Cambridge IGCSE™

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MARINE SCIENCE **0697/22**

Paper 2 Theory and Practical Skills **May/June 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 **24** pages. Any blank pages are indicated.

[Turn over

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1   Fig. 1.1 shows the geomorphology of the seabed for an area of the Pacific Ocean that extends from continental land mass.

Fig. 1.1
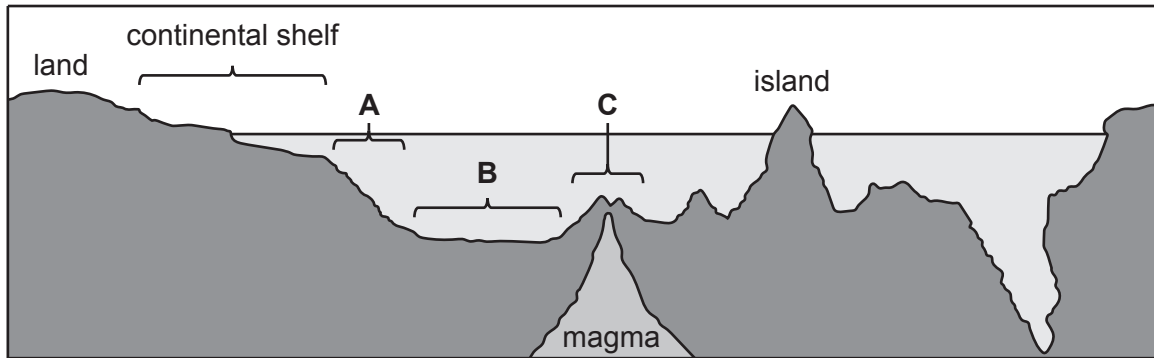
(a) (i)   State the names of the areas of the seabed labelled **A**, **B** and **C**.

A ....

B ....

C ....
[3]

(ii)   The present-day continents and oceans are the result of the movement of tectonic plates.

Outline how tectonic plate theory explains the formation of the present-day continents and oceans.

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.... [3]

(b) The direction and speed of oceanic currents are affected by the geomorphology of the seabed.

A student compares the speed of an oceanic current by a rocky shore at three different times of day.

Table 1.1 shows the student's results.

Table 1.1

time of day	mean current speed /metres per second
06:00	0.5
12:00	0.7
18:00	

(i) At each time of day, the student measures the current speed three times.
The student's measurements for 18:00 are shown in Table 1.2.

Table 1.2

measurement number at 18:00	current speed /metres per second
1	0.4
2	0.9
3	0.6

Use the information in Table 1.2 to calculate the mean current speed, in metres per second, for 18:00.

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

mean current speed = ... metres per second [2]

(ii) Describe a method to measure the speed of the water current.

....

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.... [4]

(iii) The student concludes that the speed of the water current is the same at all times of day and night.

Evaluate the student's conclusion, using the data in Table 1.1 and in Table 1.2 to support your answer.

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....

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.... [3]

[Total: 15]

 [Turn over

2 Mackerel are pelagic fish that are often caught by using purse seine nets.

(a) Describe purse seine net fishing.

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.... [3]

(b) Fig. 2.1 is an image of a mackerel, *Scomber scombrus*.
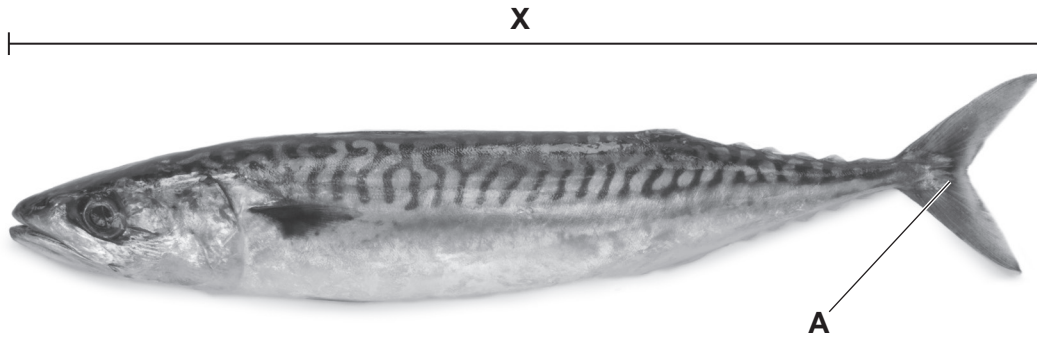
X

A

Fig. 2.1

(i) In the space below, make a large, accurate drawing of the mackerel shown in Fig. 2.1.

Do **not** include the markings.

[4]

(ii) State the name and the main function of the fin labelled **A** in Fig. 2.1.

name of fin **A** ....

main function of fin **A** ....

[2]

(iii) The magnification of the image in Fig. 2.1 is × 0.85.

Calculate the actual length of the mackerel in Fig. 2.1 along the length of the line labelled **X**.

Give your answer in centimetres and to the nearest whole number.
Show your working.

actual length of mackerel = ... cm [2]

(iv) The binomial name of this mackerel is *Scomber scombrus*.

Complete Table 2.1 to classify the mackerel.

Table 2.1

classification group	name
....	Eukarya
kingdom	....
genus	....
species	....

[2]

(c) Mackerel live within the sunlight zone of the open ocean.

(i) State **two** abiotic conditions of the sunlight zone.

1 ....

2 ....

[2]

(ii) This mackerel is a typical example of a fish species that is adapted to live in the sunlight zone.

Explain **one** adaptation of fish species in the sunlight zone.

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....

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.... [2]

[Total: 17]

3 Rocky shores can be divided up into different zones.

Each zone has different abiotic factors that affect the distribution of organisms.

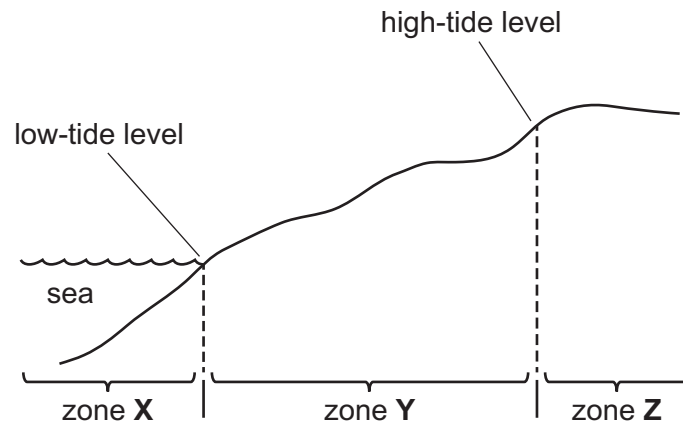**(a)** Fig. 3.1 shows a diagram of a rocky shore.

Fig. 3.1

State the names of the zones labelled **X**, **Y** and **Z**.

zone **X** ....

zone **Y** ....

zone **Z** ....

[1]

(b) A student investigates the distribution of limpets and the macroalgae *Fucus* sp. on a rocky shore.

The student carries out systematic sampling of these species, from the low-tide level up the shore to the high-tide level.

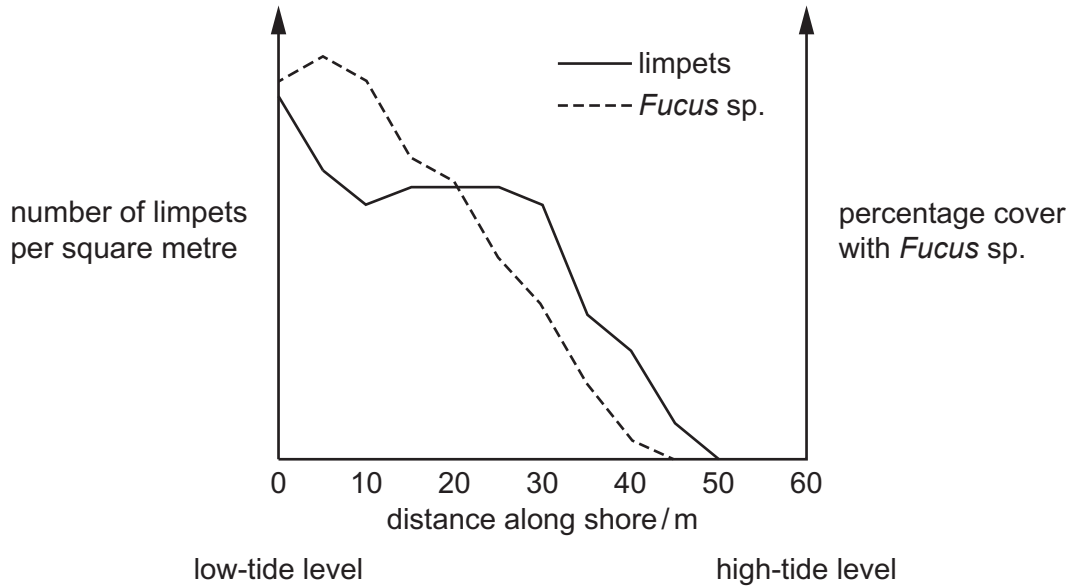The student's results are shown in Fig. 3.2.

Fig. 3.2

(i) Outline a systematic sampling method to collect the results for the limpets as shown in Fig. 3.2.

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....

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.... [3]

(ii) Suggest why the student measured the percentage cover of rocks with *Fucus* sp. rather than counting the number per square metre.

....

.... [1]

(iii) Discuss reasons for the change in the number of limpets per square metre along the rocky shore.

Use Fig. 3.2 and your own knowledge to support your answer.

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.... [4]

(c) Sea anemones are also found on rocky shores.

Explain how sea anemones are adapted to live on rocky shores.

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....

....

.... [3]

[Total: 12]

4   Plastic pollution is a threat to marine ecosystems.

Table 4.1 shows the total mass of plastic released into the oceans from different continents in 2022.
Table 4.1 also shows the mass of plastic released per person from each continent.

Table 4.1

continent	total mass of plastic released /tonnes	mass of plastic released per person /kilograms
A	78 000	0.06
B	790 000	0.17
C	5 800	0.01
D	44 000	0.12
E	3 600	0.09
F		0.12

(a) (i) In 2022, the population of continent **F** was 436 817 000.

Calculate the total mass of plastic released from continent **F** in 2022.
Show your working.

Give your answer in tonnes and to the nearest whole number.
[1 tonne = 1 000 kg]

total mass of plastic released from continent **F** = ... tonnes [2]

(ii) Plot a bar chart to show the mass of plastic released **per person** from each continent in 2022.

You do **not** need to plot the **total** mass of plastic released.
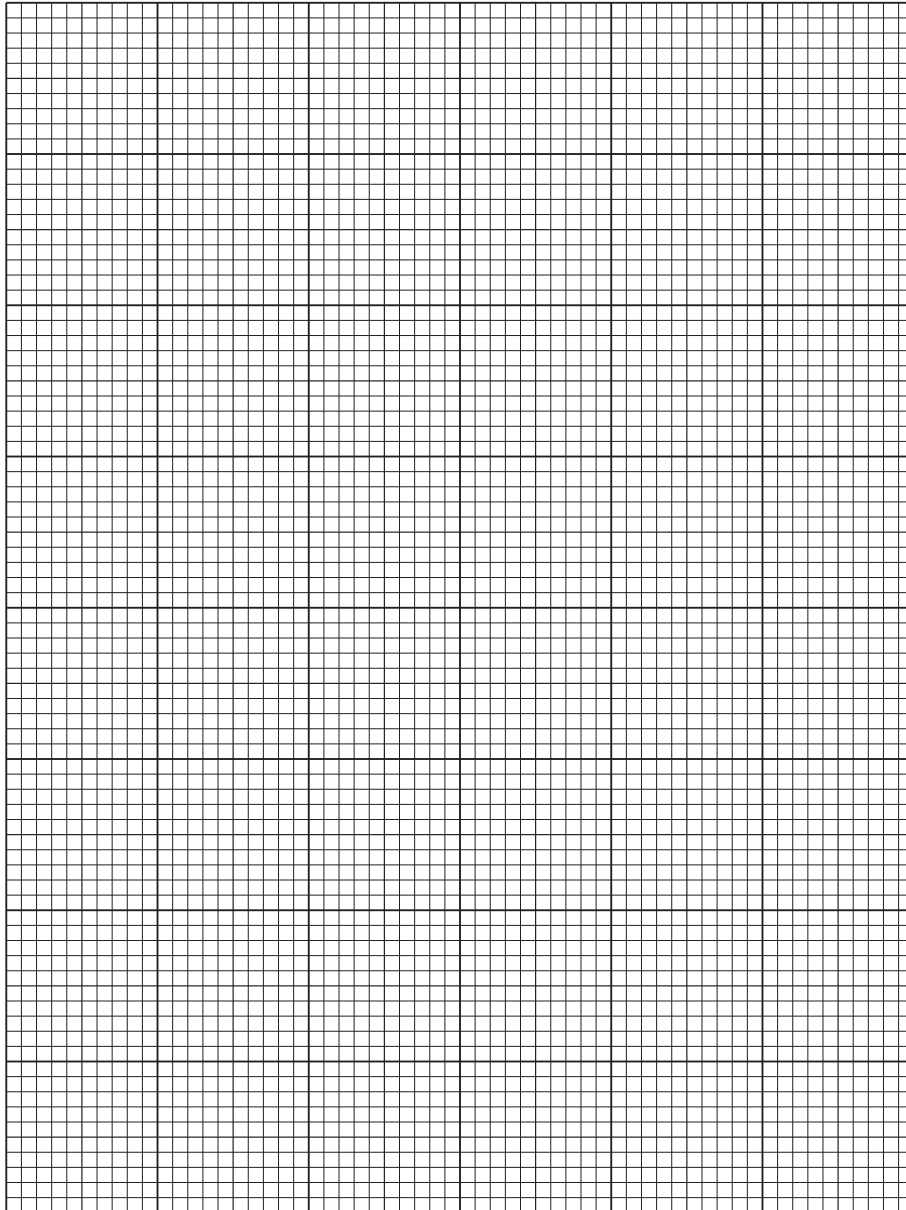
[4]

(iii) Suggest **one** reason for the difference in the mass of plastic released **per person** from continent **B** compared with that from continent **C**.

....

.... [1]

14

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(b) Plastic pollution can reduce the penetration of light into water.

A student investigates the effect reduced light intensity, caused by plastics, has on the rate of photosynthesis of an aquatic plant.

The student uses the following method.

- Place an aquatic plant into a boiling tube filled with water.
- Place the boiling tube into a beaker filled with water.
- Place a lamp 5 cm away from the beaker.
- Place a piece of plastic sheet between the lamp and the beaker.
- Switch on the lamp.
- Count the number of oxygen bubbles produced by the plant in 10 minutes.
- Repeat the experiment with different numbers of identical plastic sheets.

Fig. 4.1 shows the apparatus the student uses.

not to scale
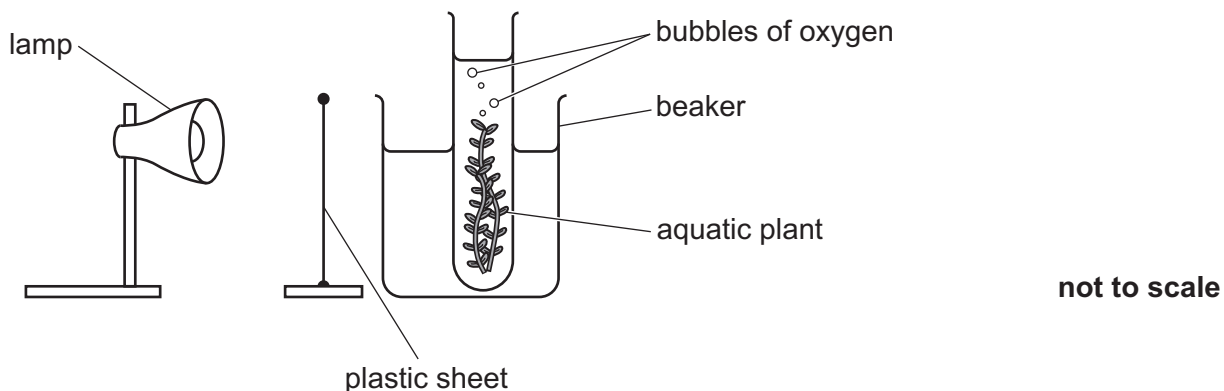
Fig. 4.1

(i) Complete the word equation for photosynthesis.

.... + ... → .... + oxygen

[1]
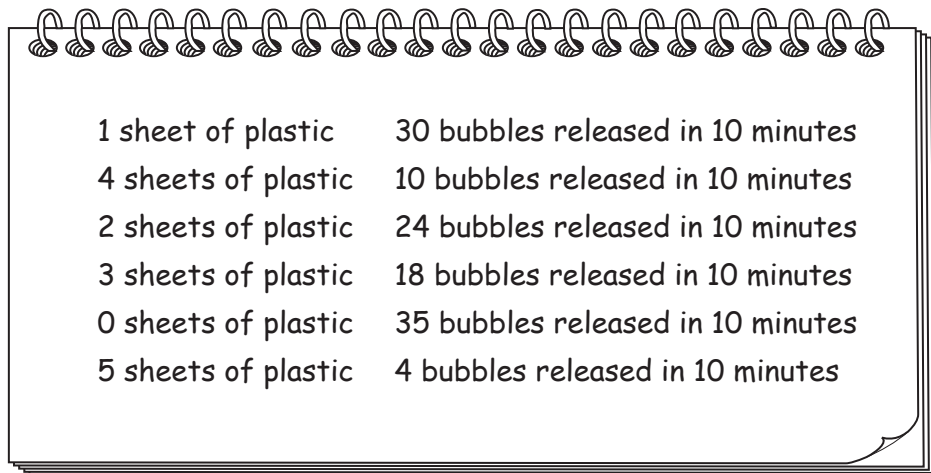
(ii) State **one** abiotic variable that the student should control and a method to control it.

variable ....

method ....

[2]

The student's results are shown in Fig. 4.2.

1 sheet of plastic	30 bubbles released in 10 minutes
4 sheets of plastic	10 bubbles released in 10 minutes
2 sheets of plastic	24 bubbles released in 10 minutes
3 sheets of plastic	18 bubbles released in 10 minutes
0 sheets of plastic	35 bubbles released in 10 minutes
5 sheets of plastic	4 bubbles released in 10 minutes

Fig. 4.2

(iii) Draw a suitable table for recording the results shown in Fig. 4.2.

In your table, write the results in order from the lowest to the highest number of sheets of plastic.

[3]

(iv) Explain how the results of this investigation show that plastic pollution leads to reduced productivity in oceans.

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.... [2]

(v) Describe **one** change to the student's method that improves the accuracy of the results.

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.... [2]

[Total: 17]

5 Table 5.1 shows some nutritional information for salmon produced by aquaculture and wild-caught salmon.

Table 5.1

nutrient content in 100 g of salmon meat	salmon produced by aquaculture	wild-caught salmon
protein / g	20	22
fat / g	13	7
calcium / mg	8	12
vitamin D / μg	5	15

(a) (i) State **one** micronutrient listed in Table 5.1.

.... [1]

(ii) Salmon meat also contains iron.

Explain why a lack of iron in the diet of fish reduces the ability of muscle cells to respire.

....

....

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.... [2]

(b) Salmon meat produced by aquaculture has a higher fat content than meat from wild-caught salmon.

Describe an investigation to test if meat from salmon produced by aquaculture has a higher energy content than meat from wild-caught salmon.

Your method should include a relevant safety precaution.

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.... [6]

[Total: 9]

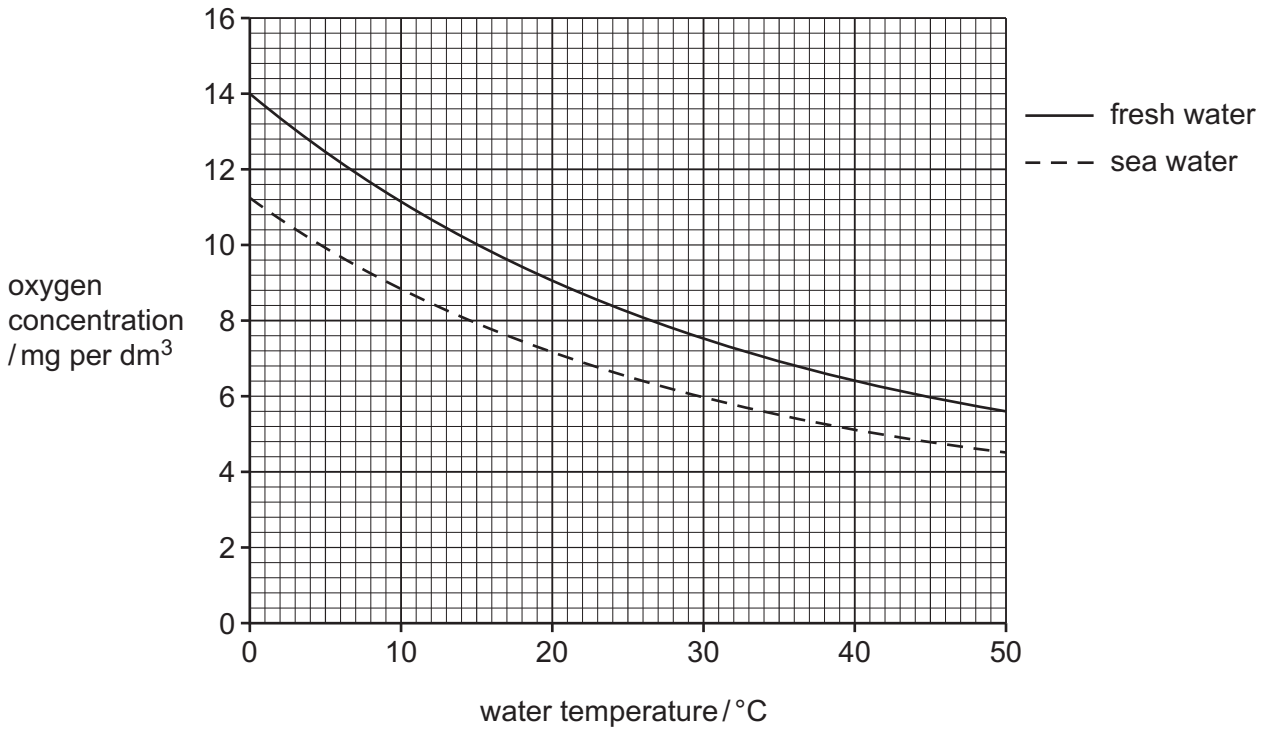6 Fig. 6.1 shows the effect of temperature on the dissolved oxygen concentration of fresh water and of sea water.

Fig. 6.1

(a) (i) Define the term salinity and state the unit of measurement.

definition ....

....

unit of measurement ....
[2]

(ii) Calculate the difference in dissolved oxygen concentration between fresh water and sea water at a temperature of 20 °C.

difference in oxygen concentration at 20 °C = ... mg per dm^3 [2]

(b) Fig. 6.2 shows the salinity of Arctic sea water and equatorial sea water at different depths during an Arctic summer.
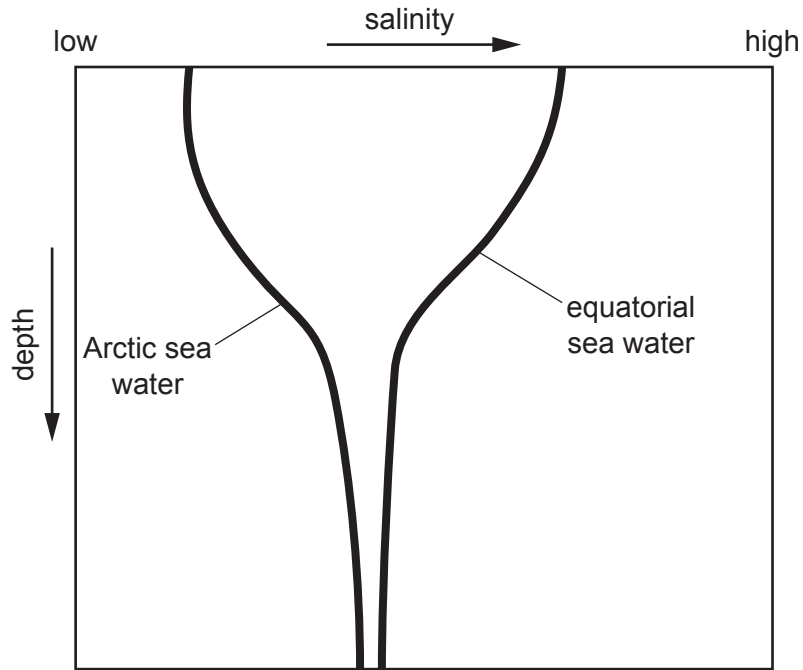
Fig. 6.2

Explain why the concentration of dissolved oxygen is higher at the surface of Arctic sea water during the Arctic summer compared with the surface of equatorial sea water.

Use Fig. 6.1, Fig. 6.2 and your own knowledge to support your answer.

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.... [4]

(c) Describe a method to compare the pH of fresh water with the pH of sea water.

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.... [2]

[Total: 10]

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