



Cambridge International AS & A Level

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MARINE SCIENCE

9693/13

Paper 1 AS Level Theory

May/June 2025

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) Fig. 1.1 shows part of a red mangrove tree, *Rhizophora mangle*.

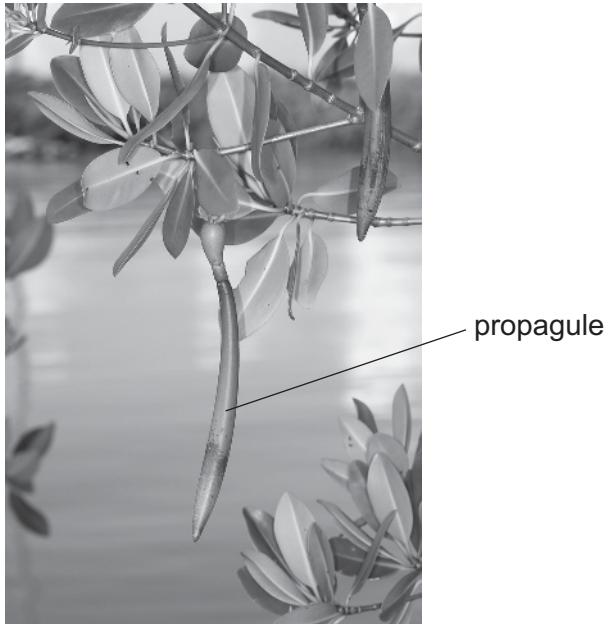


Fig. 1.1

(i) *Rhizophora mangle* reproduces using propagules instead of releasing seeds.

Name this type of reproduction.

..... [1]

(ii) Explain the advantage of producing propagules instead of releasing seeds.

.....
.....
.....
..... [2]





(b) Red mangrove trees have prop roots.

Describe how red mangrove prop roots are a benefit for nearby seagrass beds.

.....
.....
.....
.....
.....

[3]

(c) Worldwide, the area covered by mangrove ecosystems is decreasing.

(i) Describe **two** threats to mangrove ecosystems.

1

.....

2

.....

[2]

(ii) In one area of the United States of America, over 100 000 people are estimated to be dependent on mangroves for their work.

State **two** ways that mangroves provide work opportunities for people.

1

.....

2

.....

[2]

[Total: 10]





2 (a) Sodium chloride is the most abundant salt in sea water.

(i) Fig. 2.1 shows the subatomic particles in an atom of sodium.

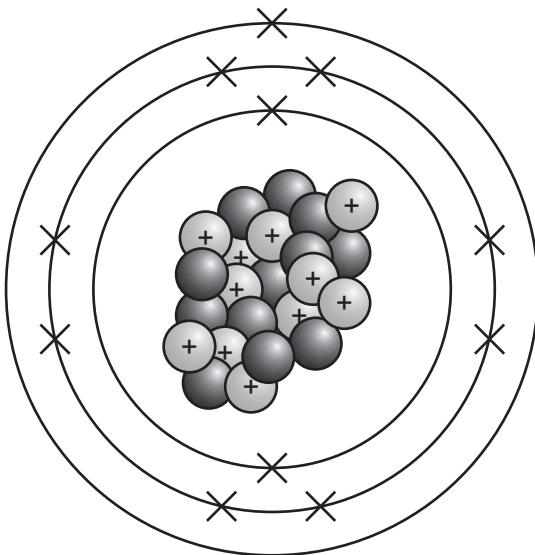


Fig. 2.1

Table 2.1 shows information about the structure of a sodium atom.

Table 2.1

subatomic particle	charge	number present in a sodium atom
electron
neutron	12
proton	+1

Use Fig. 2.1 to complete Table 2.1.

[2]

(ii) State the particle formed from an atom when electrons are lost or gained.

..... [1]





(b) Calcium carbonate is found in animals.

(i) State the chemical formula of calcium carbonate.

..... [1]

(ii) Describe how calcium carbonate from animals can become part of rocks.

.....
.....
.....
.....
.....
..... [3]

(c) Algae require magnesium for growth.

Explain why a lack of magnesium can limit the growth of algae.

.....
.....
.....
.....
.....
.....
.....
..... [4]

[Total: 11]





3 (a) Name the zone in the open ocean that includes the ocean floor.

..... [1]

(b) Evidence for the theory of plate tectonics has been found in the rocks of the ocean floor.

Give **two** pieces of evidence of plate tectonics that are found in rocks.

1

.....

2

.....

[2]

(c) Table 3.1 shows three types of plate boundary.

Table 3.1

	A	B	C
name of plate boundary

(i) Complete Table 3.1 with the name of each plate boundary shown. [3]

(ii) State the plate boundary, **A**, **B** or **C**, where a mid-ocean ridge could form.

..... [1]





(d) Hydrothermal vents can form on the ocean floor near to plate boundaries.

(i) Describe how a chimney forms at a hydrothermal vent.

.....
.....
.....
.....
.....

[3]

(ii) Suggest **two** reasons why photosynthesis would **not** be expected to occur at a hydrothermal vent.

1

2

[2]

[Total: 12]





4 Fig. 4.1 shows a keyhole limpet.



Fig. 4.1

(a) The keyhole limpet is an animal that attaches to rocks in the littoral zone of a rocky shore.

(i) Define the term littoral zone.

.....
.....

[1]

(ii) Rocky shores are formed by weathering and erosion.

Contrast the processes of weathering and erosion.

.....
.....
.....
.....

[2]

(iii) Many organisms living on rocky shores have shells.

Describe **one** way that a shell is an advantage to living on a rocky shore.

.....
.....

[1]

(iv) The keyhole limpet attaches to rocks. The number of keyhole limpets in an area was investigated.

State the name of the equipment used to estimate the number of keyhole limpets in an area.

.....

[1]





(b) The keyhole limpet is an omnivore.

Describe why assigning a trophic level to the keyhole limpet is difficult.

..... [1]

(c) The keyhole limpet produces a protein called keyhole limpet hemocyanin (KLH).

(i) Name the **four** chemical elements found in all proteins.

1

2

3

4

[1]

(ii) KLH is used as an anticancer drug.

Patients are given a KLH dose of 0.8 milligrams (mg).

An estimated global demand for KLH is 90 000 000 doses per year.

One keyhole limpet can produce 1.2 grams (g) of KLH per year.

Calculate how many keyhole limpets are needed to meet the yearly global demand of KLH doses.

Space for working.

..... [3]

(iii) KLH cannot be made artificially. KLH can only be harvested from keyhole limpets.

Describe **two** ways the over-harvesting of keyhole limpets is a threat to the rocky shore food web.

1

.....

2

.....

[2]

[Total: 12]

[Turn over]





Section B

Answer **all** questions in this section.

5 Describe the structures **and** methods that coral polyps use to obtain their nutrition.

[8]





6 (a) Fig. 6.1 shows two water molecules.

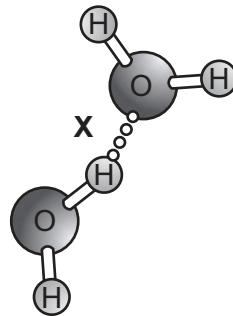


Fig. 6.1

The bond labelled **X** is between two water molecules.

Explain the formation of bond X.

[5]





(b) Fig. 6.2 shows the arrangement of water molecules in liquid water and in ice.

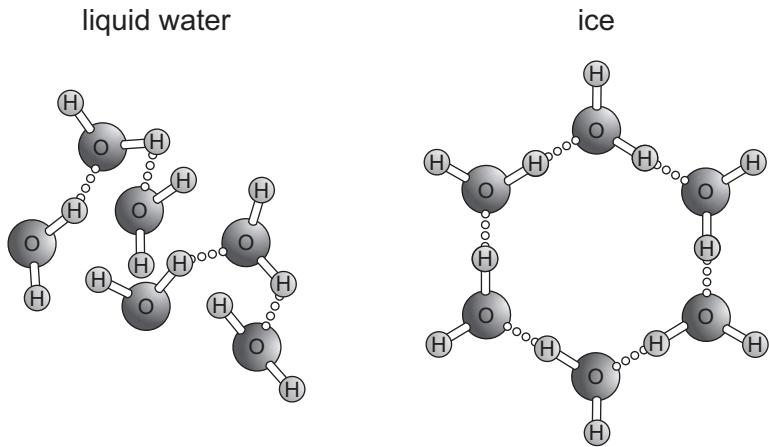


Fig. 6.2

Liquid water and ice have different densities.

Explain the different densities of liquid water and ice **and** how this is important to marine organisms.

[8]





[9]

[Total: 22]







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