



Cambridge International AS & A Level

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MARINE SCIENCE

9693/11

Paper 1 AS Level Theory

May/June 2026

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. Do **not** use correction fluid or tape.
- 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 Sea bass are bony fish.

(a) Figure 1.1 shows a sea bass.



Figure 1.1

On Figure 1.1, draw label lines to identify:

- the pectoral fin
- the caudal fin
- the lateral line.

[3]

(b) Sea bass and Peruvian anchoveta are both ecologically important. Sea bass are secondary consumers whereas Peruvian anchoveta are primary consumers.

Discuss the ecological importance of sea bass **and** Peruvian anchoveta.

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[4]



- (c) Peruvian anchoveta populations change significantly during El Niño events.

Complete Table 1.1 with ticks (✓) to show which conditions occur during El Niño events near the west coast of South America.

Table 1.1

condition	occurs during El Niño
weaker winds blow from the west	
stronger currents move water from south to north	
colder water	
more upwelling	
reduced plankton populations	

[2]

[Total: 9]

2 Sea water contains sodium chloride.

(a) A sodium atom has 11 electrons and a relative atomic mass of 23.

(i) Describe the structure of the nucleus of a sodium atom.

.....

.....

.....

..... [2]

(ii) Explain how a sodium atom becomes a sodium ion with a charge of +1.

.....

.....

.....

.....

.....

..... [3]

(b) Sodium chloride is soluble in water, therefore dissolves to form a solution.

Complete the sentence.

As sodium chloride dissolves in water, sodium chloride is the and the
water is the

[1]



(c) A scientist investigated the salinity of sea water at the halocline.

(i) Describe what is meant by the term halocline.

.....

.....

.....

..... [2]

(ii) Describe how the salinity of sea water causes a halocline to form.

.....

.....

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.....

.....

..... [3]

[Total: 11]



3 Red mangrove trees, *Rhizophora mangle*, have adaptations to survive in environments where roots are partly submerged in sea water.

(a) (i) Red mangrove trees reproduce using propagules.

Describe how a propagule is different from a seed.

.....
..... [1]

(ii) Propagules are an adaptation to living in water with a high concentration of salt.

Describe **one** other adaptation of red mangrove trees to living in water with a high concentration of salt.

.....
..... [1]

(b) Describe how red mangrove trees stabilise muddy shores.

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

(c) Over the last 30 years many areas of mangrove forest have reduced in size.

Give **two** reasons why humans destroy mangroves.

1
.....
2
.....
..... [2]

[Total: 7]



4 Figure 4.1 shows paleomagnetic stripes on the ocean floor.

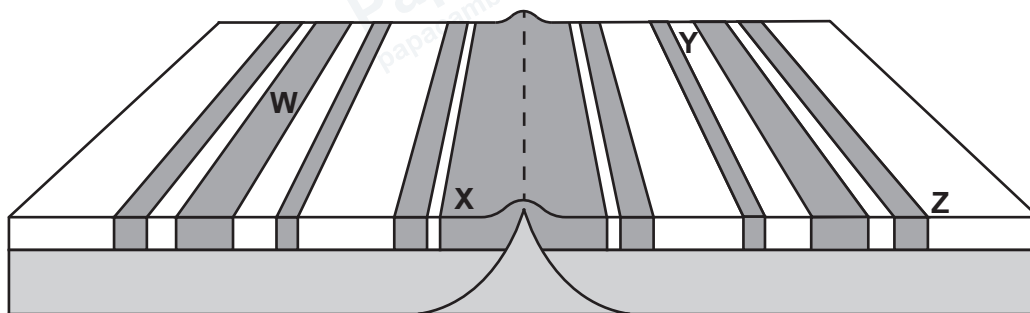


Figure 4.1

(a) Explain which location, W, X, Y or Z, will contain the oldest rock.

.....

.....

.....

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.....

..... [3]

(b) Explain how the formation of paleomagnetic stripes provides evidence of tectonic processes.

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..... [4]

(c) State **two** other types of evidence for the theory of plate tectonics.

1

.....

2

.....

[2]

[Total: 9]



5 Crown of thorns starfish (COTS), *Acanthaster planci*, damage coral.

(a) State the genus of COTS.

..... [1]

(b) Scientists have tried to control the population of COTS by injecting a poison into adult COTS.

(i) In 2015, the population of COTS on one reef was estimated to be 12 000 000.

Scientists attempted to decrease the population of COTS on the reef by injecting COTS with poison.

The population decreased to 11 655 000.

Calculate the percentage change in the population of COTS.

..... % [2]

(ii) Suggest **one** reason why scientists could **not** kill more COTS.

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

.....
..... [1]

(c) Figure 5.1 shows the number of predators of COTS at different life stages of the COTS.

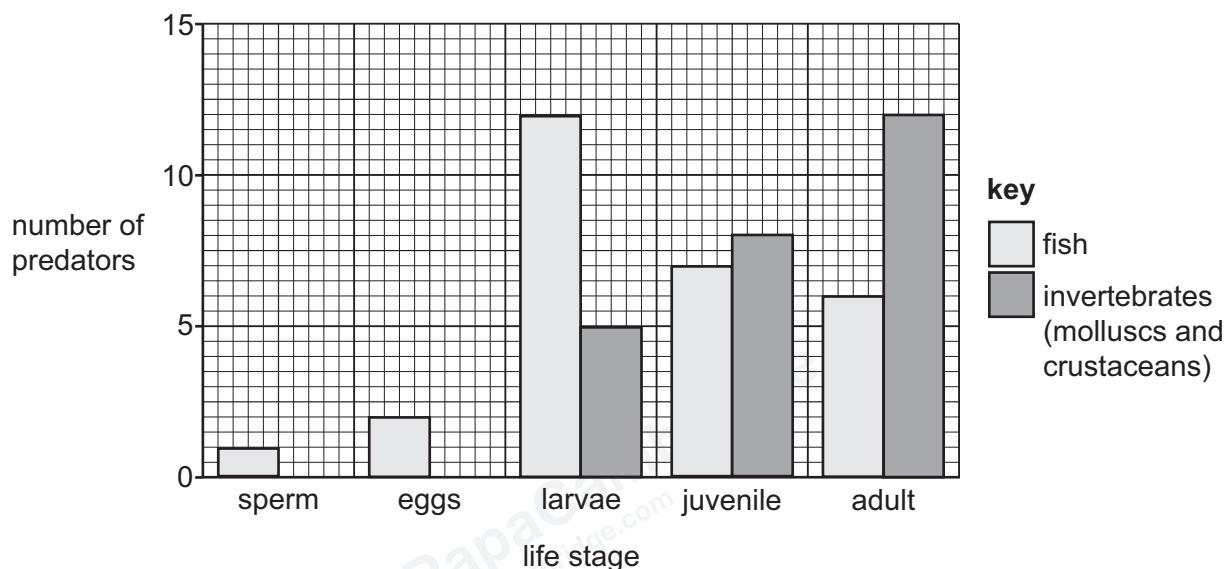


Figure 5.1

(i) Describe the trend shown in Figure 5.1 for the invertebrate predators of COTS.

..... [1]

(ii) Use Figure 5.1 to explain how overharvesting of fish may affect the population of COTS.

..... [4]

[Total: 9]



Answer **all** questions in this section.

- [6]



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[9]

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7 Discuss how the rate of photosynthesis affects the biomass of secondary consumers.

..... [7]





[8]



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