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Cambridge Assessment International Education

Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1378190598

MARINE SCIENCE **0697/23**

Paper 2 Theory and Practical Skills **October/November 2024**

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 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **20** pages. Any blank pages are indicated.

[Turn over

1 Fig. 1.1 is a photograph of a lanternfish.

Lanternfish live in the open ocean.

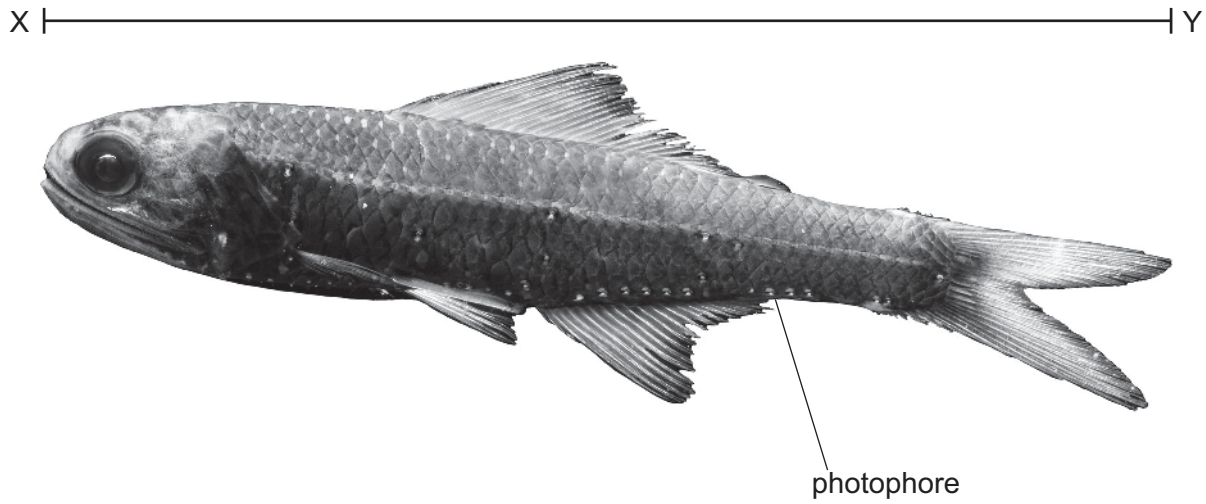

Fig. 1.1

(a) (i) Make a large, accurate drawing of the lanternfish in Fig. 1.1.

Do **not** draw individual scales or photophores.

[4]

(ii) The lanternfish has an actual length of 7 cm between X and Y on Fig. 1.1.

Calculate the magnification of the photograph in Fig. 1.1.

Give your answer to the nearest whole number.

Show your working.

magnification = × ..... [2]

(iii) On your drawing in **(a)(i)**, label the features:

- lateral line
- caudal fin.

[2]

(b) Lanternfish live in the midnight zone of the ocean during the day and migrate to the sunlight zone at night.

(i) Lanternfish have bioluminescent organs called photophores on the underside of their bodies.

Suggest why lanternfish have bioluminescent photophores.

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..... [2]

(ii) Explain why lanternfish undergo daily migration from the midnight zone to the sunlight zone.

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..... [2]

(iii) Lanternfish eat zooplankton.

Lanternfish are prey of many fish species that live in the midnight zone.

Lanternfish are one of the most abundant species of fish in the oceans.

Explain why lanternfish are important in open ocean food webs.

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..... [3]

[Total: 15]

2 **(a)** Fig. 2.1 shows an underwater plate boundary.

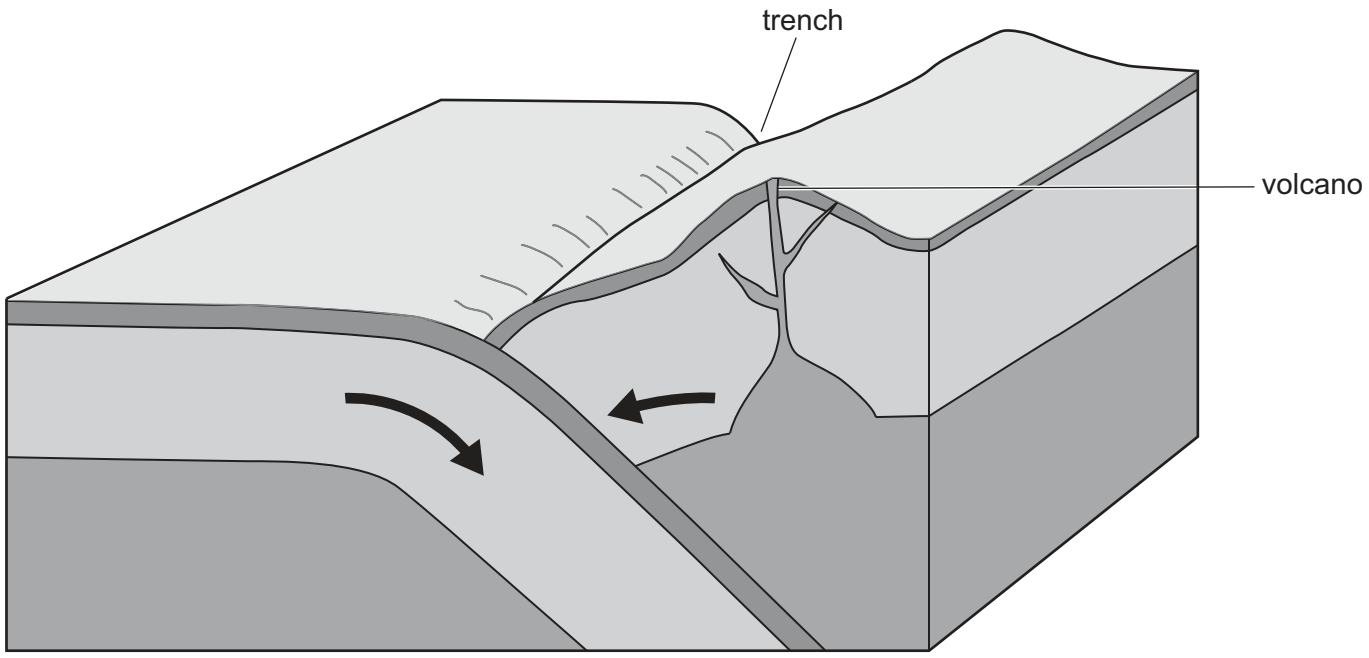

Fig. 2.1

(i) Give the name of the type of plate boundary shown in Fig. 2.1.

..... [1]

(ii) Describe how plate movement at the boundary shown in Fig. 2.1 can cause a tsunami.

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..... [3]

(b) A tide house is a small building located on a pier on a rocky shore. Tide houses are used to measure tidal amplitude.

Fig. 2.2 shows a tide house.

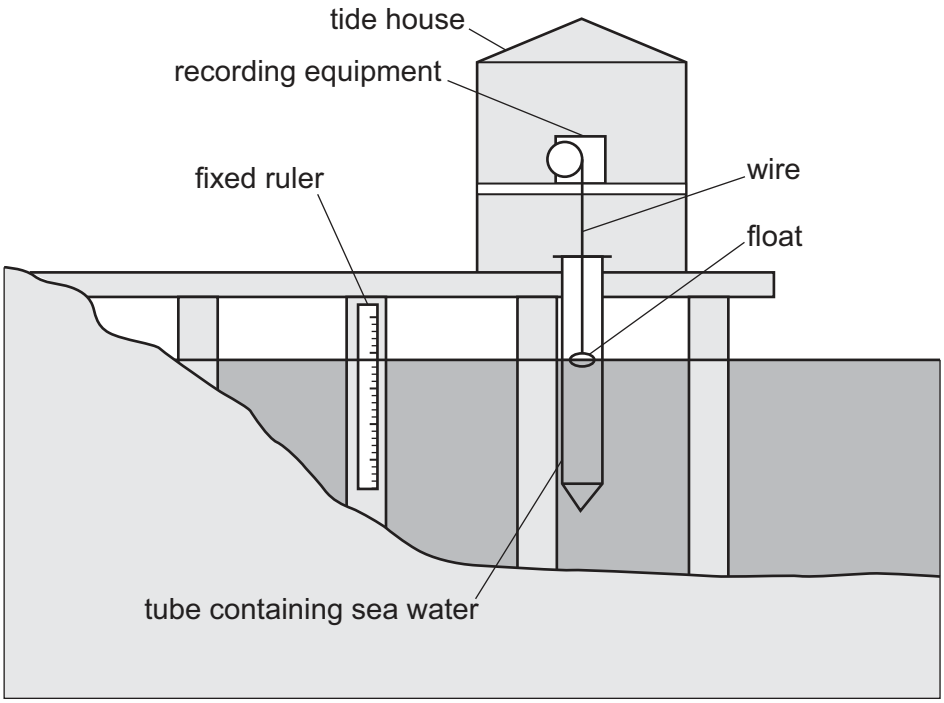

Fig. 2.2

Scientists use two methods in this tide house to measure the tidal amplitude of the sea on the rocky shore.

Method one: the scientists use a fixed ruler to measure the height of the water every hour for 24 hours.

Method two: the scientists place a float into a tube that is placed in the sea. The float is attached to recording equipment by a wire. The float moves up and down with the water height and the recording equipment records the height every six minutes. The scientists examine the recording after 24 hours.

Fig. 2.3 shows the recordings from the float in the tube.

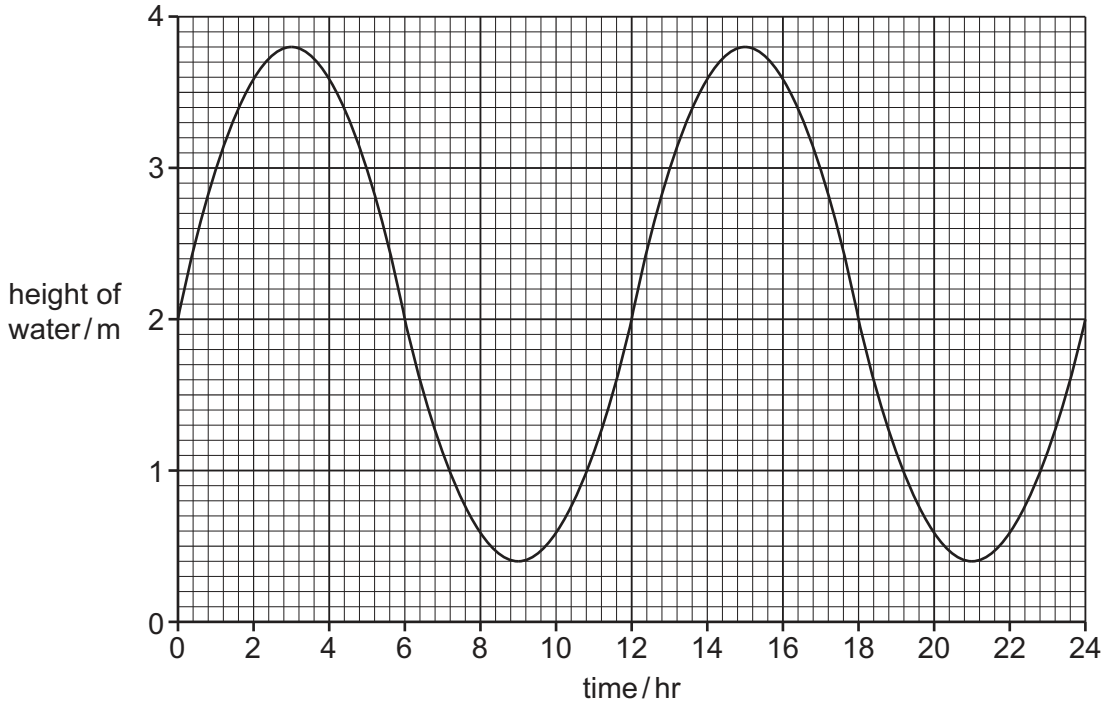

Fig. 2.3

(i) State why method two may give a more accurate measure of tidal amplitude compared with method one.

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..... [1]

(ii) Suggest one advantage of using method one compared with method two.

.....

..... [1]

(iii) The scientists state that it is more reliable to use both methods rather than relying on one.

State why using both method one and method two to measure tidal amplitude gives more reliable data.

.....

..... [1]

(iv) Use Fig. 2.3 to state **one** time at which a low tide occurs.

time of low tide ..... [1]

(v) Tidal amplitude can be calculated using the formula shown.

$$\textit{tidal amplitude} = \frac{\textit{height of high tide} - \textit{height of low tide}}{2}$$

Calculate the tidal amplitude recorded in Fig. 2.3.

Give your answer to **one** decimal place.

Show your working.

tidal amplitude = ... m [2]

(vi) The results shown in Fig. 2.3 are for a neap tide.

Explain why the results would be different for a spring tide.

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..... [3]

[Total: 13]

3 Crude oil is a fossil fuel. The combustion of fossil fuels releases carbon dioxide gas into the atmosphere.

(a) Crude oil is transported in oil tankers. To reduce the risk of oil spillage, oil tankers must be built in line with MARPOL standards.

Give **two** MARPOL standards that reduce the risk of marine pollution.

1 .....

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2 .....

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[2]

(b) Increased release of carbon dioxide gas can cause acidification of sea water.

Describe a simple, laboratory-based experiment to investigate the effect on pH of adding carbon dioxide to sea water.

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..... [3]

(c) Increased atmospheric carbon dioxide may also cause global warming. This can cause ice to melt.

A student compares the effect of the melting of floating ice with the effect of the melting of land-based ice.

Fig. 3.1 shows the apparatus the student uses.

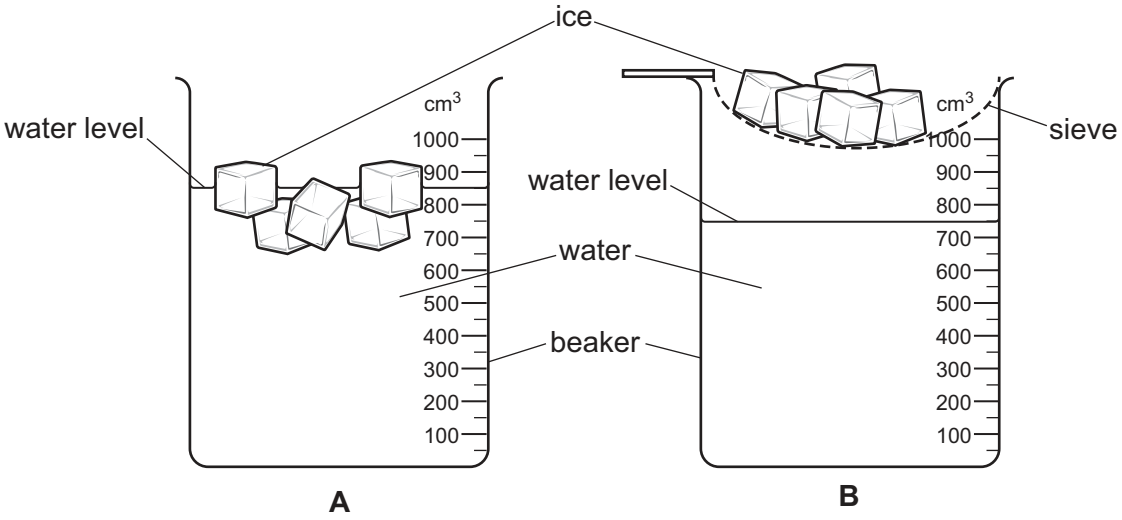

Fig. 3.1

The method used by the student is given.

- Measure 750 cm^3 of water into each of two beakers, **A** and **B**.
- Place a sieve over beaker **B**, as shown in Fig. 3.1.
- Place ice cubes into the water of beaker **A**, and measure the height of the water from the base of the beaker.
- Place the same number of ice cubes into the sieve above beaker **B**, and measure the height of the water from the base of the beaker.
- Measure the height of the water in each beaker every two minutes for 10 minutes in total.

The student's results are shown in Fig. 3.2.

0 minutes: water heights are: A = 62 mm, B = 50 mm

two minutes: water heights are: A = 62 mm, B = 52 mm

four minutes: water heights are: A = 62 mm, B = 55 mm

six minutes: water heights are: A = 62 mm, B = 58 mm

eight minutes: water heights are: A = 62 mm, B = 59 mm

ten minutes: water heights are: A = 62 mm, B = 60 mm

Fig 3.2

(i) Draw a results table to display the data in Fig. 3.2.

Record the results in order of increasing time.

[4]

(ii) Discuss how the results show that the melting of land-based ice poses a greater threat compared with the melting of floating ice.

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..... [3]

(iii) Describe **two** ways that the student could improve the experiment.

1 .....

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2 .....

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[2]

[Total: 14]

4 Marine Protected Areas (MPAs) are set up to conserve species in areas of ocean.

Scientists investigated the effect of the setting up of an MPA in an area of the Indian Ocean on the number of different species of fish living on coral reefs in that area.

Fish were sampled in coral reefs within:

- an MPA that was set up in 2010
- areas that are actively fished.

Sampling of fish was done between 2013 and 2017.

The number of different species of fish in each area was recorded.

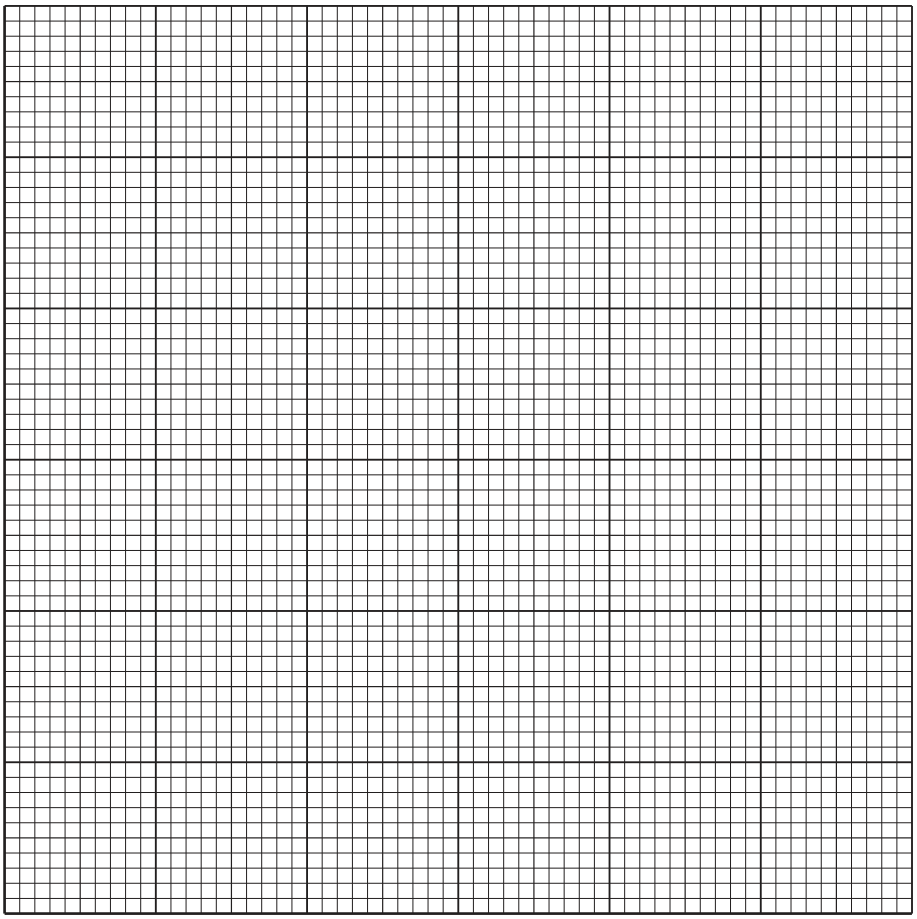
The results are shown in Table 4.1.

Table 4.1

year	number of different species of fish on coral reefs	
	MPA	actively fished area
2013	17	14
2014	18	15
2015	18	11
2016	19	12
2017	20	12

(a) (i) Using Table 4.1, plot a graph with two lines to show the number of different species of fish on the coral reefs in the MPA and in the actively fished areas between 2013 and 2017.

Join your points with ruled, straight lines.



[5]

(ii) Suggest **two** abiotic factors that the scientists should ensure are the same when comparing the coral reef areas in the MPA and the coral reef areas in the actively fished area.

1 .....

2 .....

[2]

(b) Coral reefs are made up of coral polyps which contain photosynthetic organisms called zooxanthellae.

The scientists also sampled the density of coral polyps in 2013 and 2017 within the coral reefs by using random sampling.

The results are shown in Table 4.2.

Table 4.2

year	density of coral polyps / polyps per m^2	
	MPA	**actively fished area**
2013	152	144
2017	188	102

(i) Describe a method to measure the density of coral polyps in these areas.

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..... [3]

(ii) The density of coral polyps increased by 24% on coral reefs in the MPA between 2013 and 2017.

Use Table 4.2 to calculate the percentage decrease in density of coral polyps in the actively fished area between 2013 and 2017.

Give your answer to the nearest whole number.

Show your working.

percentage decrease in density of coral polyps = ...% [2]

(iii) Explain the effect of increased density of coral polyps on the change in number of fish species in the MPA between 2013 and 2017.

Use the data in Table 4.1, and Table 4.2 and your knowledge of coral reef ecosystems to support your answer.

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..... [3]

(c) One species of fish that was present on the coral reefs in the MPA was the trigger fish.

Explain how the trigger fish is adapted to avoid predators in coral reefs.

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..... [2]

[Total: 17]

5 Fig. 5.1 shows an area of mangrove forest at low tide on the island of Zanzibar. The area of shore closest to the sea has no mangrove forest and is sandy. The area further up the shore has many aerial roots of mangrove surrounded by sediment.

Fig. 5.1

(a) Explain why mangroves that are submerged under water for large periods of time have aerial roots (pneumatophores).

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..... [3]

(b) A student notices that, at low tide, areas of sediment around the aerial roots seem to contain more water compared with sediment from the lower shore.

Describe an investigation the student could safely carry out to compare the moisture content of sediments from areas with aerial roots with the moisture content of sediment from the lower shore.

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..... [6]

[Total: 9]

6 Fig. 6.1 shows some kelp.

Fig. 6.1

(a) (i) State the kingdom in which kelp is classified.

..... [1]

(ii) Explain how **two** features of kelp enable it to maximise its rate of photosynthesis.

1 .....

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2 .....

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[4]

(b) Kelp is an important producer in many marine ecosystems. It also acts as a nursery area for many marine animals.

Fig. 6.2 shows a food chain and the biomass of each trophic level.

	kelp	⟶	purple sea urchins	⟶	sea otters
biomass in kg per cubic metre:	5.000		0.540		0.052

Fig. 6.2

(i) Sea otters are mammals.

State **one** characteristic feature that is used to classify marine organisms as mammals.

..... [1]

(ii) Calculate the percentage of biomass present in the kelp that is transferred to the sea otters in the food chain in Fig. 6.2.

Show your working.

.....% [1]

(iii) Suggest reasons for the loss of biomass between the kelp and the sea otters in the food chain shown in Fig. 6.2.

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..... [3]

(iv) A student reads that kelp does **not** store its energy as starch.

Describe how to test a sample of kelp to show if starch is present.

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..... [2]

[Total: 12]

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