



## Cambridge International AS & A Level

CANDIDATE  
NAME



CENTRE  
NUMBER

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### MARINE SCIENCE

9693/11

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) Carbon, hydrogen and oxygen are used to make many important biological molecules.

Complete Table 1.1 by stating **one other** essential element required to make each biological molecule.

**Table 1.1**

biological molecule	essential element
chlorophyll	.....
DNA	.....
skeletons and shells	.....

[3]

(b) Large biological molecules are made from smaller molecules.

State the name of the **two** smaller molecules used to form lipids.

1 .....

2 .....

[2]

[Total: 5]





2 Fig. 2.1 shows kelp, a macroalga.

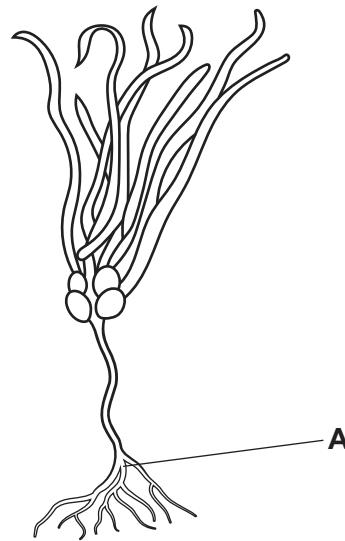


Fig. 2.1

(a) (i) State the name **and** suggest the function of the part labelled **A**.

name .....

function .....

[2]

(ii) Describe the roles of kelp in the carbon cycle.

.....

.....

.....

.....

.....

.....

[3]





(b) Fig. 2.2 shows part of a food web for a kelp ecosystem.

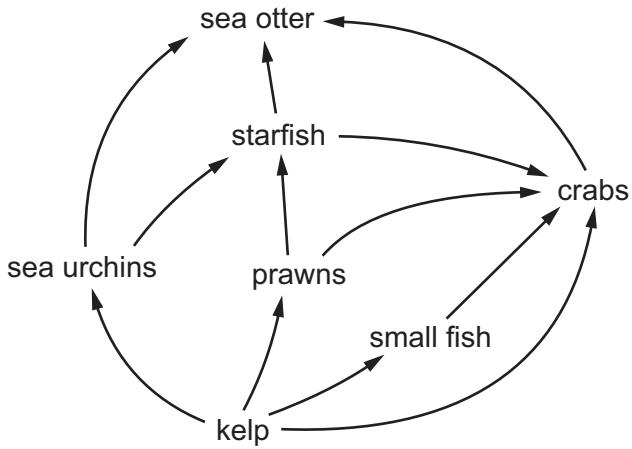


Fig. 2.2

(i) State the name of **one** omnivore shown in Fig. 2.2.

..... [1]

(ii) Suggest **one** benefit of being an omnivore.

..... [1]

..... [1]

(iii) Fig. 2.3 shows the biomass in arbitrary units (a.u.) of each population of organism in one food chain.

kelp → prawns → starfish → sea otter  
 1850 a.u.    325 a.u.    26 a.u.    1 a.u.

Fig. 2.3

Calculate the percentage decrease in biomass between prawns and starfish.

Space for working.

..... % [2]





(iv) Sea otters can be infected by large numbers of parasites.

Use Fig. 2.2 to draw a pyramid of numbers for the food chain of kelp, prawns, starfish and sea otter. Include a bar for parasites infecting the sea otters.

[3]

(c) State **three** ways kelp is of economic importance.

- 1 .....
- 2 .....
- 3 .....

[3]

[Total: 15]





3 (a) Water is a solvent.

(i) Draw a diagram to show the covalent bonding within a water molecule.

Show the electron arrangement in the outer shells.

[2]

(ii) Describe how sodium chloride dissolves in water.

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

[3]

(iii) Define the term salinity.

.....  
.....

[1]

(b) A student made  $500\text{cm}^3$  of artificial sea water by dissolving sodium chloride in pure water.

State the mass of sodium chloride required to make a solution of 34 parts per thousand (ppt) in  $500\text{cm}^3$  of water.

..... g [1]





**(c)** Describe the importance of ice floating to the marine ecosystem.

.....

.....

.....

.....

.....

.....

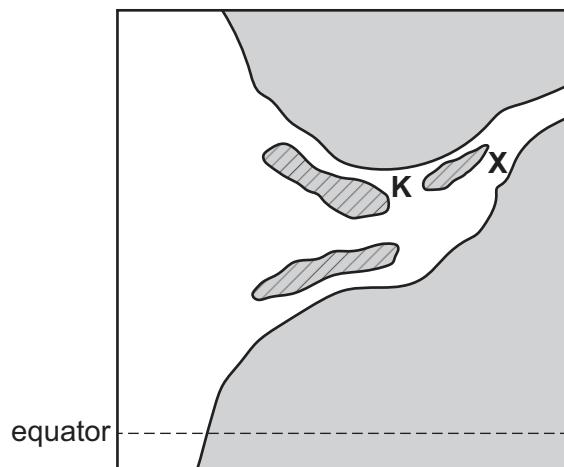
[3]

[Total: 10]



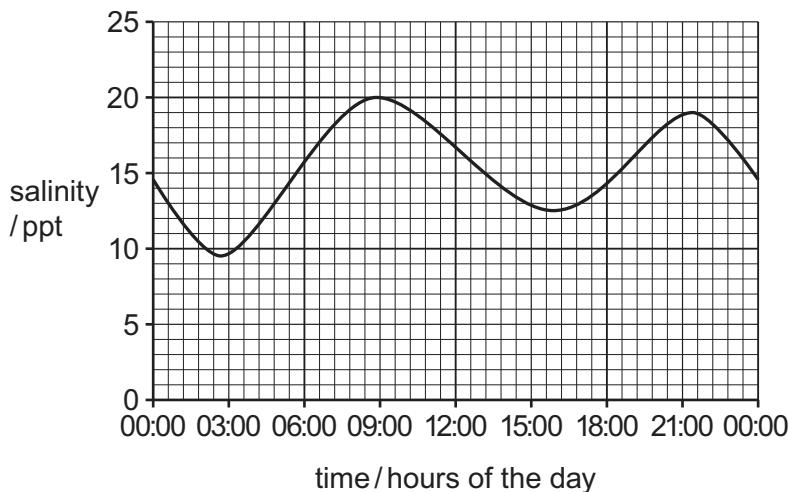


4 Fig. 4.1 shows a diagram of an estuary viewed from above. Fig. 4.2 shows how the salinity changes at location X in the estuary during a 24-hour period.

**Key**

■ land

■ islands exposed at low tide

**Fig. 4.1****Fig. 4.2**

(a) (i) Use Fig. 4.2 to calculate the salinity range for location X during the 24-hour period.

..... ppt [1]

(ii) Suggest the reasons for the changes in salinity levels at location X in Fig. 4.1 during the 24-hour period.

.....

.....

.....

.....

.....

[3]





(b) (i) Explain why location **K** is suitable for the development of a mangrove ecosystem.

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

[3]

(ii) Explain **one** adaptation of the red mangrove, *Rhizophora mangle*, to its tidal habitat.

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

[2]

[Total: 9]





5 (a) Primary productivity was continuously measured in two parts of an ocean in the southern hemisphere for a year. Fig. 5.1 shows the results.

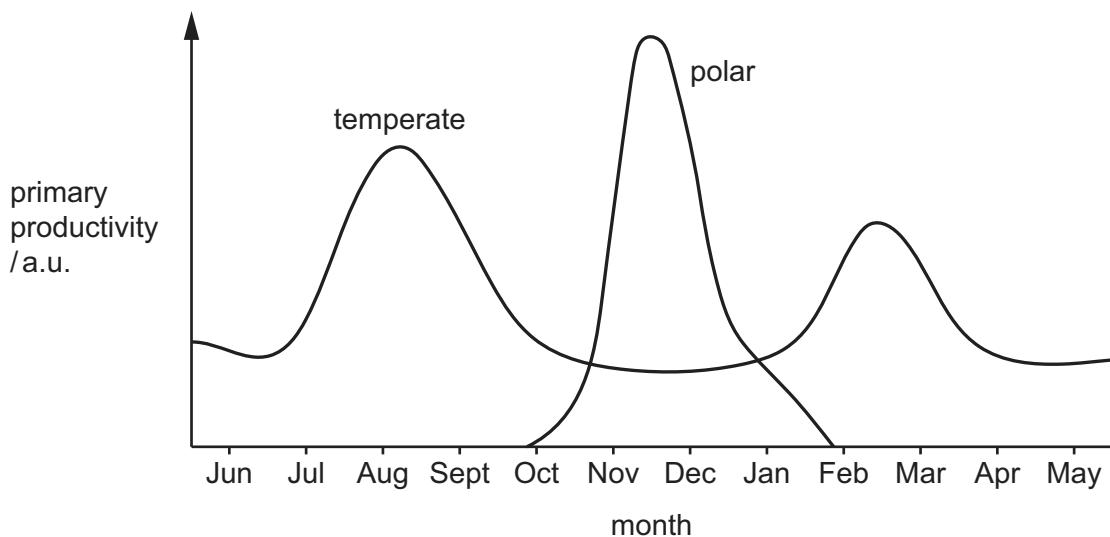


Fig. 5.1

(i) Define the term productivity.

..... [1]

(ii) Use Fig. 5.1 to describe how productivity differs between temperate and polar regions.

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

(iii) Light intensity is an abiotic factor which affects primary productivity.

State **two other** changes in abiotic conditions that **decrease** primary productivity.

1 .....

.....  
 .....  
 2 .....

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





(b) Table 5.1 shows the neap tide heights in South Georgia in the Southern Ocean on one day.

**Table 5.1**

time	height / m
05:04	1.09
12:40	0.58
18:36	1.01
21:24	0.76

Suggest how the data would be different during a spring tide.

.....  
.....

[1]

[Total: 6]





## Section B

Answer **all** questions in this section.

6 Rocky shore ecosystems contain different zones. Rocky shore organisms show different distribution and abundance across the zones. Fig. 6.1 shows this zonation.

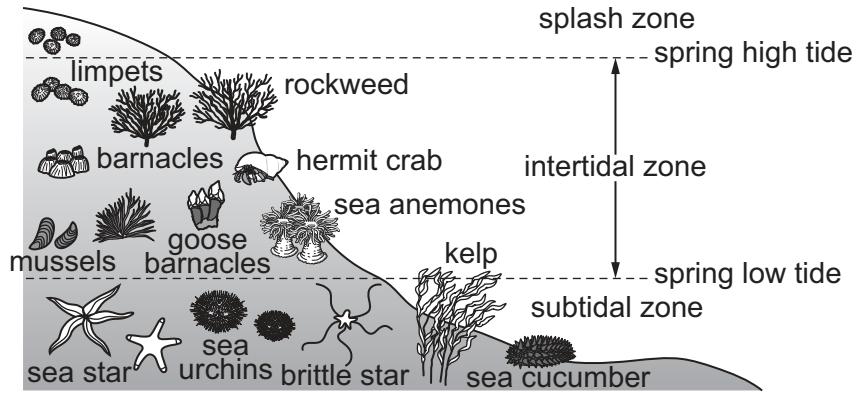


Fig. 6.1

Explain why zonation occurs.

[8]





7 Describe how underwater volcanoes form close to convergent plate boundaries.

[5]





8 (a) Discuss the structure of a typical coral polyp. Describe the function of each structure.

You can include a diagram.

.....

.....

.....

.....

.....

.....

[8]





**(b)** Discuss the causes **and** effects of coral reef erosion.

[9]

[Total: 17]





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