

Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



MARINE SCIENCE

9693/13

Paper 1 AS Level Theory

May/June 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) (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)	(i)		nd in all carbohydrates, lipids and proteins.	
			and [ˈ	1]
(ii)	Draw lines from each large mole	cule to the smaller molecule(s) from which it is made.	
		There may be more than one lin	ne to or from each box.	
		large molecule	smaller molecule	
		cellulose	amino acids	
		lipids	glucose	
		protein	glycerol	
		starch	fatty acids	
			[4	4]
(i	ii)	Outline how sea grasses make of	arbohydrates.	
				••
			[3	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.

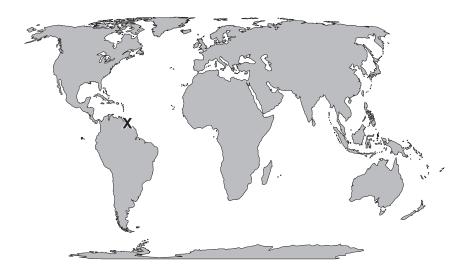


Fig. 2.1

- 1	[1	1
- 1		
- 1		
	-	-

(b)	There	is	а	spring	high	tide	at	X	on Fig. 2.1.	
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(i)	Explain how the spring high tide at X is formed.
	[4]
(ii)	The air pressure at X increases between a high tide and the next low tide.
	State and explain the difference between the predicted and the actual height of the low tide at X .
	[2]

[Total: 7]

A symbiotic relationship has recently been discovered between a photosynthetic marine alga and

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a bacterium that only lives within the alga.

		teria use 20% of their own energy production to make a toxin. The toxin is not harmful to but is toxic to organisms eating the alga.
(a)	(i)	Suggest the type of symbiotic relationship between the alga and the bacterium.
		[1]
	(ii)	Suggest and explain the effect of this relationship on the alga and the bacterium.
		[4]
(b)	One drug	e of the toxins produced by the bacterium is being investigated as a potential anti-cancer g.
	Stat	te the name of one 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 and explain why the oxygen concentrations will differ between rockpools in the different regions of the shore.
	rei
	[3]

(c)	State two biotic factors that also affect the distribution of organisms in the lower rockpoo	ls.
	1	
	2	
		[2]
(d)	Suggest two adaptations that rocky shore organisms have to high wave action.	
	1	
	2	
		[2]

[Total: 9]

	(i)	State one bio	ological molecule that contains both elements.	
				[1]
	(ii)	Complete the	sentences.	
		Nitrogen is es	ssential to organisms to make w	hich are
		required for ce	ellular repair and growth. Phosphorus and	
		are essential	nutrients in the production of bone for marine vertebrates.	[2]
(b)	Fig.	. 5.1 shows a p	byramid of biomass for a rocky shore.	
			seabird	
			crab	
			limpet	
			algae	
			Fig. 5.1	
	Suc	agest how the h	Fig. 5.1	t of fertiliser
		ggest how the b n run-off.	Fig. 5.1 bars on the pyramid would change over time following the input	t of fertiliser
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Section B

Answer all questions in this section.

6	(a)	Describe the main structural features of a typical coral polyp and state the function of each feature.
		You may include labelled diagrams.
		[11]

(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.
[7

8

can occur.	temperature and salinity gradients form in sea water and how mixing of these laye

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