

Cambridge International AS & A Level

CANDIDATE NAME					
CENTRE NUMBER			CANDIDATE NUMBER		



MARINE SCIENCE

Paper 3 A Level Theory

May/June 2022

9693/33

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 16 pages. Any blank pages are indicated.

Section A

Answer all questions in this section.

1 (a) Fig. 1.1 is a diagram of a typical plant cell from a mangrove tree as seen using an electron microscope.

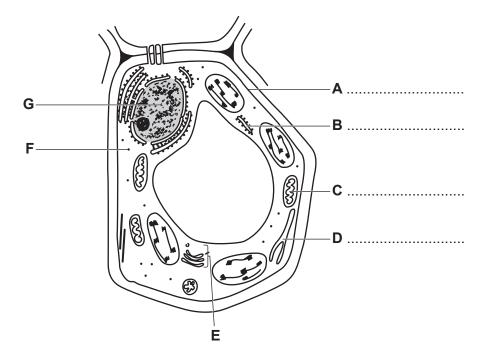


Fig. 1.1

State three features, visible in Fig. 1.1, that show that this is a plant cell.	
1	
2	
3	
[3	3]
Name structures A, B, C and D on Fig. 1.1.	

[3]

© UCLES 2022 9693/33/M/J/22

Write your answers on Fig. 1.1.

(i)

(ii)

	(iii)	Outline the functions of structures E , F and G .
		structure E
		structure F
		structure G
/I- \	D	
(D)	Des	cribe how phospholipids are arranged in cell membranes.
		[3]
		[Total: 12]

2 (a) Almost all marine producers carry out photosynthesis.

Fig. 2.1 shows one of the stages involved in photosynthesis.

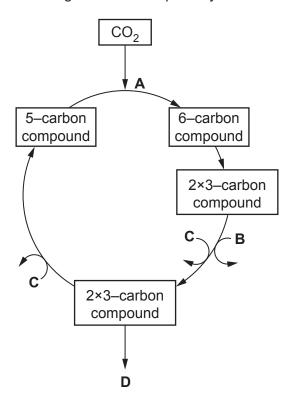


Fig. 2.1

(i)	Name the stage shown in Fig. 2.1 and state where it occurs in a chloroplast.	
	name of stage	
	where it occurs	
		[2
(ii)	Name the enzyme at A , and compounds B , C and D .	
	enzyme at A	
	compound B	
	compound C	
	compound D	
		[4

(b) The graph in Fig. 2.2 shows the effect of temperature on the rate of photosynthesis in a mangrove leaf, at a constant $\rm CO_2$ concentration of 0.1%.

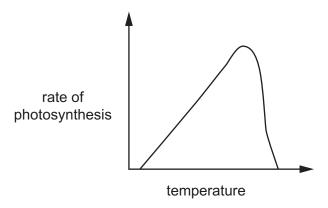


Fig. 2.2

(1)	photosynthesis.
	[3]
(ii)	The ${\rm CO_2}$ concentration of the mangrove leaf was then increased to 0.5%.
	Sketch a line on Fig. 2.2 to show what you would expect to happen to the rate of photosynthesis.
(iii)	Give a reason for your answer in (b)(ii).
	[1]
	[Total: 11]

3 (a) Skipjack tuna occur in large shoals in tropical and sub-tropical areas around the coast of West Africa. They reach sexual maturity in one year and spawn throughout the year in tropical areas where the water temperature is at least 25 °C.

Data from tagged fish have shown that growth of skipjack tuna from sub-tropical areas is faster than in tropical areas.

)	Suggest a reason for the difference in growth rates.
	r.

Before 1990, most skipjack tuna fishing occurred from small local boats using longlines or pole and line. Since 1990, modern technology, such as sonar and purse seine nets on industrial fishing fleets, has increased the number and size of fishing areas further from the coast.

Large shoals are usually a mix of skipjack tuna and other shoaling species. Shoals that form under Fish Aggregation Devices (FADs) consist of a much higher percentage of skipjack tuna.

Table 3.1 shows the total skipjack tuna catch from all fishing methods in West Africa between 2010 and 2017.

Table 3.1

year	skipjack tuna catch /tonnes
2010	152 165
2013	254 852
2017	267 565

Fig. 3.1 shows the mean skipjack tuna catch by purse seine fishing with and without the use of FADs from 2010 to 2017.

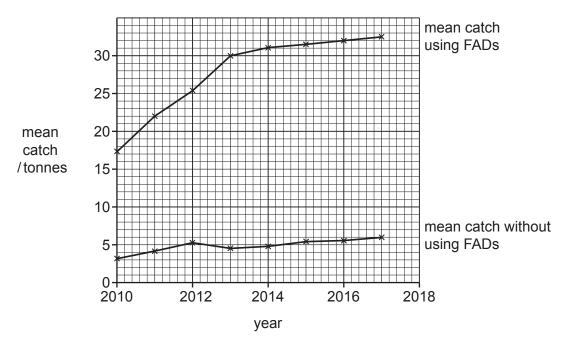


Fig. 3.1

© UCLES 2022

(ii)	Use all the information provided to suggest and explain why there has been an increase in total catch since 2010.
	[4]
(iii)	Scientists are concerned that skipjack tuna fishing might now be unsustainable.
	State the meaning of the term unsustainable.
	[1]
(iv)	State two restrictions that could be introduced to fishing gear to ensure that skipjack tuna stocks are sustainable in future.
	1
	2
	[2]

(b)	Data on skipjack tuna stocks are limited, especially before 2010. Even in 2017 catch was estimated to be under-reported by around 28%.
	Use all the information provided and your own knowledge to suggest why data on stock assessment of skipjack tuna are difficult to collect and under-reported.
	[4]
	[Total: 12]

BLANK PAGE

4	(a)				ually. Wind power is converted to electricity in the largest wind farms.
			ons why the numbe		s increasing worldwide.
		2			
					[2]
	(b)	Fig. 4.1 shows	two turbines from a	a typical offshore	wind farm.
	_	rator uses wind <			blade length can be 40 m or more
	electi	ricity using romagnetism			shaft of turbine placed into steel tube for support
					steel tube 4 m in diameter is hammered 25 m into the seabed
				Fig. 4.1	
		areas or by bei	ing hammered into	the sediment. I	nto the seabed either by drilling in rocky Large ships bring the parts to the site for generated from the wind farm to the land.
		Suggest and ex	xplain the likely imp	pacts of construct	tion activities on marine fish.

(c) Several different methods are used to protect the base of the turbine from erosion by water currents. These methods include placing large 2m structures, either large rocks or reef balls, around the base.

Fig. 4.2 shows a typical reef ball.



Fig. 4.2

	Suggest the ecological advantages of using reef balls instead of using large rocks.
	[3]
d)	Suggest an advantage and a disadvantage of large offshore wind farms to commercial fishermen.
	advantage
	disadvantage
	[2]

[Total: 10]

Section B

Answer all questions in this section.

5 Salmon farmers usually transfer smolt (juvenile fish) from land-based hatcheries to sea cages in shallow inshore waters to grow them to adult size. As the availability of inshore sites decreases, several aquaculture businesses are looking at completing the growth process further offshore, in deep-water cages in open ocean sites.

Fig. 5.1 shows a possible deep-water sea cage system, monitored from land.

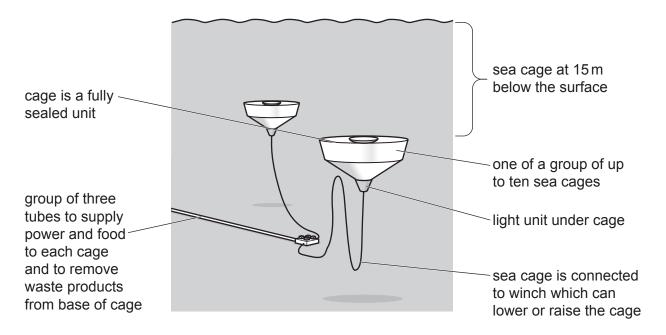


Fig. 5.1

Discuss the benefits and challenges of growing smolt to adult size in deep-water sea cages in open ocean sites, instead of in shallow inshore waters.

	[10

6	(a)	Explain how the natural greenhouse effect helps maintain a temperature on Earth that is suitable for life.
		เลา

(b)	Describe environme	the ent.	possible	impacts	of	increasing	sea	water	temperatures	on	the	marine
												[8]

Conservation measures frequently aim to maintain or increase biodiversity.
Discuss the importance of marine biodiversity in terms of the services it provides.
[6]

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

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.