

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

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

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.....
.....[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.

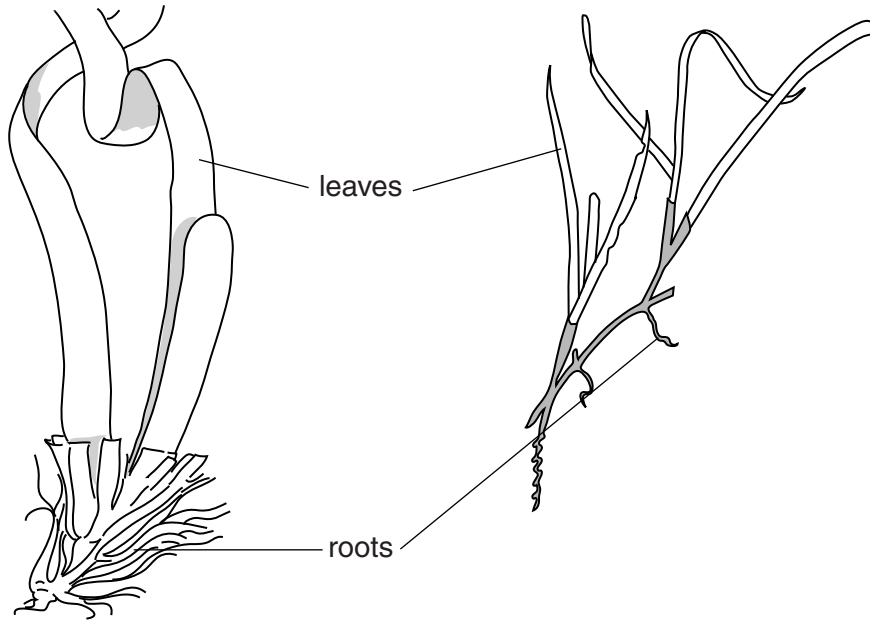


Fig. 1.1

- (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

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2

.....[2]

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

.....
.....
.....
.....[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
.....
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.

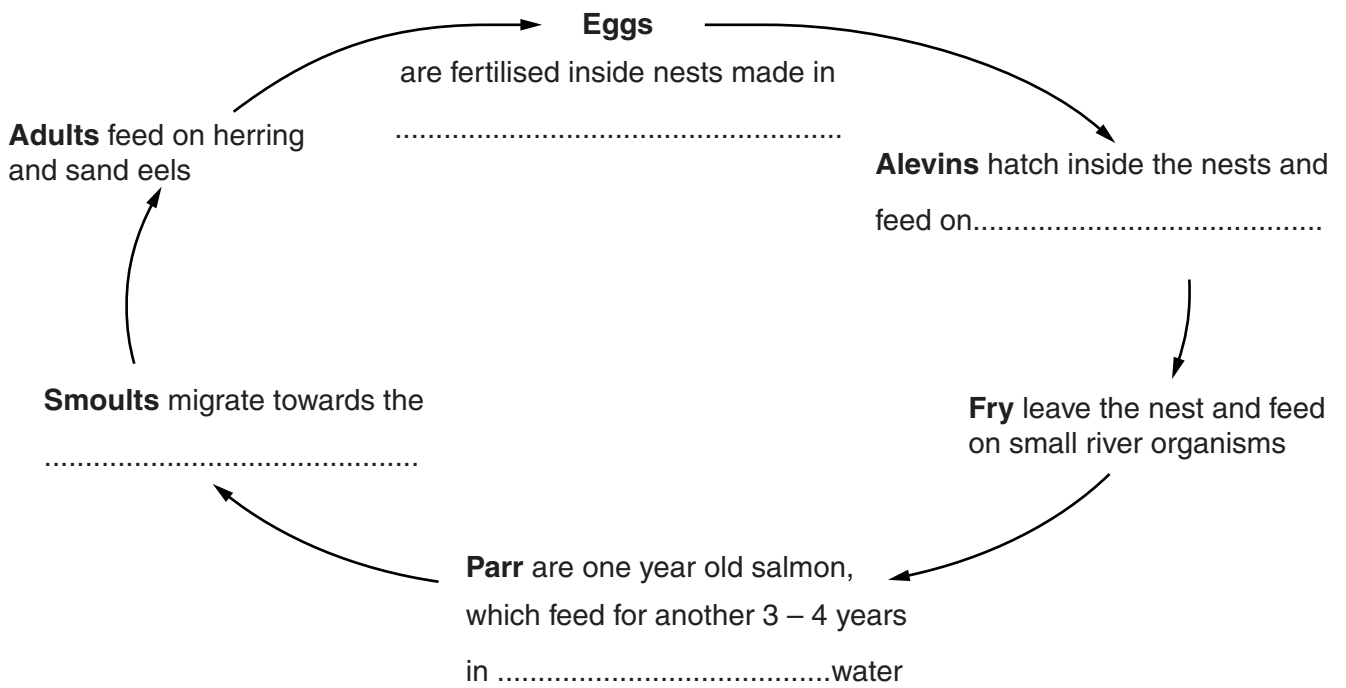


Fig. 2.1

(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]

[Turn over

(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.

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.....
.....
.....[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.

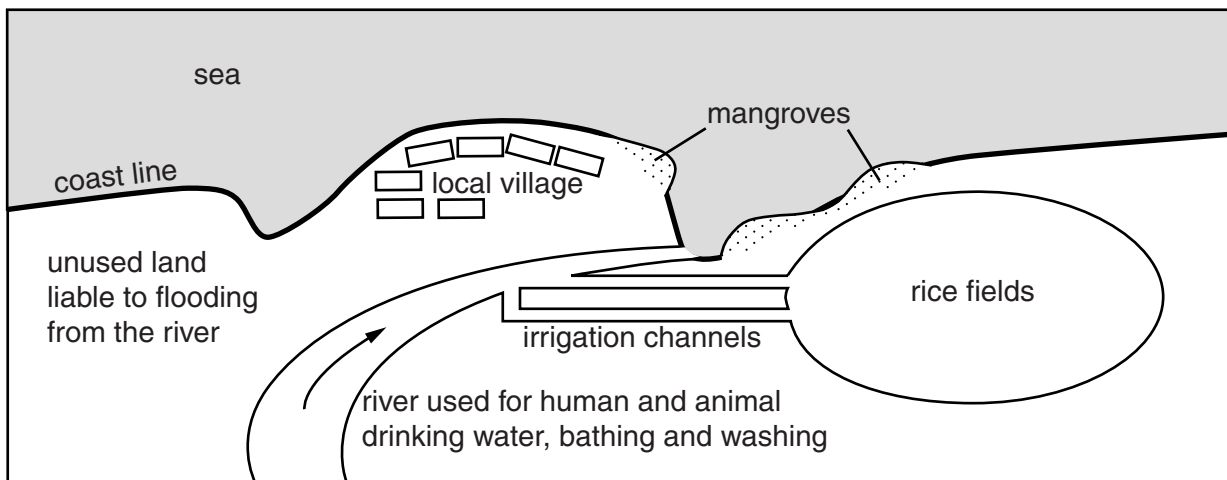


Fig. 4.1

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.

- 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.

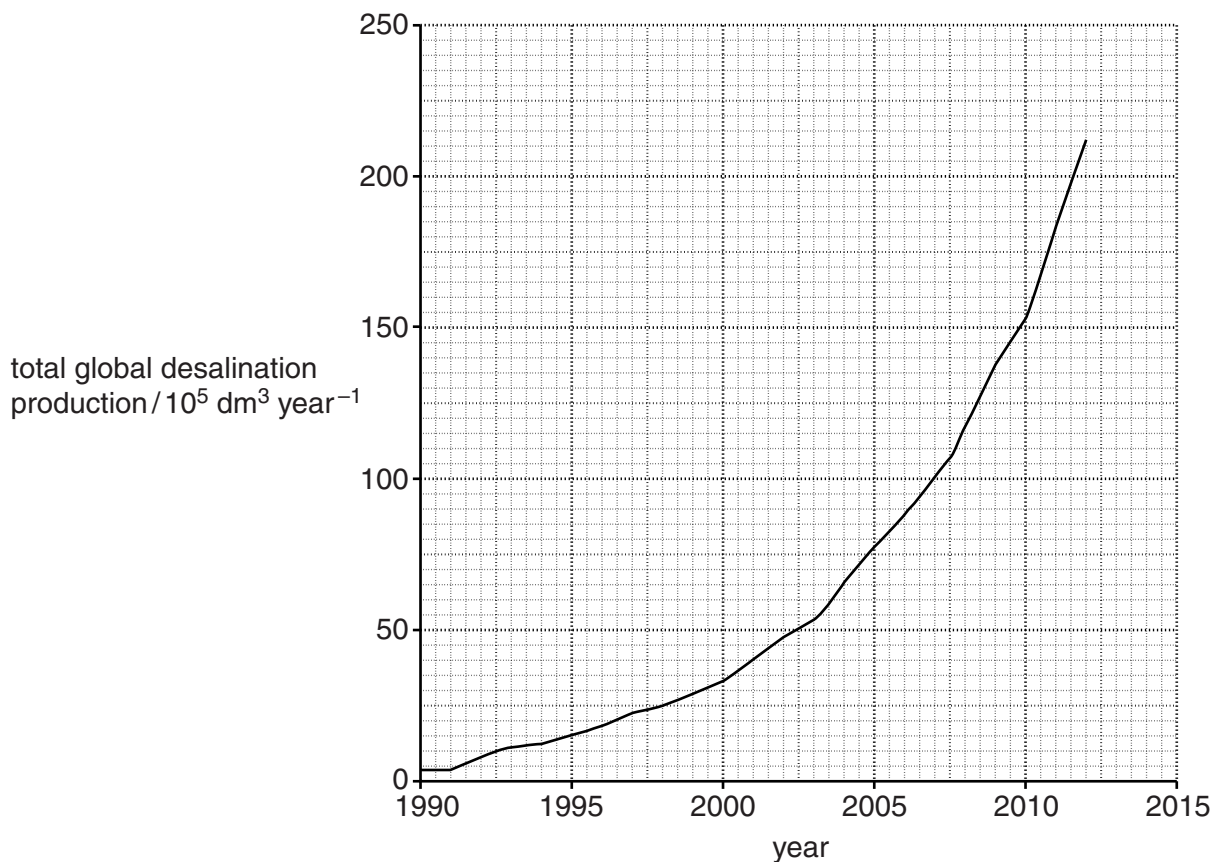


Fig. 5.1

- (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]

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.

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.....

.....[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]

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

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2

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.....[2]

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

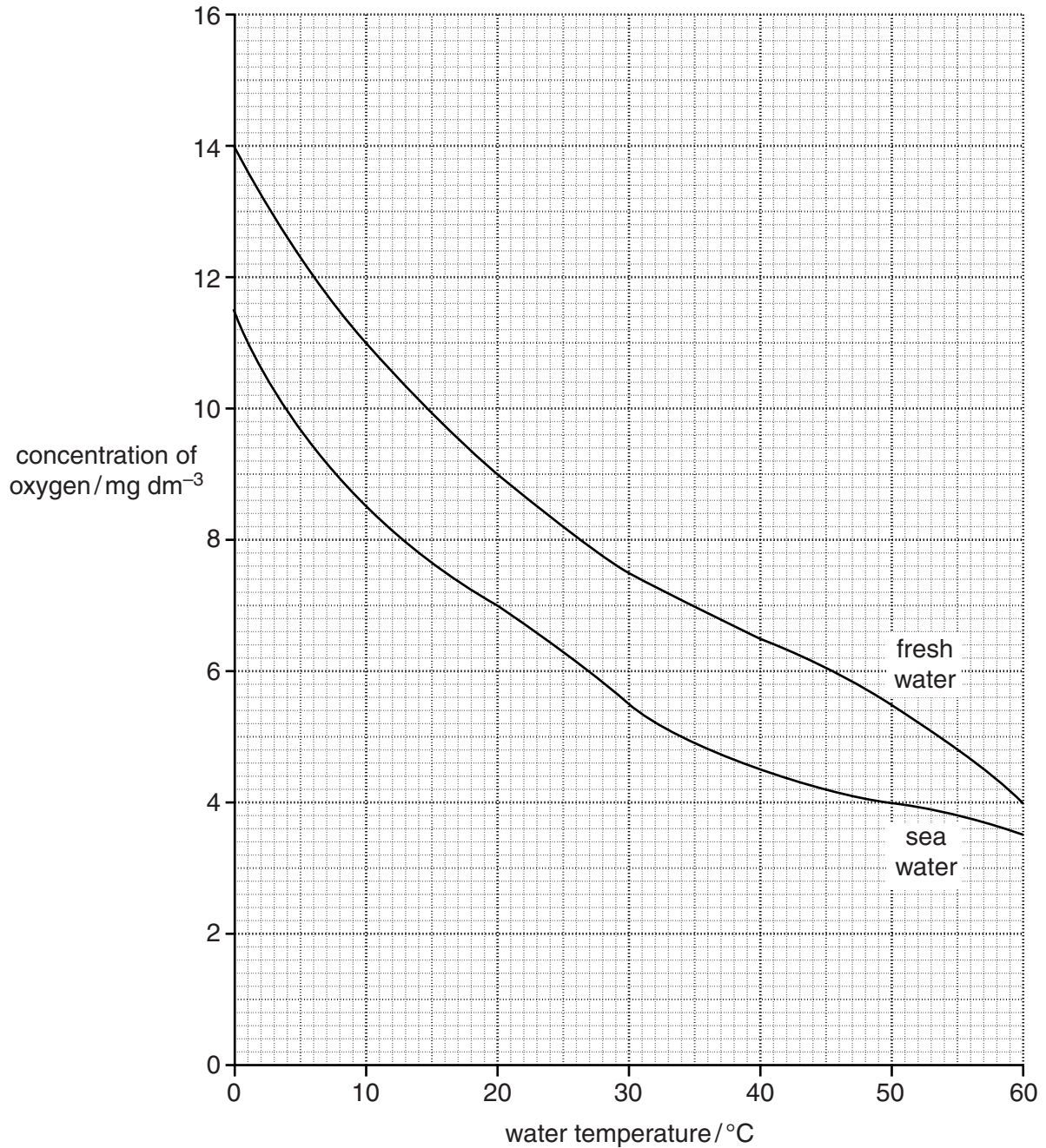


Fig. 7.1

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

..... % [2]

