



Cambridge International AS & A Level

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MARINE SCIENCE**9693/11**

Paper 1 AS Level Theory

October/November 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 Fig. 1.1 shows part of a food web.

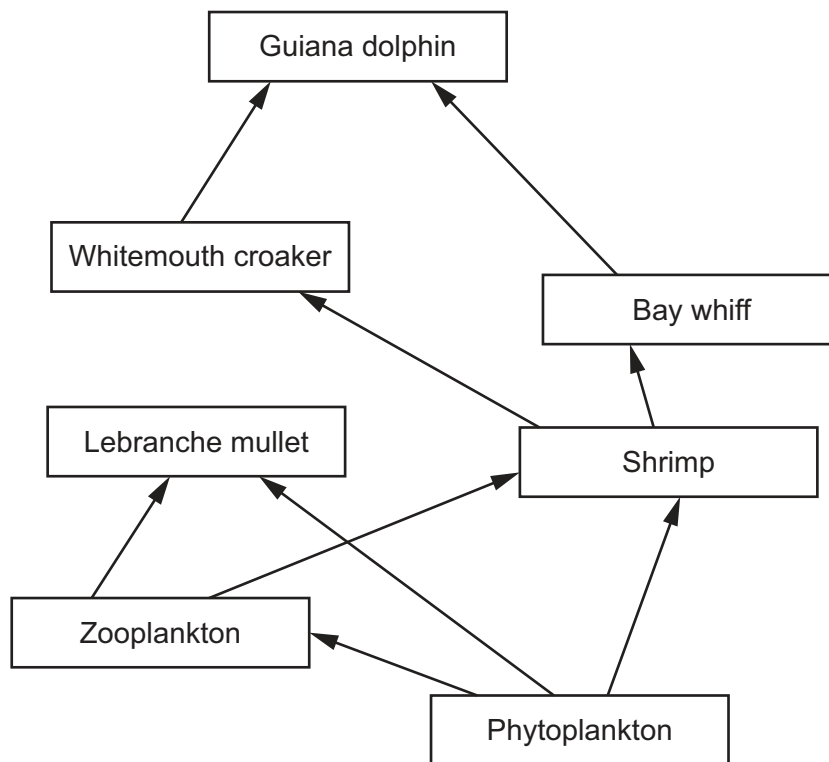


Fig. 1.1

- (a) (i) Complete the sentence.

Choose **one** answer from the box.

carnivores

herbivores

omnivores

Shrimp are

[1]

- (ii) State **one** tertiary consumer in Fig. 1.1.

.....

[1]



- (iii) Cutlassfish are predators of whitemouth croakers and lebranche mullets.

Cutlassfish are prey of Guiana dolphins.

Complete Fig. 1.1 by adding cutlassfish to the food web.

[2]

- (iv) Zooplankton are in the second trophic level.

Describe the meaning of the term trophic level.

.....

.....

.....

..... [2]

- (b) (i) Barnacles attach to Guiana dolphins in a similar way that they attach to whales.

Describe **one** benefit to the barnacles of being attached to the Guiana dolphin.

.....

..... [1]

- (ii) Suggest **two** disadvantages to the Guiana dolphin of having barnacles attached.

1

.....

2

..... [2]

- (iii) State the type of symbiosis where one organism benefits and the other organism is harmed.

.....

..... [1]



(c) (i) Marine organisms require dissolved nutrients for growth.

State **three** ways that dissolved nutrients in the ocean are replenished.

- 1
.....
- 2
.....
- 3
.....
- [3]

(ii) State **two** elements that are found in chlorophyll.

- 1
2
[2]

[Total: 15]



2 Hydrothermal vents occur at divergent plate boundaries.

(a) (i) Describe the plate movement that occurs at a divergent plate boundary.

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

(ii) Describe how a hydrothermal vent chimney forms at a divergent plate boundary.

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

(b) (i) A hydrothermal vent is at a depth of 2000 metres.

State the type of producer at the hydrothermal vent.

..... [1]

(ii) A chimney at a hydrothermal vent was observed to increase in height by 12.2 metres in 2 years.

Calculate the mean **monthly** growth rate of the chimney.

Include the unit.

..... [3]

[Total: 9]



3 (a) Boxer crabs and anemones have a symbiotic relationship.

(i) State the type of symbiotic relationship between boxer crabs and anemones.

..... [1]

(ii) Anemones are in the same phylum as coral.

State the name of the phylum of coral.

..... [1]

(b) The size of a boxer crab population on one beach was estimated using the equation:

$$N = \frac{n_1 \times n_2}{m_2}$$

N = estimate of population size

n_1 = number of individuals captured in first sample

n_2 = number of individuals (both marked and unmarked) captured in second sample

m_2 = number of marked individuals recaptured in second sample

(i) State the name of the equation used to estimate the population using the mark-release-recapture method.

..... [1]

(ii) 55 boxer crabs were captured in the first sample and marked.

35 boxer crabs were captured in the second sample.

11 boxer crabs in the second sample had a mark.

Calculate the boxer crab population size.

..... [1]



(c) State **three** limitations of the mark-release-recapture method.

- 1
- 2
- 3
- [3]

(d) Describe **three** biotic factors that would **decrease** the size of the boxer crab population.

- 1
- 2
- 3
- [3]

[Total: 10]



4 (a) Fig. 4.1 shows a diagram of a water molecule.

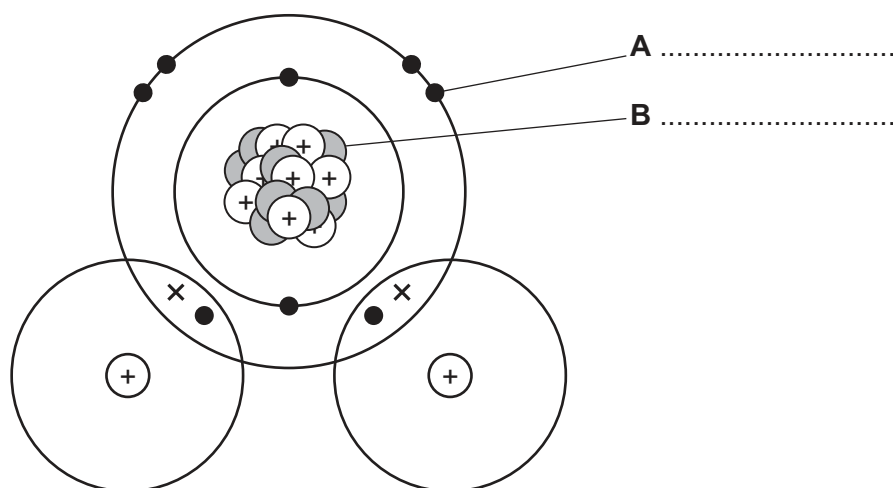


Fig. 4.1

- (i) Label part **A** and part **B** of the oxygen atom in Fig. 4.1. [2]
- (ii) Name the type of bond between an oxygen atom and a hydrogen atom within one water molecule.

..... [1]



(b) Explain why hydrogen bonds form between different water molecules.

You may include a labelled diagram.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Explain how hydrogen bonds cause the density of water to decrease when water freezes.

.....

.....

.....

..... [2]

(d) Explain how hydrogen bonds affect the specific heat capacity of water compared with most other liquids.

.....

.....

.....

..... [2]

[Total: 11]



Section B

Answer **all** questions in this section.

- 5** Fig. 5.1 shows a map of the Bay of Fundy.

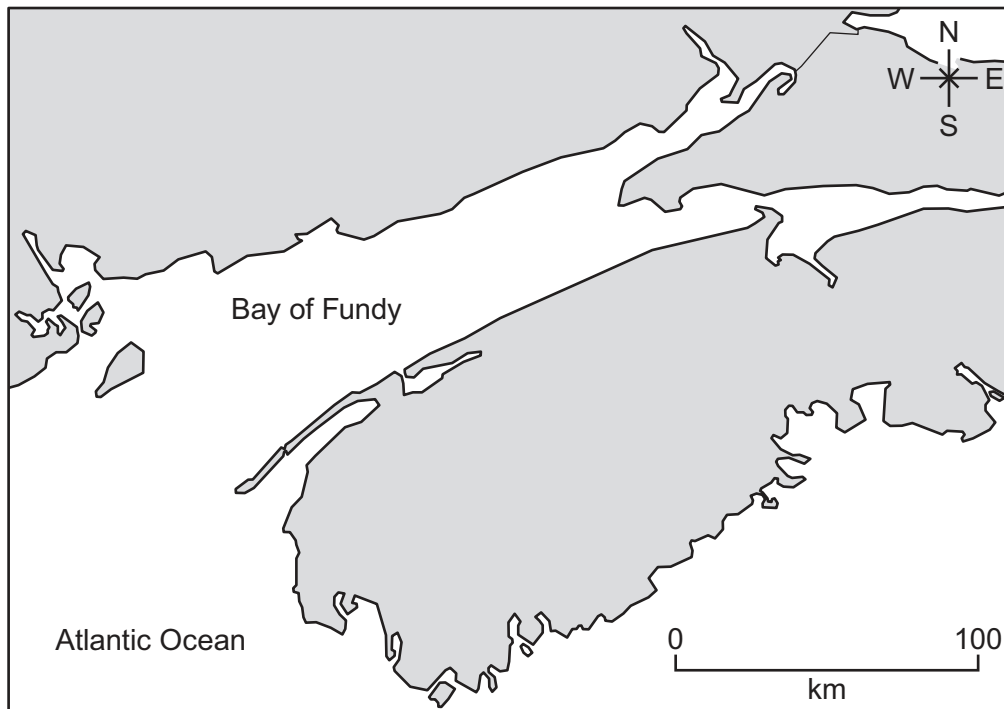


Fig. 5.1

- (a)** Explain the factors that will cause the highest tide each year in the Bay of Fundy.

[illegible]



(b) Discuss the adaptations of named animals to the abiotic factors on a rocky shore.

[6]





(c) The blades of macroalgae from the littoral zone are harvested by people for food.

The macroalgae are cut at the stipe. The holdfast is left attached to rock. The macroalgae can grow from the holdfast.

Explain the ecological **and** economic benefits of **not** harvesting the holdfast of macroalgae.

[6]

[Total: 17]



..... [5]

[8]

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