CANDIDATE
NAME

CENTRE
NUMBER

CANDIDATE
NUMBER

MARINE SCIENCE **9693/03**

Paper 3 A2 Structured Questions **October/November 2015**

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use an HB pencil for any diagrams or graphs.
Do not use staples, paper clips, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.
Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.
You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.
The number of marks is given in brackets [ ] at the end of each question or part question.

[Turn over

Answer **all** the questions in the spaces provided.

1 (a) Explain what is meant by the term *primary producer*.

....

....

....

....[2]

(b) Sea grasses form large beds made up of either one species or of several species together. They are found in shallow waters along coastlines. Their leaves trap sediment and slow down water movement. Their roots bind sediment on the sea bed.

Fig. 1.1 shows two types of sea grass.
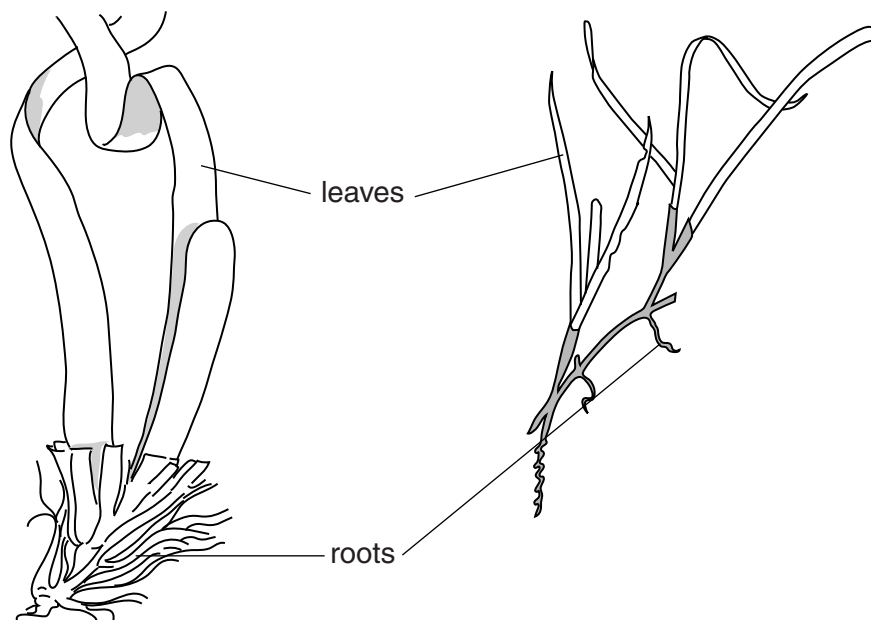
Fig. 1.1

(i) With reference to Fig. 1.1, suggest and explain **two** features of the sea grasses that allow them to live in moving water.

1 ....

....

2 ....

....[2]

(ii) Explain why sea grasses are found only in shallow water.

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....

....

....[2]

(iii) Corals survive best in clear water and are often found close to sea grass beds. Suggest how sea grass beds aid the survival of coral.

....

....[1]

(c) Suggest **three** reasons why sea grass beds are often nursery areas for many species of marine animals.

1 ....

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2 ....

....

3 ....

....[3]

(d) Sea grass beds have shown a progressive decrease in size due to human activities. Suggest **two** ways in which humans cause damage to sea grass beds.

1 ....

....

2 ....

....[2]

[Total: 12]

2 (a) Fig. 2.1 shows the main stages in the life cycle of salmon.

Eggs
are fertilised inside nests made in
....

Adults feed on herring
and sand eels

Alevins hatch inside the nests and
feed on...

Smoults migrate towards the
....

Fry leave the nest and feed
on small river organisms

Parr are one year old salmon,
which feed for another 3 – 4 years
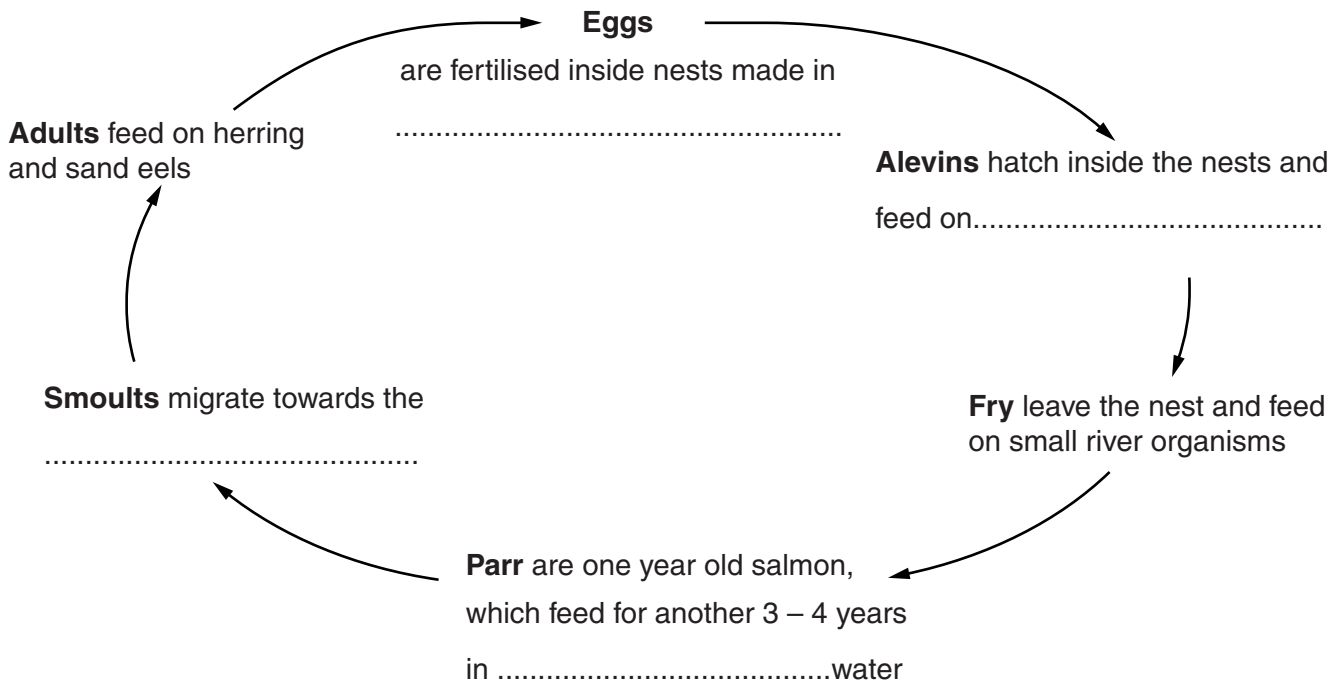in ....water

Fig. 2.1

(i) On Fig. 2.1, write a word, or words, in each of the four spaces to complete the sentences.
[4]

(ii) State **one** advantage to salmon of laying their eggs inside nests.

....

....[1]

(iii) Suggest **one** disadvantage to the salmon of the eggs developing inside nests.

....

....[1]

(b) (i) Salmon reared by aquaculture have been modified by selective breeding and genetic engineering.

Explain how selective breeding differs from genetic engineering.

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....[4]

(ii) Identify the roles of the two genes used in genetic engineering of salmon.

....

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....

....[2]

(iii) Suggest **one** characteristic, other than those gained by genetic engineering, for which selective breeding might be used to improve salmon.

....[1]

(c) (i) State what is meant by the term *precautionary principle* in relation to genetic engineering.

....

....[1]

(ii) Describe and explain **one** way in which the requirements of the precautionary principle have been met for the rearing of genetically engineered salmon.

....

....

....

....[2]

[Total: 16]

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3 **(a)** Read the information about a project to rehabilitate mangroves.

> The Philippines are increasing the replanting of mangroves following the damage caused by typhoon Haiyan. One project is an island that was once home to over 12 400 hectares of mangrove forests. However, extensive clearing to make way for fish and shrimp ponds has left them as barren coastlines and muddy fish ponds, with only 300 hectares of mangrove forest remaining.
>
> This has had disastrous consequences for biodiversity and resulted in the local communities of this island losing natural resources and ways of making a living.
>
> A number of local and international organisations are working together to revert 80 hectares of unused fish ponds and deforested coastal areas back to mangrove forest.
>
> There are three different strategies:
> 1. setting up ecotourism sites to help restore the mangrove forests
> 2. planting mangrove seedlings in protected sites
> 3. cancelling existing Fishpond Lease Agreements on abandoned fish ponds and obtaining the legal right for the coastal communities to manage the resources.

    (i) Explain why the loss of mangrove forests reduces biodiversity.

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....[3]

    (ii) Suggest **two** benefits to the local people of restoring mangrove forests.

1 ....

....

2 ....

....[2]

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(b) For each of the three strategies listed in the information, suggest **one** way in which they could help restore mangrove forests.

    (i) strategy 1 ....

         ....

         ....

    (ii) strategy 2 ....

         ....

         ....

    (iii) strategy 3 ....

         ....

         ....[3]

(c) Rehabilitation of mangrove forests may also involve restocking with captive-bred fish when the wild population is threatened by overfishing or removal of young fish for aquaculture.

Suggest **two** ways in which captive-bred fish may **not** be successful in increasing the population of wild fish.

1 ....

....

2 ....

....[2]

[Total: 10]

4 (a) Aquaculture is a rapidly growing industry in many parts of the world, where its development may be integrated into the rural economy. Rural developments are usually small, family or community managed semi-extensive systems.

Developing aquaculture in this way can bring benefits, but may also have negative impacts on the environment and on rural communities.

(i) Suggest how aquaculture development can benefit rural communities.

....

....

....

....[2]

(ii) Suggest **one** negative impact that aquaculture development may have on rural communities.

....

....[1]

(b) Fig. 4.1 is a plan of the site for a proposed rural aquaculture development site.
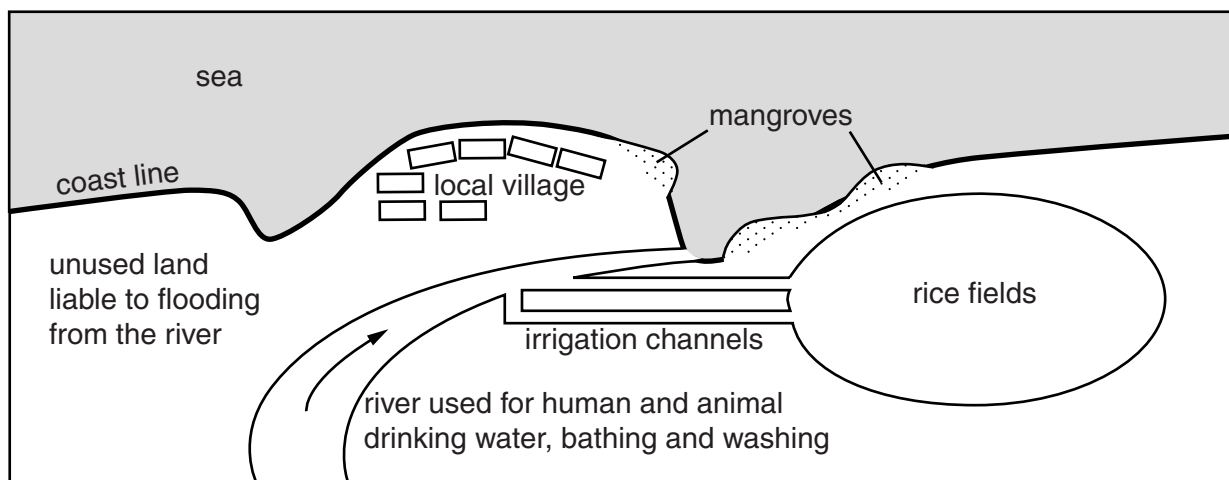The river is the only source of fresh water.

Fig. 4.1

The proposed development includes:

• making two ponds in the unused land to rear freshwater fish

• building channels from the river to the ponds so the river water will flow through the ponds and back to the river

• building a barrier around the rice fields so freshwater fish can be kept in these fields

• digging a ditch inside the new barrier to contain water for the fish.

(i) Describe the features of this site that are suitable for the proposed development.

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....[3]

(ii) Describe **two** features of the proposed aquaculture development that are characteristic of an extensive system.

1 ....

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2 ....

....[2]

(iii) Suggest how the proposed development may affect the water supply to the local village.

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....[2]

(iv) One suggested benefit of the proposed development is an increase in rice yield. Explain why there may be an increase in rice yield.

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....[2]

[Total: 12]

5 (a) Desalination is a method used to remove salt and minerals from sea water to produce fresh water for human use.

Fig. 5.1 shows the increase in global desalination of sea water between 1990 and 2012.
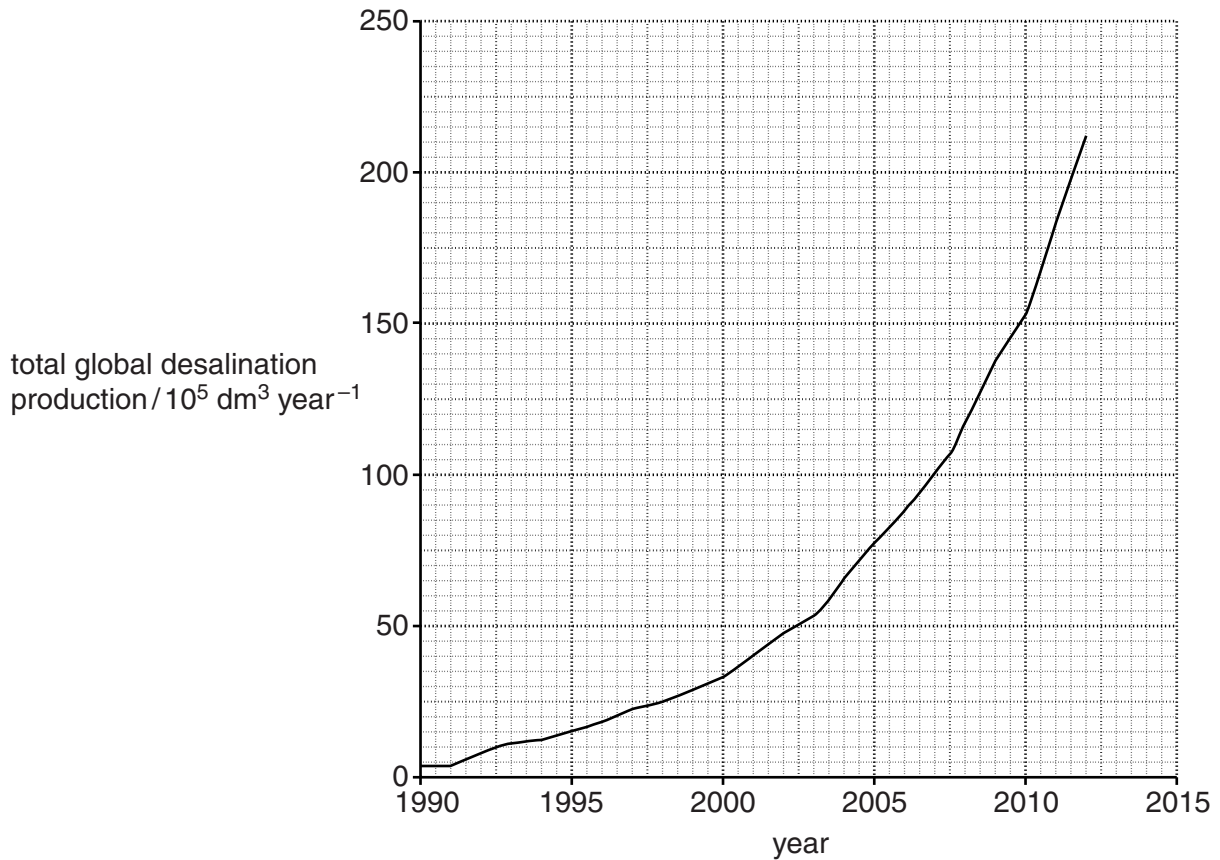

total global desalination production / 10^5 dm^3 year^{-1}

Fig. 5.1

(i) Calculate the mean rate of increase in desalination between 1990 and 2010. Show your working.

.....................................dm^3 per year [2]

(ii) Suggest **one** reason for the increase in desalination.

....

....[1]

(b) (i) Describe **one** ecological problem that can occur as a result of the intake of water to the desalination plant from the sea.

....

....[1]

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(ii) Desalination may release very concentrated brine (salt solution) into the sea.
Explain why this may cause death to benthic organisms.

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....[3]

[Total: 7]

[Turn over

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6 Table 6.1 shows the colours and wavelengths of light in the visible spectrum.

Table 6.1

colour of light	violet	blue	green	yellow	orange	red
wavelength of light/nm	400	450	500	600	630	700

(a) Describe how light of different colours penetrates to different depths in water.

....

....

....

....

....[2]

(b) Table 6.2 shows some of the pigments found in algae and the wavelengths at which maximum absorption of light occurs by these pigments.

Table 6.2

pigment	wavelength of light/nm	type of algae containing pigment
chlorophyll a	400 – 460 and 640 – 680	green and red
phycobilin	520 – 580	red only
phycoerythrin	550 – 600	red only

(i) Explain why both types of algae in Table 6.2 have chlorophyll a.

....

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....

....[2]

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(ii) With reference to Table 6.1 and Table 6.2, suggest why red algae tend to live in deeper water then green algae.

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....[4]

[Total: 8]

7 **(a)** **(i)** Describe how oxygen from the atmosphere can enter water in the oceans.

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....[2]

(ii) Describe how **two** named biological processes can affect the concentration of oxygen in the water.

1 ....

....

....

2 ....

....

....[2]

(b) Fig. 7.1 shows the concentration of dissolved oxygen in fresh water and sea water at different temperatures.
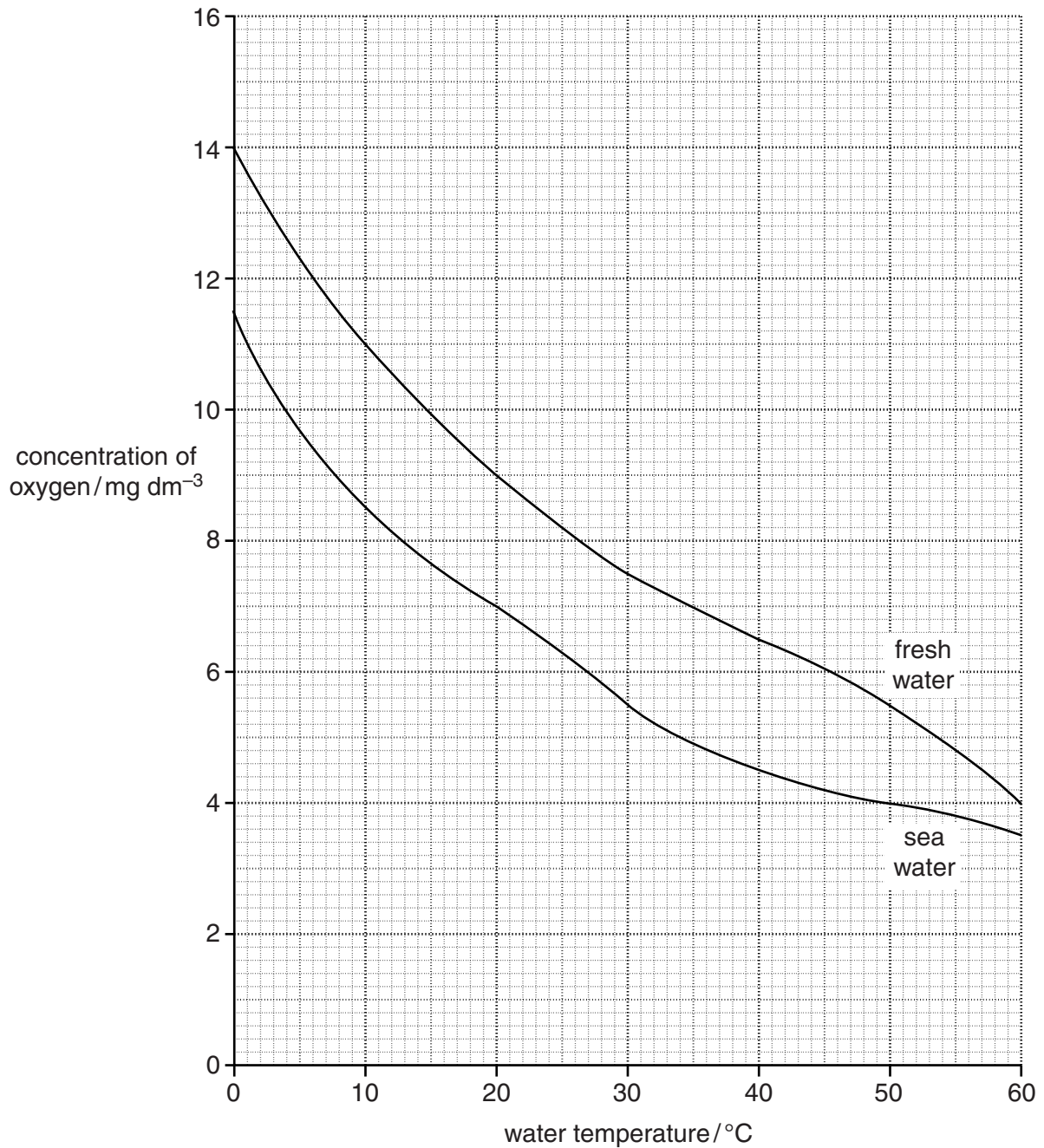
Fig. 7.1

(i) Calculate the percentage difference in dissolved oxygen concentration between fresh water and sea water at 10 °C.

.... % [2]

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(ii) Tuna are fast-swimming marine fish which may be found in water at a temperature of 35 °C.

With reference to Fig. 7.1, explain why ram ventilation is used to meet the demand for oxygen in tuna.

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....[4]

[Total: 10]

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