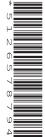


Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



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		

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

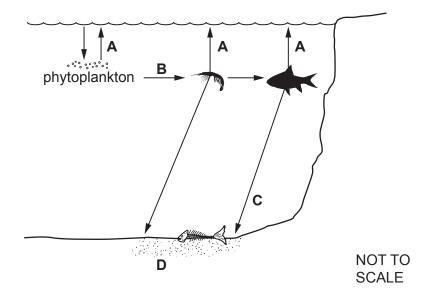


Fig. 1.1

© UCLES 2022 9693/13/O/N/22

[5]

(i)	Give the name of the processes A , B and C .
	A
	В
	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	Dermochelys
species	coriacea

(1)	Complete Table 2.1 to give the domain, kingdom and phylum of the leatherback tur	tle.
		[3]
(ii)	Give the binomial name of the leatherback turtle.	
		[1]

© UCLES 2022 9693/13/O/N/22

(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)		cribe the differences between liquid water and ice in terms of the arrangement and the rement of water molecules.
		1	
		2	
			roi
	(b)	Eia	[2] 3.1 shows the arrangement of an oxygen atom and hydrogen atoms in a water molecule.
	(2)	. 19.	H H O
			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.
		(iii)	Describe how a bond forms between two water molecules.
			[4]

© UCLES 2022 9693/13/O/N/22

(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]
	[ی]

[Total: 15]

4	(a)	A cl ven	-	ht of 60 m abo	ove the ocean floor has be	en discovered at a hydrotherma
		The	ocean depth fron	n the surface	to the ocean floor is 800 m	at this point.
		Cal	culate the height o	of the chimney	/ as a percentage of the o	cean depth.
		Sho	ow your working.			
						%
						[2]
	(b)	Tab	le. 4.1 shows the	productivity a	t two hydrothermal vents.	
					Table 4.1	
				vent	total productivity /g carbon year ⁻¹	
				Α	4.7×10^{6}	
				В	7.4 × 10 ³	
		(i)	Calculate how m	any times gre	eater the productivity is at v	vent A compared with vent B .
			Show your worki	ng.		
			-	_	oriate number of significar	t figures
			one year anone	. to an appro	onate names of eighnoar	i ngaroo.
						[3]
		/ii\	Suggest and rea	can for the la	wor productivity at yent R	-
		(ii)	Suggest one rea	SOIT IOI THE IO	wer productivity at vent B .	
						[1]

© UCLES 2022 9693/13/O/N/22

` '	Productivity at hydrothermal vents affects the total biomass of the food web in the ocean around the vent.
	A student predicted vent ${\bf A}$ would increase the biomass in a larger volume of ocean than vent ${\bf B}$.
	Explain why vent A may increase the biomass in a larger volume than vent B .
	[2]
	[Total: 8]

Section B

Answer all questions in this section.

5	(a)	Explain the effect of increasing ocean temperature on the solubility of salts and gases.
		[5]
	(b)	Describe the impact of decreasing concentrations of oxygen and carbon dioxide on marine organisms.
		[7]

•	(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.

Describe the importance of mangrove forests to human communities.
[5]
[Total: 18]

The boundaries and names shown, the designations used and the presentation of material on any maps contained in this question paper/insert do not imply official endorsement or acceptance by Cambridge Assessment International Education concerning the legal status of any country, territory, or area or any of its

Permission to reproduce items where third-party owned material protected by copyright is included has been sought and cleared where possible. Every reasonable effort has been made by the publisher (UCLES) to trace copyright holders, but if any items requiring clearance have unwittingly been included, the publisher will be pleased to make amends at the earliest possible opportunity.

To avoid the issue of disclosure of answer-related information to candidates, all copyright acknowledgements are reproduced online in the Cambridge Assessment International Education Copyright Acknowledgements Booklet. This is produced for each series of examinations and is freely available to download at www.cambridgeinternational.org after the live examination series.

Cambridge Assessment International Education is part of Cambridge Assessment. Cambridge Assessment is the brand name of the University of Cambridge Local Examinations Syndicate (UCLES), which is a department of the University of Cambridge.

authorities, or of the delimitation of its frontiers or boundaries.

(b)