Cambridge Assessment International Education

Cambridge International AS & A Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MARINE SCIENCE **9693/32**

Paper 3 A Level Theory **October/November 2025**

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.

[Turn over

Section A

Answer **all** questions in this section.

1 **(a)** Fig. 1.1 shows the life cycle of a jellyfish.

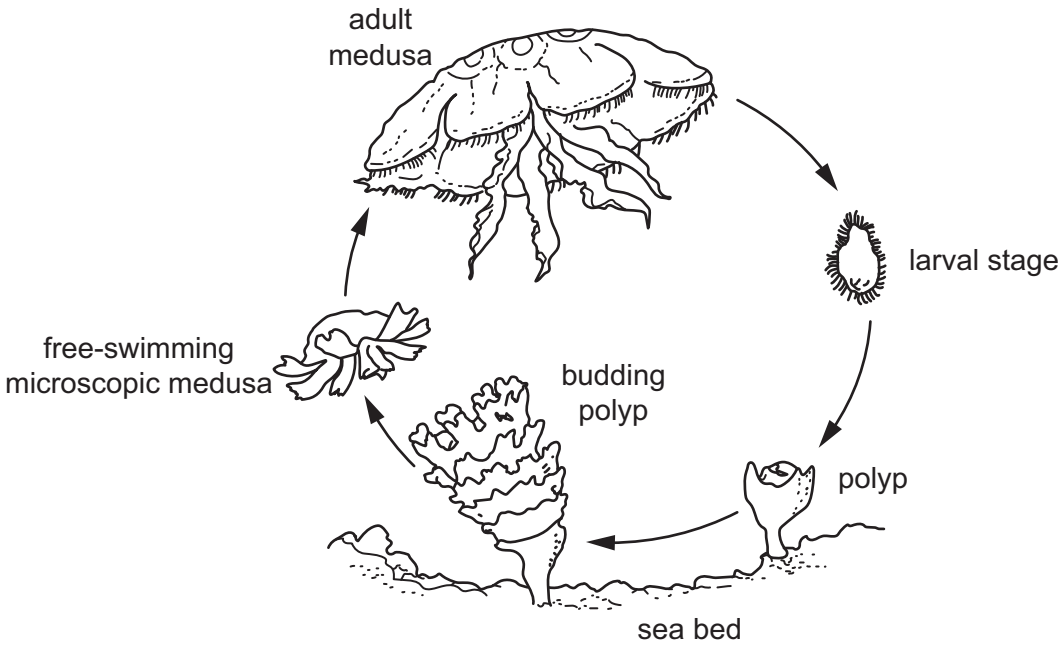

Fig. 1.1

(i) Use Fig. 1.1 to state the type of life cycle shown by the jellyfish **and** give **two** reasons for your answer.

type of life cycle .....

reason 1 .....

reason 2 .....

[3]

(ii) Polyps are sessile and adult medusae are non-sessile.

State **one** advantage of having a non-sessile stage in the life cycle.

..... [1]

(b) The helmet jellyfish is a predator with large stinging cells. They feed on zooplankton, fish larvae and juvenile fish, including cod. The jellyfish breed throughout the year.

During the last 20 years, jellyfish numbers have increased so much that they form large swarms. These swarms have caused increased problems for local cod fishermen who fish in the inlets around Norway, in northern Europe.

Suggest **and** explain the negative effects of jellyfish swarms on these fishermen.

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..... [4]

[Total: 8]

2 **(a)** Atlantic cod swim at slow speeds just above the sea bed. They use pumped ventilation.

Fig. 2.1 shows an Atlantic cod.

Fig. 2.1

Explain the role of the operculum in pumped ventilation.

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..... [3]

(b) Atlantic cod feed on benthic invertebrates and fish. Cod prefer to be in deep, cold waters when hunting prey during the day and to rest in shallow, warm waters at night.

The rate of operculum movements decreases with decreasing temperatures.

(i) Explain why the decrease in the rate of operculum movements is an advantage when hunting for prey in colder waters.

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..... [3]

(ii) After the prey has been swallowed, it forms a ball in the stomach where it is digested. Digestion involves enzymes breaking down larger molecules of food into smaller ones so that they can be absorbed into the blood. Digestion can take many hours.

Suggest the disadvantages to the cod of eating too much prey at once.

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..... [2]

(iii) Fig. 2.2 shows the effect of temperature on the rate of digestion of food by enzymes.

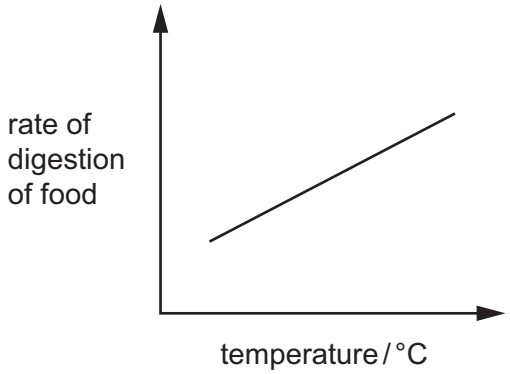

Fig. 2.2

Use **all** the information provided to suggest why cod rest in warm, shallow waters at night and **not** in deep waters.

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..... [3]

[Total: 11]

3 **(a)** Île du Grand-Connétable is an uninhabited island situated 15 km from the coast of French Guiana, in South America. It is a steep-sided, treeless rock that provides nesting sites for thousands of seabirds. The island and the waters around it have been designated a marine protected area because of the high biodiversity both in the sea and on land.

Fig. 3.1 shows a photograph of part of the island.

Fig. 3.1

(i) The site conserves species such as the Atlantic goliath grouper and the Guiana dolphin, which are both on the International Union for Conservation of Nature (IUCN) Red List.

State why some species are listed on the IUCN Red List.

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..... [1]

(ii) The main sources of income for local people on Île du Grand-Connétable are commercial and recreational fishing as well as tourism. The site is managed locally and includes science activities for local schoolchildren and visitors.

Suggest **and** explain possible conflicts of interests which could occur between some local people and conservationists.

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..... [3]

(iii) In 2020, Île du Grand-Connétable was added to the IUCN Green List of protected and conserved areas. IUCN Green List sites are certified for being managed effectively.

Suggest how this marine protected area could be managed effectively to produce a long-term positive impact on people and nature.

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..... [4]

(iv) Suggest the possible effects of **excessive** conservation of the Atlantic goliath grouper and the Guiana dolphin.

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..... [2]

(b) (i) State the meaning of the term ecotourism.

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..... [1]

(ii) Suggest **two** ways marine protected areas can benefit from ecotourism.

1 .....

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2 .....

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[2]

[Total: 13]

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4 **(a)** Fig. 4.1 shows a chloroplast from a red mangrove leaf.

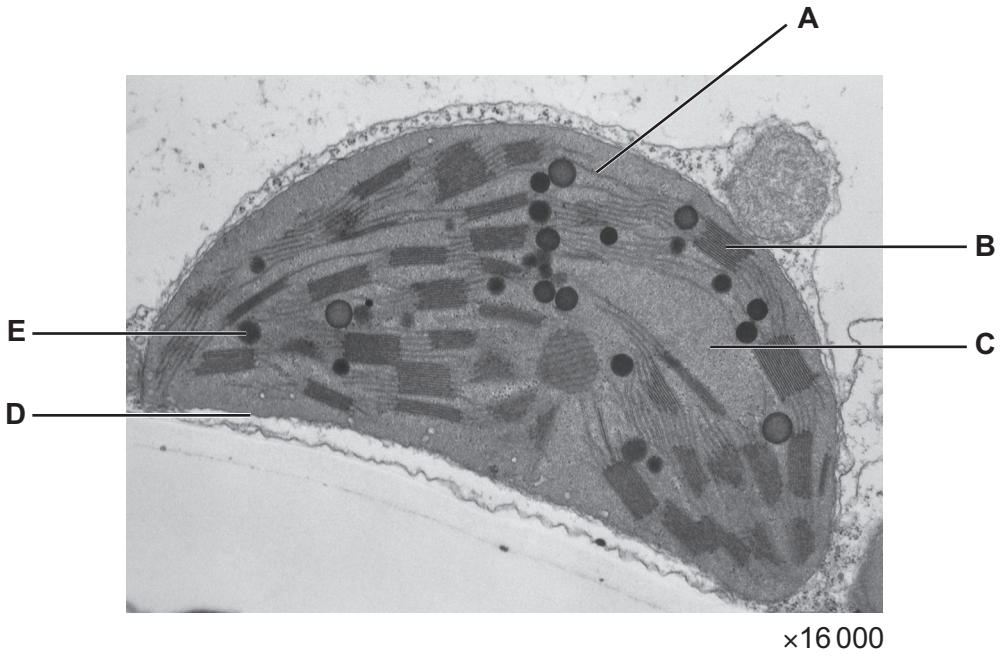

Fig. 4.1

(i) Identify structures **A** to **D** in Fig. 4.1.

structure	name
A	
B	
C	
D	

[3]

(ii) State the letter where the light-independent stage of photosynthesis occurs.

..... [1]

(iii) Letter **E** represents a carbohydrate made of large molecules produced from photosynthesis.

Name this carbohydrate.

..... [1]

(b) Hydrogencarbonate indicator changes colour depending on pH.

(i) Explain how the hydrogen ion concentration in a solution determines pH.

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..... [2]

(ii) Fig. 4.2 shows a laboratory experiment on photosynthesis using discs cut from the leaves of red mangrove trees (leaf discs).

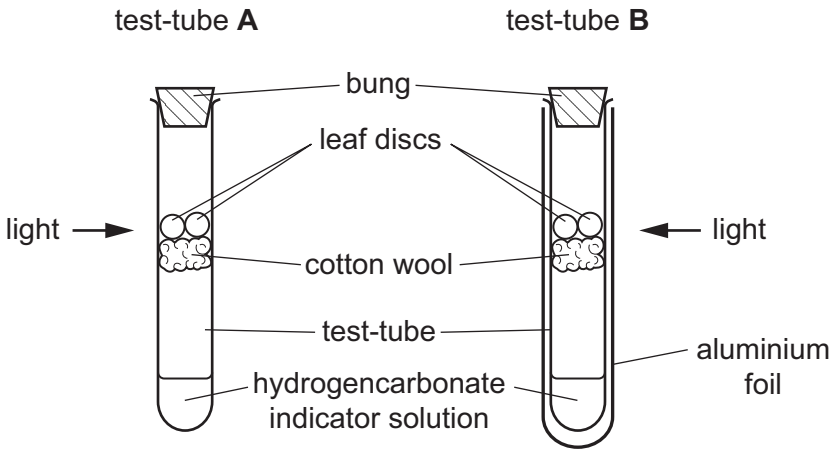

Fig. 4.2

Air was bubbled into the hydrogencarbonate indicator solution in both test-tubes at the start of the experiment. This turned the indicator a red colour.

Fig. 4.3 shows the different colours of the hydrogencarbonate indicator solution as the pH changes.

colour of indicator	yellow	red	purple
	decreasing pH ←	start of experiment	→ increasing pH

Fig. 4.3

Predict the colour of the hydrogencarbonate indicator solution in test-tube **A** after 20 minutes. Give reasons for your answer.

colour .....

reasons .....

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[3]

(iii) Suggest what you would expect to happen in test-tube **B** after 20 minutes **and** explain why.

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..... [3]

[Total: 13]

Section B

Answer **all** questions in this section.

5 Market demand, access to market and a return on investment are three requirements for the long-term success of aquaculture projects.

Explain **other** factors that contribute to the long-term success of aquaculture projects.

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6 Cells of both animals and plants contain many smaller structures, including smooth endoplasmic reticulum, Golgi bodies and mitochondria.

(a) Outline the structure and function of smooth endoplasmic reticulum **and** Golgi bodies.

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(b) Mitochondria are involved in respiration.

Describe the process of respiration in marine organisms.

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[Total: 11]

7 Describe the effect of desalination plants on sea-water quality **and** marine organisms.

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