Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MARINE SCIENCE **9693/11**

Paper 1 AS Level Theory **October/November 2024**

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.

[Turn over

Section A

Answer **all** questions in this section.

1 Sea water consists of many different elements and compounds.

(a) Fig. 1.1 shows an atom of chlorine.

Key

p = protons
n = neutrons

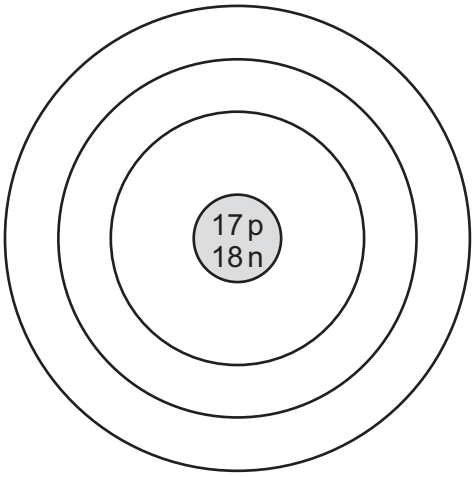

Fig. 1.1

(i) Complete Fig. 1.1 to show the electron arrangement of chlorine.

Use a cross (x) to represent each electron. [2]

(ii) The compound sodium chloride is a major component of sea water.

Chlorine forms chloride ions when it forms an ionic compound with sodium.

Explain why the symbol for a chloride ion is Cl^-.

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..... [2]

(iii) A different ionic compound is used to form the bones and shells of marine organisms.

Name this compound **and** give its chemical formula.

name .....

chemical formula .....

[2]

(b) Brine is a concentrated solution of sodium chloride in water.

A sample was taken from a marine brine pool.

The sample had a volume of 300.0 cm^3 and a mass of 358.2 g.

Calculate the density of the brine sample.

Show your working.

State the unit.

.....

[3]

(c) State **two** abiotic factors other than sodium chloride concentration that affect the density of sea water.

1 .....

2 .....

[1]

[Total: 10]

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2 Fig. 2.1 shows the crown-of-thorns starfish (COTS), *Acanthaster planci*, an echinoderm.

Fig. 2.1

(a) (i) State **two** features typical of echinoderms.

1 .....

2 .....

[2]

(ii) Complete Table 2.1 to show the hierarchy of classification for the crown-of-thorns starfish.

Table 2.1

group	crown-of-thorns starfish classification
domain	Eukarya
kingdom	.....
.....	Echinodermata
class	Asteroidea
order	Valvatida
family	Acanthasteridae
genus	.....
.....	.....

[4]

(b) Crown-of-thorns starfish (COTS) prey on fast growing branching hard corals, but do not prey on slow growing soft corals as frequently.

(i) Explain the effect COTS have on the coral species diversity at a low population density of COTS.

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..... [2]

(ii) Explain the effect COTS have on the coral species diversity at a high population density of COTS.

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..... [2]

(c) Fig. 2.2 shows the percentage cover of algae and the percentage cover of hard corals on a section of reef between 1993 and 2020.

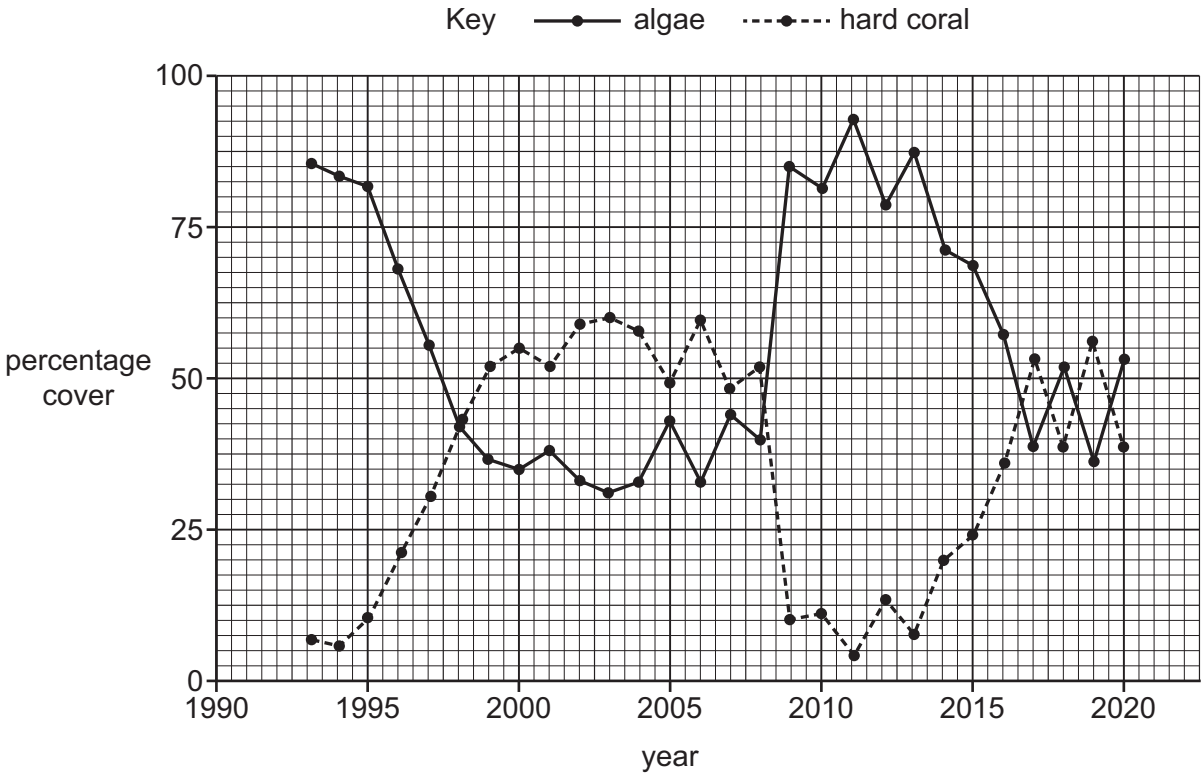

Fig. 2.2

(i) Use Fig. 2.2 to state the year in which a COTS outbreak started.

..... [1]

(ii) Use Fig. 2.2 to describe the relationship between the percentage cover of algae and the percentage cover of hard corals.

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..... [1]

(iii) Suggest **one** abiotic factor which reduces percentage cover of coral on a reef.

..... [1]

(iv) Name **one** method used for estimating the population size of a mobile species such as COTS on a coral reef.

..... [1]

[Total: 14]

3 Manatees are large, air-breathing, marine mammals that feed on seagrass.

Fig. 3.1 shows a seagrass plant.

Fig. 3.1

(a) On Fig. 3.1, label **four** features of a seagrass plant using label lines. [2]

(b) There are large seagrass beds around the coastline of Florida in the USA.

In 2021, there were many deaths of manatees living in lagoons around Florida. Significant phytoplankton blooms also occurred in the same areas.

(i) Suggest **one** reason why a phytoplankton bloom may have occurred.

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..... [1]

(ii) Suggest how the phytoplankton bloom could have caused the death of the manatees.

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..... [3]

(c) Seagrass beds are a food source for many marine species.

Explain **two** other ecological or economic benefits of seagrass beds.

1 .....

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2 .....

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[4]

[Total: 10]

4 Fig. 4.1 shows a cross-section of a rocky shore.

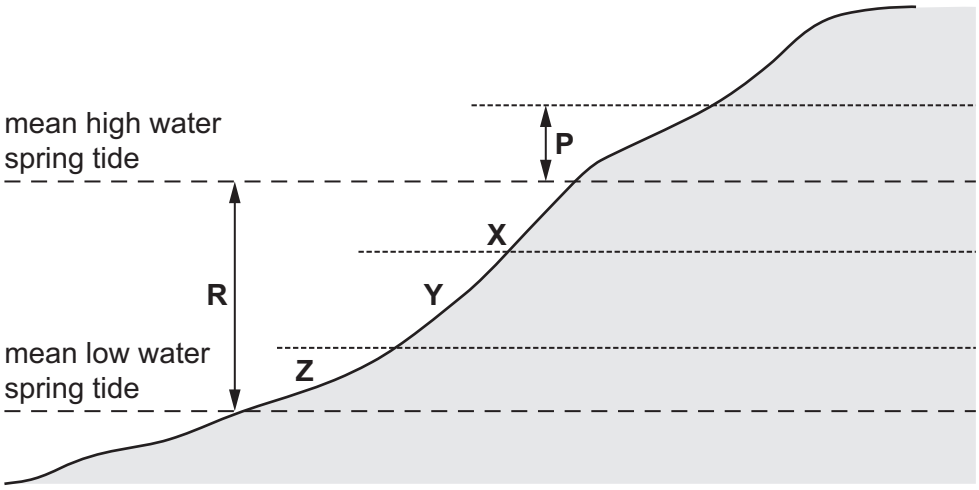

Fig. 4.1

(a) (i) Name zones **P** and **R** shown on Fig. 4.1.

P .....

R .....

[2]

(ii) Zone **P** is partly submerged on a few occasions each year.

Name **one** abiotic factor that would cause part of zone **P** to become submerged.

..... [1]

(b) Describe how abiotic factors in zone **Y** on Fig. 4.1 change over a tidal cycle on a sunny, warm day.

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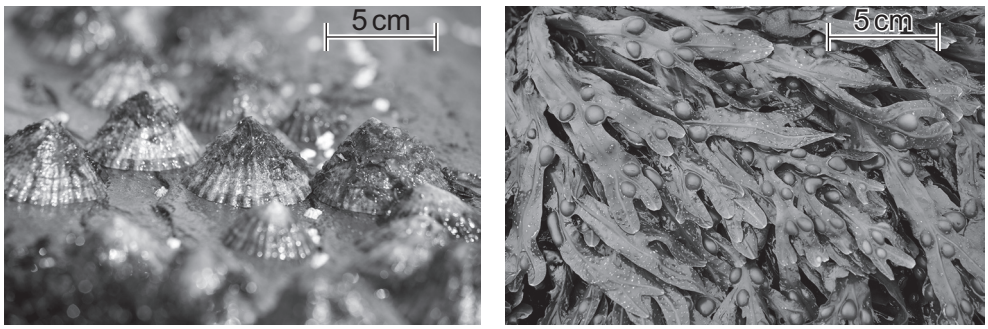
..... [4]

(c) Fig. 4.2 shows two marine organisms, **A** and **B**, from a rocky shore.



A **B**

Fig. 4.2

On Fig. 4.1, organism **A** is found in zone **X** and organism **B** is found in zone **Z**.

Explain **one** adaptation each organism has to the zone in which it is found.

organism **A** .....

.....

.....

organism **B** .....

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[4]

[Total: 11]

Section B

Answer **all** questions in this section.

5 **(a)** Explain the processes involved in the formation of sediment **and** its deposition in mangrove estuaries.

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..... [5]

(b) Discuss the causes **and** impacts of the loss of mangrove forests.

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..... [7]

[Total: 12]

6 **(a)** Describe how hydrogen bonds form between water molecules **and** how hydrogen bonds are involved in the formation of floating sea ice.

You may include labelled diagrams.

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..... [7]

(b) Explain the importance to marine organisms of ice floating on sea water.

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..... [5]

[Total: 12]

7 Explain the processes leading to a vent chimney forming at a hydrothermal vent.

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..... [6]

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