



# Cambridge International AS & A Level

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**MARINE SCIENCE**

**9693/33**

Paper 3 A 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

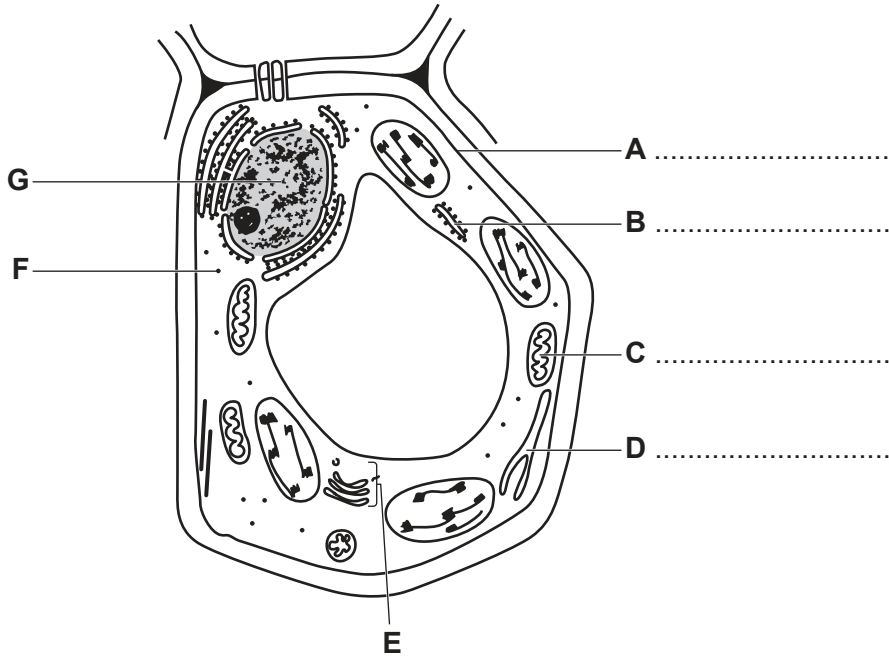
- The total mark for this paper is 75.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **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**

- (i) State **three** features, visible in Fig. 1.1, that show that this is a plant cell.

1 .....

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2 .....

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3 .....

.....

[3]

- (ii) Name structures **A**, **B**, **C** and **D** on Fig. 1.1.

Write your answers on Fig. 1.1. [3]

(iii) Outline the functions of structures **E**, **F** and **G**.

structure **E** .....

.....

structure **F** .....

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structure **G** .....

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[3]

(b) Describe how phospholipids are arranged in cell membranes.

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..... [3]

[Total: 12]

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

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

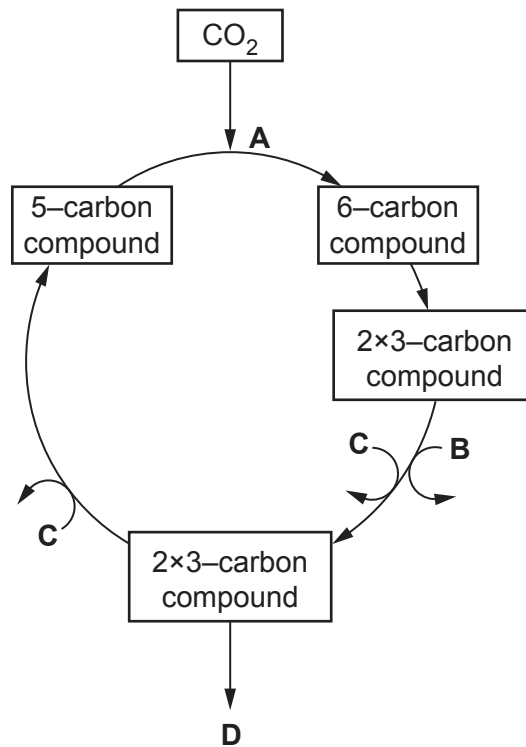


Fig. 2.1

- (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 CO<sub>2</sub> concentration of 0.1%.

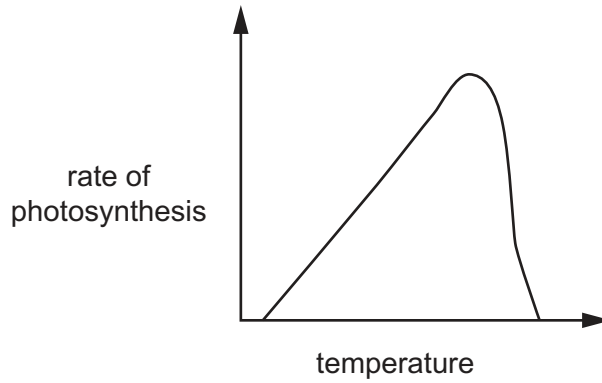


Fig. 2.2

(i) Use Fig. 2.2 to describe **and** explain the effect of temperature on the rate of photosynthesis.

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..... [3]

(ii) The CO<sub>2</sub> 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. [1]

(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.

- (i) Suggest a reason for the difference in growth rates.

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 ..... [1]

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.

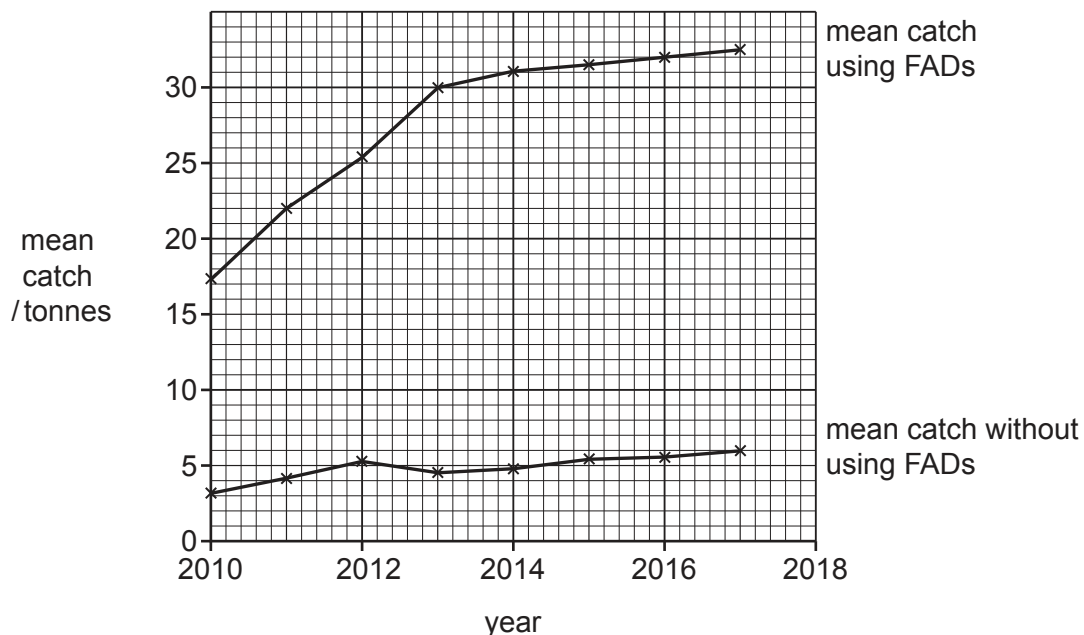
Large shoals are usually a mix of skipjack tuna and other shoaling species. Shoals that form under Fish Aggregation Devices (FADs) consist of a much higher percentage of skipjack tuna.

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**

(ii) Use all the information provided to suggest **and** explain why there has been an increase in total catch since 2010.

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..... [4]

(iii) Scientists are concerned that skipjack tuna fishing might now be unsustainable.

State the meaning of the term unsustainable.

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..... [1]

(iv) State **two** restrictions that could be introduced to fishing gear to ensure that skipjack tuna stocks are sustainable in future.

1 .....

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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.

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..... [4]

[Total: 12]





- 4 (a) Numbers of offshore wind farms are increasing annually. Wind power is converted to electricity by turbines. There can be more than 650 turbines in the largest wind farms.

State **two** reasons why the number of wind farms is increasing worldwide.

1 .....

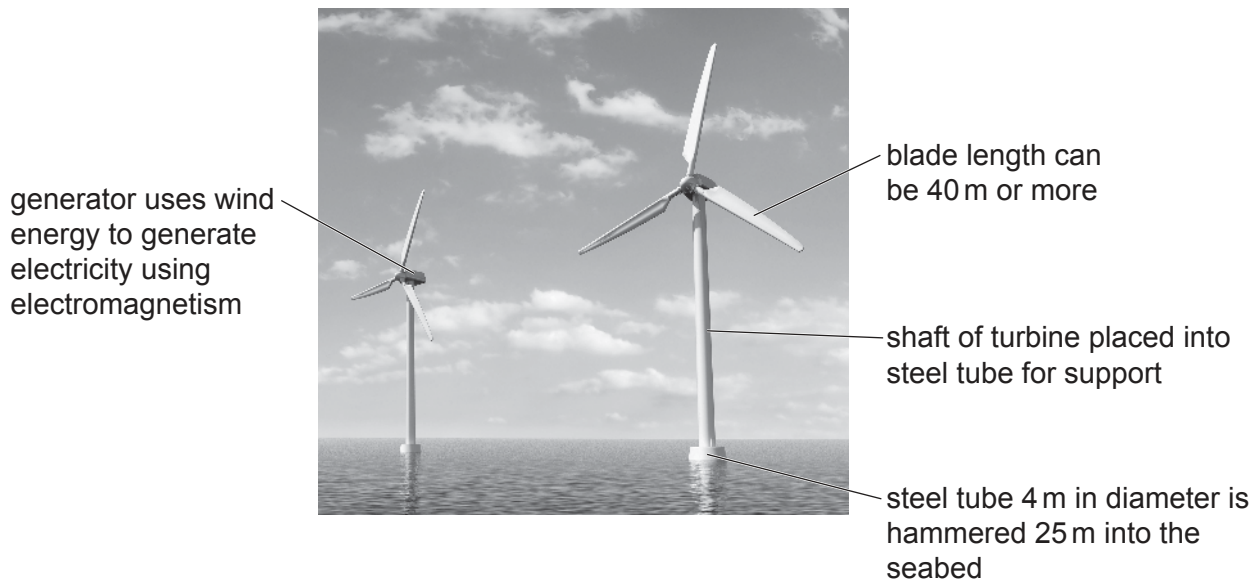
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2 .....

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[2]

- (b) Fig. 4.1 shows two turbines from a typical offshore wind farm.



**Fig. 4.1**

During construction, the steel tubes are placed into the seabed either by drilling in rocky areas or by being hammered into the sediment. Large ships bring the parts to the site for assembly and lay cables to transport the electricity generated from the wind farm to the land.

Suggest **and** explain the likely impacts of construction activities on marine fish.

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[3]

- (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.

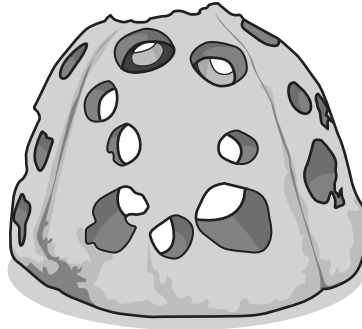


Fig. 4.2

Suggest the ecological advantages of using reef balls instead of using large rocks.

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..... [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.

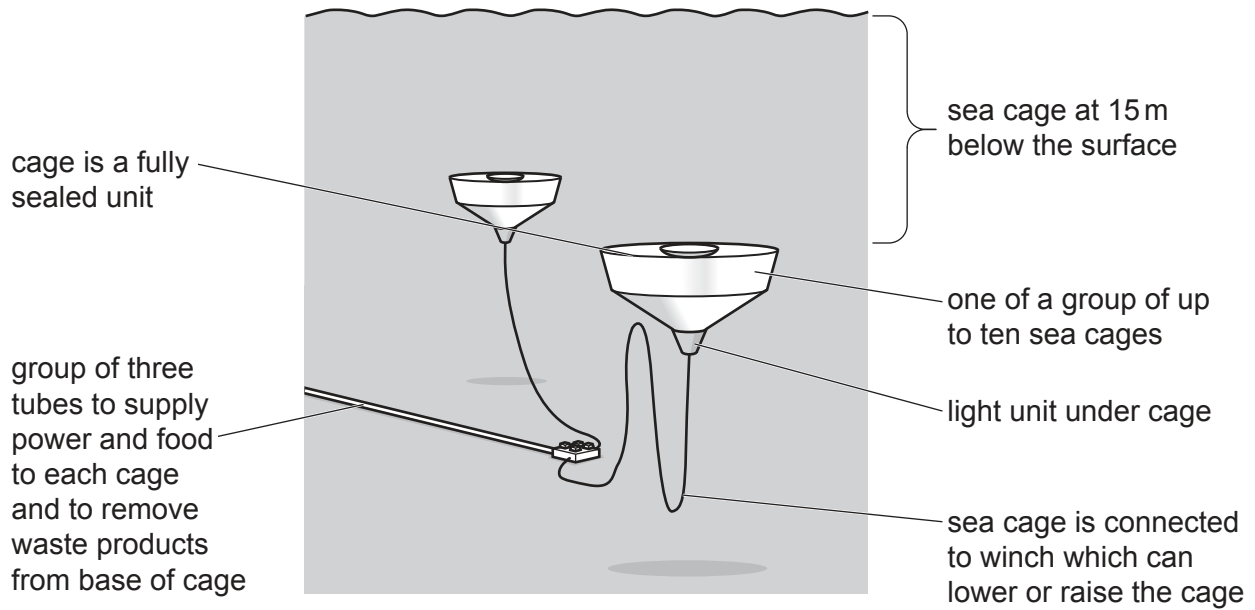


Fig. 5.1

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.

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