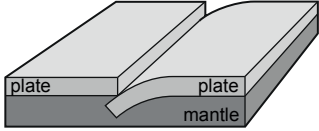
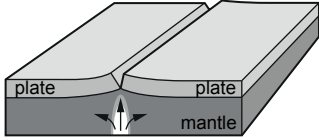
[Total: 8]

2 (a) The Earth's crust is made up of three types of tectonic plate boundaries.

Complete Table 2.1. One row has been completed for you.

Do **not** refer to earthquakes in your answer.

Table 2.1

plate boundary type	direction of movement of plates	one feature or event produced at the plate boundary
transform		earthquakes
.....	
.....	

[3]

(b) State **three** pieces of evidence that support the theory of plate tectonics.

- 1
-
- 2
-
- 3
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[3]

[Total: 6]

3 Fig. 3.1 shows an exposed rocky shore.



Fig. 3.1

(a) Explain how **two** named types of weathering have affected the shoreline in Fig. 3.1.

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..... [3]

(b) Fig. 3.2 shows a graph of the body temperature of a mollusc on the middle of the rocky shore, over a period of six hours.

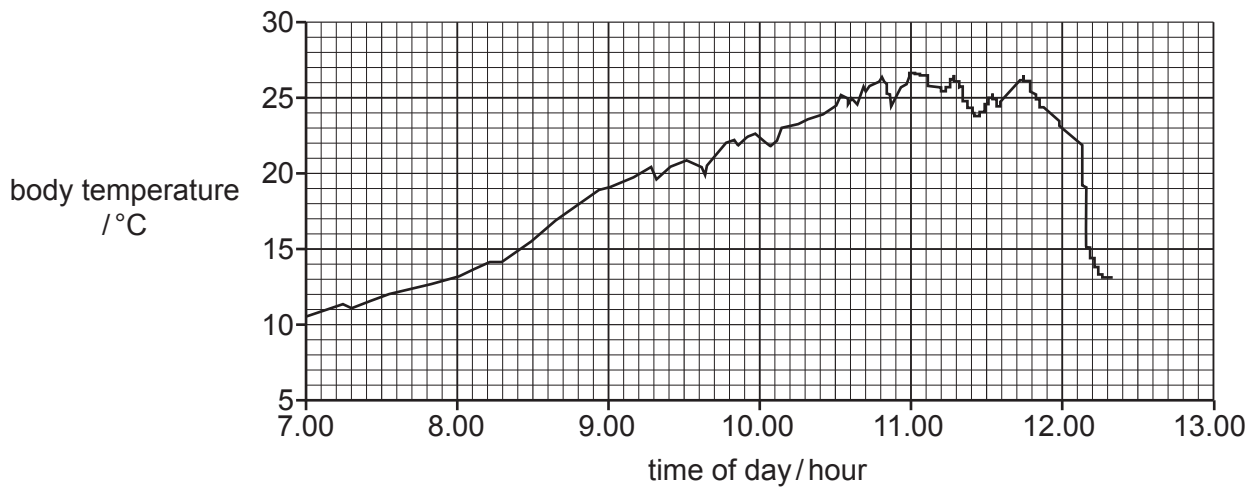


Fig. 3.2

(i) Use Fig. 3.2 to calculate the maximum change in temperature that the organisms tolerate.

..... °C [1]

(ii) Use Fig. 3.2 to identify the time when the tide returns and covers the mollusc.

..... [1]

(c) Fig. 3.3 shows a group of the molluscs on a rock.

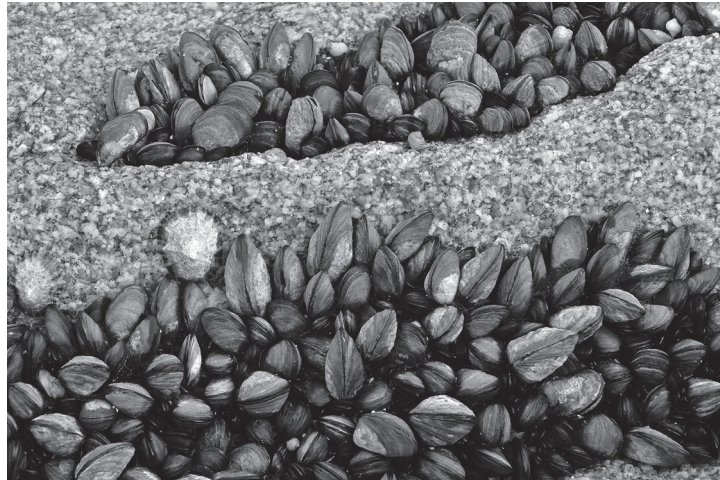


Fig. 3.3

Explain how **two** named biotic factors may limit the distribution of the mollusc species.

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..... [2]

[Total: 7]

4 (a) Fig. 4.1 shows a clownfish species living with sea anemones.



Fig. 4.1

(i) Label the pectoral fin **and** caudal fin of one clownfish on Fig. 4.1. [2]

(ii) Sea anemones belong to the same phylum as coral polyps.

Name this phylum.

..... [1]

(iii) State **one** feature present during the early development of the clownfish that indicates that it belongs to a different phylum to the sea anemone.

..... [1]

(b) Sea anemones contain zooxanthellae. Sea anemones have the same relationship with zooxanthellae as coral polyps have with zooxanthellae. Sea anemones also have nematocysts.

Explain why the sea anemone can occupy trophic level 2 **and** trophic level 3 in a food web.

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..... [4]

(c) A sea anemone was fed with nutrients containing a radioactive form of nitrogen. After a short period of time, radioactive nitrogen was found in the zooxanthellae.

(i) Suggest how the radioactive nitrogen reaches the zooxanthellae.

.....
 [1]

(ii) State **one** molecule containing nitrogen that is found in the zooxanthellae.

..... [1]

(d) Scientists investigated the behaviour of clownfish with and without the sea anemone they usually live with.

They calculated the number of fin strokes of the pectoral fins and the caudal fin per second.

Table 4.1 shows the results of the investigation.

Table 4.1

	strokes per second	
	pectoral	caudal
sea anemone not present	0.68	0.00
sea anemone present	0.75	0.24

Describe how the presence of the sea anemone affects the fin stroke rate of the clownfish.

.....

 [2]

(e) It is thought there is a benefit to sea anemones when living in close proximity to clownfish.

The clownfish feed on marine organisms and on eggs released by the sea anemone.

Discuss the relationships between sea anemones and clownfish.

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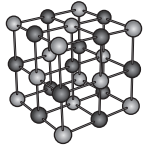
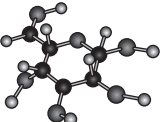
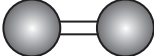
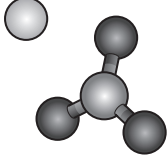
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..... [4]

[Total: 16]

5 Sea water is a solution of different chemicals.

(a) (i) Draw one line from each chemical model to its name.

	model	name of chemical
A		sodium chloride
B		calcium carbonate
C		water
D		sulfur dioxide
		glucose
		oxygen

[2]

(ii) State the type of chemical bonding found in each model.

A

B

C

D

[2]

(b) Water and sulfur dioxide are small molecules.

Explain why water is a liquid at room temperature, whereas sulfur dioxide is a gas at room temperature.

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[Total: 8]

Section B

Answer **all** questions in this section.

- 6 Describe the differences between cartilaginous and bony fish.

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(b) Describe inter-specific **and** intra-specific competition **and** how these affect the distribution of organisms on the lower zone of a rocky shore.

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[Total: 15]

8 Explain how biotic **and** abiotic factors affect the dissolved oxygen concentration in the open ocean.

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