

# Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



MARINE SCIENCE

Paper 1 AS Level Theory May/June 2022

1 hour 45 minutes

9693/12

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) (i) The list show	vs five substances tha	t are important	in the marine	environment.
	calcium carbonate	carbon dioxide	glucose	oxygen	sodium chloride
	Each substa	nce is formed using io	nic or covalent	bonds.	

Complete Table 1.1 to show the type of bond in each substance.

Table 1.1

ionic bonds	covalent bonds

[2]

(b)	b) (i) State <b>two</b> elements that are found in all carbohydrates, lipids and proteins.					
		and				
	(ii)	Draw lines from each large	molecule to the smaller molecule(s) from which it is made.			
		There may be more than o	one line to or from each box.			
		large molecule	smaller molecule			
		cellulose	amino acids			
		lipids	glucose			
		protein	glycerol			
		starch	fatty acids			
	(iii)	Outline how sea grasses m	[4] ake carbohydrates.			
			[3]			

**2** (a) Fig. 2.1 is a map of the world, showing the oceans.

Label the Atlantic Ocean and the Indian Ocean on Fig. 2.1.

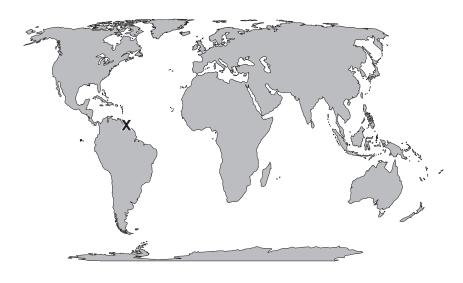


Fig. 2.1

(b)	There is a	a spring	high t	ide at X	on Fig. 2.1.

(i)	Explain how the spring high tide at <b>X</b> is formed.
	[4]
(ii)	The air pressure at <b>X</b> increases between a high tide and the next low tide.
	State ${\bf and}$ explain the difference between the predicted and the actual height of the low tide at ${\bf X}$ .
	[2]

[Total: 7]

3

A symbiotic relationship has recently been discovered between a photosynthetic marine alga and a bacterium that only lives within the alga.

The bacteria use 20% of their own energy production to make a toxin. The toxin is not harmful to the alga but is toxic to organisms eating the alga.					
(a) (i) Suggest the type of symbiotic relationship between the alga and the bacterium.					
[					
(ii) Suggest and explain the effect of this relationship on the alga and the bacterium.					
[4					
<b>(b)</b> One of the toxins produced by the bacterium is being investigated as a potential anti-cance drug.					
State the name of <b>one</b> other medical product that has been sourced from a marine organism					
[1					
[Total: 6					

**4** As the tide goes out on a rocky shore, rockpools form where the sea water does not drain away.

A scientist monitors the water temperature in several rockpools in the littoral zone over a tidal cycle.

The rockpools are located at different heights above low tide level.

Table 4.1 shows the mean temperatures of the rockpools in each region of the shore.

Table 4.1

area of littoral zone	mean temperature/°C		
lower shore	15.9		
middle shore	16.6		
upper shore	17.2		

(a)	Explain why the mean temperature of the rockpools increases with height above low tide level.
	[2]
(b)	Describe how <b>and</b> explain why the oxygen concentrations will differ between rockpools in the different regions of the shore.
	[3]

(c)	State <b>two</b> biotic factors that also affect the distribution of organisms in the lower rockpools.					
	1					
	2					
	[2]					
(d)	Suggest <b>two</b> adaptations that rocky shore organisms have to high wave action.					
	1					
	2					
	[2]					
	[Total: 9]					

5		Fertilisers used to grow crops in fields contain the elements nitrogen and phosphorus. These car be washed into the ocean via run-off.						
	(a)	(i)	State <b>one</b> biol	logical molecule that contains <b>both</b> elements.				
					[1]			
		(ii)	Complete the	sentences.				
		Nitrogen is essential to organisms to make						
			required for ce	ellular repair and growth. Phosphorus and				
			are essential r	nutrients in the production of bone for marine vertebrates.	[2]			
	(b)	Fig.	. 5.1 shows a p	yramid of biomass for a rocky shore.				
				seabird				
				limpet				
				algae				
			ggest how the b	Fig. 5.1 pars on the pyramid would change over time following the input of	f fertiliser			
		Exp	olain your sugge	estion.				
					[3]			
					[Total: 6]			
					_			

## Section B

Answer all questions in this section.

6	(a)	Describe the main structural features of a typical coral polyp <b>and</b> state the function of each feature.  You may include labelled diagrams.						
		[1	101					

(b)	Biodiversity of a healthy tropical coral reef is very high.						
	Discuss the importance to the local economy of maintaining high biodiversity on tropical coral reefs.						
	[6]						

[Total: 16]

7 Describe t	he role of:
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- weathering
- erosion
- sedimentation

in the formation of a muddy shore.

can occu	 erature and	Sallilly gra	dienis ioni	i iii sea wa	ilei anu no	w mixing o	i illese lay	yers
	 							[7]

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