



Cambridge International AS & A Level

CANDIDATE
NAME

CENTRE
NUMBER

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CANDIDATE
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MARINE SCIENCE

9693/12

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.

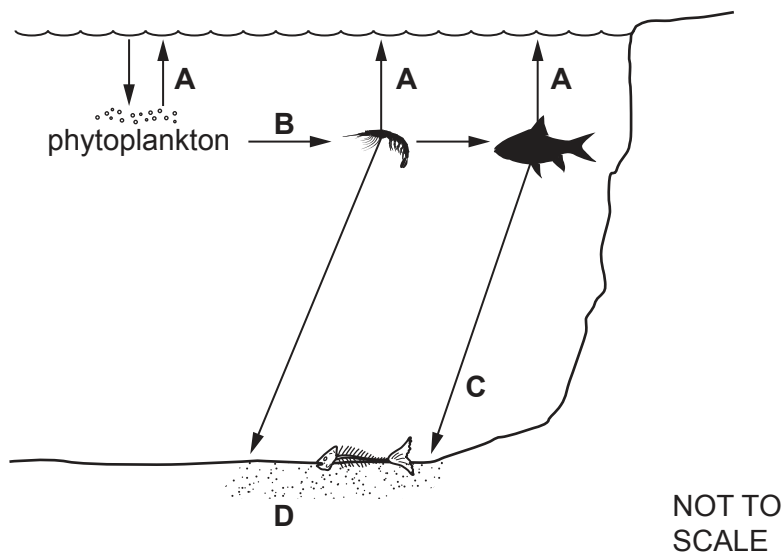
Complete Table 1.1.

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.



NOT TO SCALE

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]

(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 ⁻¹
A	4.7×10^6
B	7.4×10^3

- (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]

