



# Cambridge International AS & A Level

CANDIDATE  
NAME

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CENTRE  
NUMBER

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**MARINE SCIENCE**

**9693/13**

Paper 1 AS Level Theory

**October/November 2022**

**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 **12** pages.

**Section A**

Answer **all** questions in this section.

- 1 (a) Many large molecules are made from small molecules.

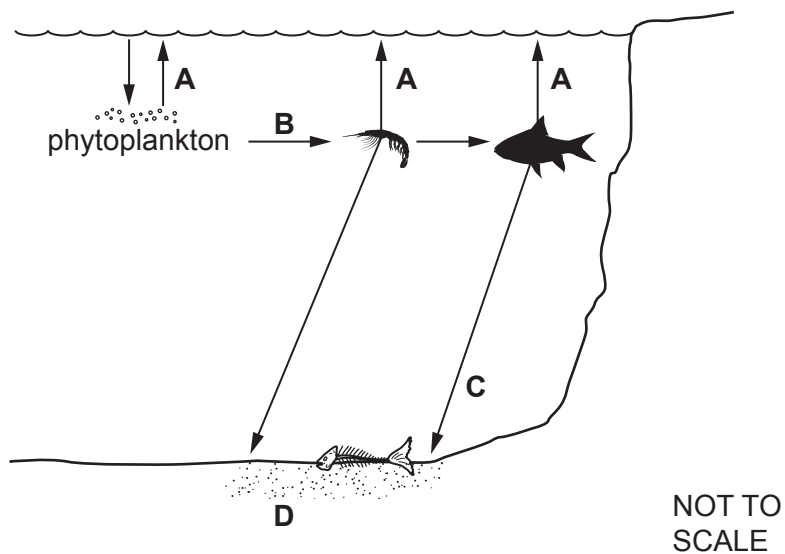
Complete Table 1.1.

**Table 1.1**

small molecules	large molecule	main chemical elements in the molecule
.....	cellulose	..... ..... .....
.....	protein	carbon, hydrogen, oxygen, nitrogen, sulfur
fatty acids and glycerol	.....	..... ..... .....

[5]

- (b) Fig. 1.1 shows part of the carbon cycle in the ocean.



**Fig. 1.1**

(i) Give the name of the processes **A**, **B** and **C**.

**A** .....

**B** .....

**C** .....

[3]

(ii) At **D**, over millions of years, fossil fuels may form.

Describe how carbon in fossil fuels may be returned to the atmosphere.

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

(iii) At **D**, over millions of years, rocks may form.

Describe how these rocks form.

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

[Total: 13]

- 2 (a) Table 2.1 shows part of the classification of the leatherback turtle.

All turtles are in the same phylum as bony fish.

**Table 2.1**

group	leatherback turtle classification
domain	.....
kingdom	.....
phylum	.....
class	Reptilia
order	Testudines
family	Dermochelyidae
genus	<i>Dermochelys</i>
species	<i>coriacea</i>

- (i) Complete Table 2.1 to give the domain, kingdom and phylum of the leatherback turtle. [3]
- (ii) Give the binomial name of the leatherback turtle.

..... [1]

(b) Fig. 2.1 shows a leatherback turtle with attached remora fish.



**Fig. 2.1**

(i) Remora fish have a commensal relationship with leatherback turtles.

Define the term commensal.

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

(ii) Scientists have investigated the effect of remora fish on the swimming efficiency of turtles.

Suggest how the presence of remora fish may be a disadvantage to a turtle when the turtle is swimming.

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

[Total: 9]

- 3 (a) Describe the differences between liquid water and ice in terms of the arrangement and the movement of water molecules.

1 .....

.....

2 .....

.....

[2]

- (b) Fig. 3.1 shows the arrangement of an oxygen atom and hydrogen atoms in a water molecule.

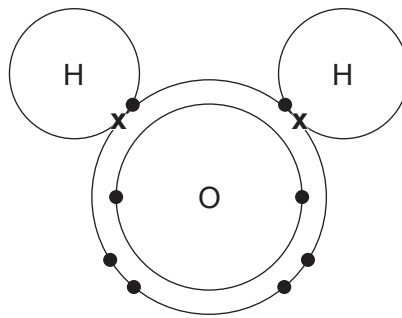


Fig. 3.1

- (i) What is represented by the crosses (x) in Fig. 3.1?

..... [1]

- (ii) Name the type of bond between oxygen and hydrogen in the water molecule shown in Fig. 3.1.

..... [1]

- (iii) Describe how a bond forms between two water molecules.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(iv) Explain how the bonds between water molecules affect the density of liquid water and of ice.

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

(v) Describe **one** way that the relative density of liquid water and of ice affects marine organisms.

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

(vi) State **three** factors that affect the density of sea water.

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

[Total: 15]

- 4 (a) A chimney with a height of 60 m above the ocean floor has been discovered at a hydrothermal vent.

The ocean depth from the surface to the ocean floor is 800 m at this point.

Calculate the height of the chimney as a percentage of the ocean depth.

Show your working.

.....%

[2]

- (b) Table 4.1 shows the productivity at two hydrothermal vents.

**Table 4.1**

vent	total productivity /g carbon year <sup>-1</sup>
<b>A</b>	$4.7 \times 10^6$
<b>B</b>	$7.4 \times 10^3$

- (i) Calculate how many times greater the productivity is at vent **A** compared with vent **B**.

Show your working.

Give your answer to an appropriate number of significant figures.

.....

[3]

- (ii) Suggest **one** reason for the lower productivity at vent **B**.

.....

..... [1]



- (iii) Productivity at hydrothermal vents affects the total biomass of the food web in the ocean around the vent.

A student predicted vent **A** would increase the biomass in a larger volume of ocean than vent **B**.

Explain why vent **A** may increase the biomass in a larger volume than vent **B**.

.....

.....

.....

..... [2]

[Total: 8]



6 (a) (i) Biodiversity can be considered at three different levels.

Describe the three different levels of biodiversity **and** explain why all three levels should be considered.

..... [7]

(ii) Explain, with examples, how coral reefs contribute to stable abiotic factors in the environment.

..... [6]

