

CANDIDATE
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MARINE SCIENCE

9693/03

Structured Questions

May/June 2014

Paper 3

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.

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.

Electronic calculators may be used.

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

This document consists of **17** printed pages and **3** blank pages.

1 (a) Diatoms are important primary producers in marine ecosystems.

(i) State the habitat of diatoms.

.....[1]

(ii) Name **one** other type of phytoplankton found in the same habitat.

.....[1]

(b) Phytoplankton productivity has been studied because of their importance to human food supply.

Explain why phytoplankton are important to human food supply.

.....
.....
.....
.....[2]

(c) Fig. 1.1 shows the variations in temperature of the surface waters in the oceans between 1998 and 2009.

Fig. 1.1 also shows the variations in the number of phytoplankton during this period.

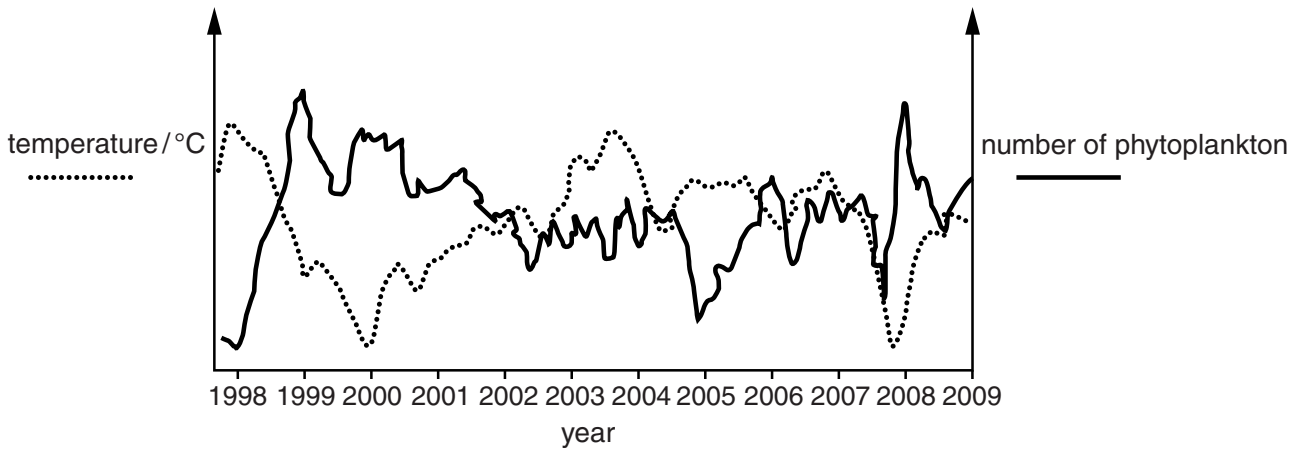


Fig. 1.1

(i) Describe the relationship between the number of phytoplankton and the temperature of the water.

.....
.....[1]

- 2 Sea water contains dissolved oxygen. The oxygen content of sea water is
- usually between 4 – 6 cm³ of oxygen per dm³ of sea water,
 - lower in warm sea water than in cold sea water,
 - very low where oxygen use balances oxygen replacement, at a depth of between 400m – 1000m.

(a) (i) Describe **two** ways in which oxygen can enter sea water.

1

.....

2

.....[2]

(ii) Suggest **two** types of marine community that live in areas where oxygen concentration is very low.

1

2[2]

(b) Features of marine fish adapted to live in sea water with very low oxygen concentration include

- slow movement,
- large gill surface area,
- increased ventilation mechanisms.

Explain how each of these features helps these fish to survive in very low oxygen concentrations.

slow movement

.....

.....

.....

large gill surface area

.....

.....

.....

increased ventilation mechanisms

.....

.....

.....[6]

3 (a) Fertilisation in whales is internal. State **one** disadvantage of internal fertilisation.

.....
[1]

(b) Table 3.1 shows some features of three species of whale.

Table 3.1

features	beluga whale	narwhal whale	minke whale
breeding frequency	1 offspring every 3 years	1 offspring every 3 years	1 offspring every 2 years
gestation period / months (length of pregnancy)	14	15	10
average mass of offspring at birth / kg	45–64	79–100	318–454
feeding after birth	milk from mother up to 2 years	milk from mother 6–12 months	milk from mother 4–6 months
social groups / number of whales in a pods	5–100	4–10	2–3

With reference to the information in Table 3.1, answer (i) and (ii).

(i) Suggest why whales have a long gestation period.

.....
[1]

(ii) Describe the relationship between the average mass of the offspring at birth and the number of whales in the social group.

.....
[1]

(c) Suggest **one** disadvantage to the mother of producing milk to feed young whales.

.....
[1]

(d) The survival of newborn whales to maturity is over 85% for most species. Suggest how living in social groups may help the survival of the young.

.....
.....
.....
.....[2]

(e) Many species of whale are endangered and are protected from hunting by humans. Suggest **one** reason, other than hunting, that may contribute to the falling populations of many species of whale.

.....
.....[1]

[Total: 7]

- 4 (a) (i) Information about recruitment into fish populations is collected in order to make decisions about sustainable fishing.

State what is meant by the term *recruitment*.

.....
.....[1]

- (ii) State **two** factors that may influence the level of recruitment of a fish population.

1

.....

2

.....[2]

- (b) Fig. 4.1 shows the relationship between the numbers of mature fish in an area in a specific year and the number of 3-year old fish in the same area three years later.

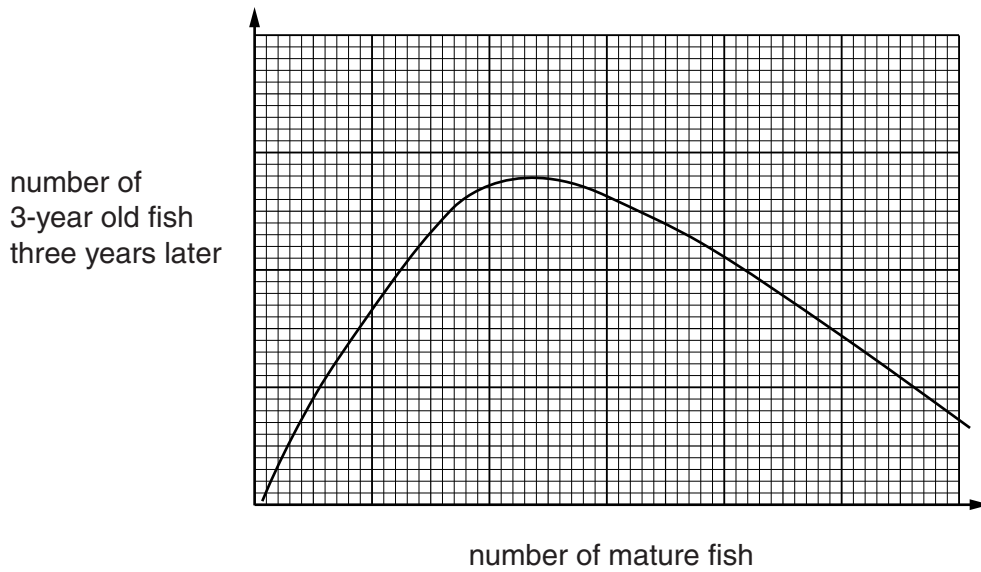


Fig. 4.1

- (i) Describe the relationship between the number of mature fish and the number of 3-year old fish three years later.

.....
.....
.....
.....[2]

(ii) Suggest an explanation for this relationship.

.....

.....

.....

.....

.....

.....

.....[3]

5 (a) Figure 5.1 shows the world production of food by aquaculture from 1985 to 2010.

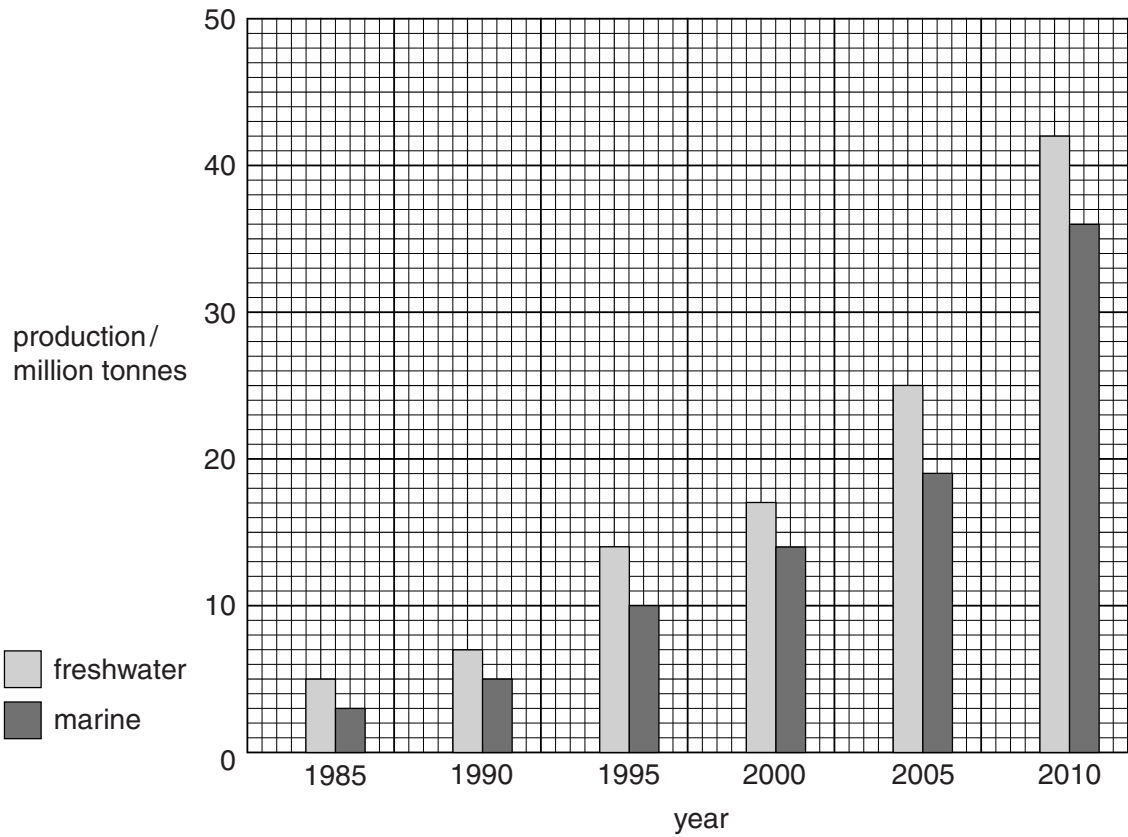


Fig. 5.1

(i) Calculate the percentage increase in **total** production from 2000 to 2010. Show your working.

.....[2]

(ii) China has one of the fastest growing aquaculture industries. In 2010, the total aquaculture production by China was twice that of the rest of the world.

Calculate the estimated aquaculture production by China in 2010. Show your working.

.....[3]

(b) Table 5.1 shows three requirements for the development of aquaculture on a large scale and three of the methods by which these requirements may be met.

Table 5.1

method	requirement 1 availability of stock	requirement 2 availability of clean water	requirement 3 availability of food
1	catch wild fish and rear them	use offshore sea cages	feed live wild fish
2	keep a breeding stock and rear fertilised eggs in a hatchery	net an estuary or bay area	pellets made from fish waste from human food production
3	catch wild adults, strip eggs and sperm and rear fertilised eggs in a hatchery	build ponds and pump water through from the sea	processed wild fish not used for human food

For each of the requirements in Table 5.1, identify which method an **intensive** marine aquaculture development might use in order to be sustainable. Explain your answers.

availability of stock

.....

.....

.....

availability of clean water

.....

.....

.....

availability of food

.....

.....

..... [6]

(c) Describe **two** economic considerations of sustainable aquaculture.

1

.....

2

..... [2]

[Total: 13]

- 6 (a) The information below is about sewage and refuse disposal from small boats by tourists visiting marine sites.

Sewage and refuse disposal from small boats has become a subject of concern for many within the tourism industry. Boats discharging raw or partially treated sewage and dumping refuse in coastal waters pose an increasing threat to both people and the environment.

Human waste contains nutrients that can contribute to harmful algal blooms in coastal marine environments. This waste also contains pathogens that can cause disease.

Refuse such as plastic objects, fishing lines, cigarette butts and expanded polystyrene debris are often consumed by turtles, seabirds, fish and marine mammals.

When refuse from tourist fishing boats becomes entangled on coral and rocky reefs, it can smother coral and pose a safety hazard to snorkelers, divers and young marine mammals.

- (i) Suggest how human waste in coastal waters can cause disease.
.....
.....
.....
.....
.....
.....
.....
.....[3]

- (ii) Explain why algal blooms can be harmful.
.....
.....
.....
.....
.....
.....
.....[3]

(b) (i) Explain **two** ways in which eating refuse is a danger to turtles, seabirds, fish or marine mammals.

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.....
.....[4]

(ii) Suggest **one** type of fishing boat refuse that may be a safety hazard to snorkelers, divers and young marine mammals.

Explain why this type of refuse may be a safety hazard.

hazard

explanation

.....
.....[3]

[Total: 13]

7 (a) State what is meant by the term *ecotourism*.

.....
[1]

(b) Fig. 7.1 shows a coastal region that has some areas of outstanding natural beauty. The nearest local village is 2 km away.

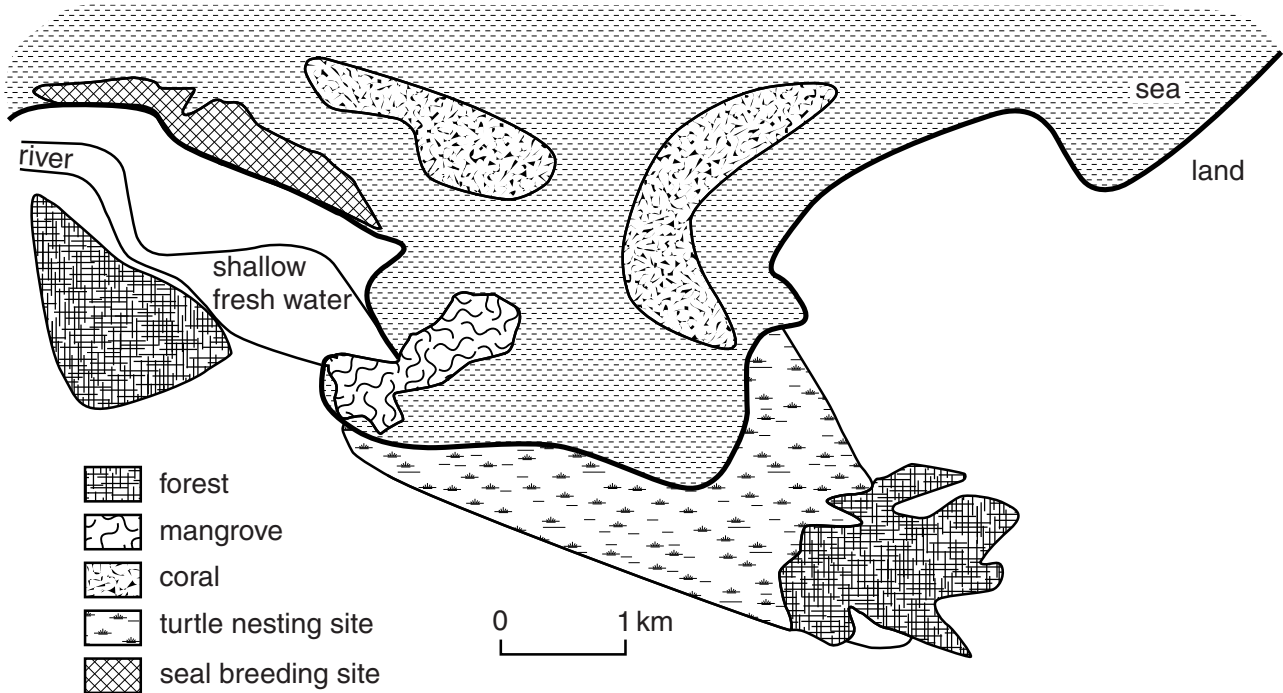


Fig. 7.1

This area is under consideration to develop for ecotourism.

The proposals for development include:

1. building self-catering log cabins in the forested area next to the river, using wood from the trees that are cut down to make space
2. developing a camp site in the same area
3. piping water from the river to a small water treatment plant to supply drinking water
4. using solar cells to provide electricity
5. collecting rainwater and river water for washing
6. draining waste water into the sea
7. parking all vehicles in the nearby village and providing local horse-drawn carts to the development area.

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