



UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS  
General Certificate of Education  
Advanced Subsidiary Level and Advanced Level

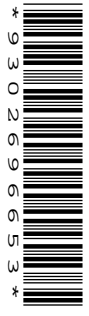
CANDIDATE  
NAME

CENTRE  
NUMBER

--	--	--	--	--

CANDIDATE  
NUMBER

--	--	--	--



**MARINE SCIENCE**

**9693/03**

Structured Questions

**May/June 2009**

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 on both sides of the paper.  
You may use a soft pencil for any diagrams, graphs or rough working.  
Do not use staples, paper clips, highlighters, 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.

For Examiner's Use	
1	
2	
3	
4	
5	
6	
7	
8	
<b>Total</b>	

This document consists of **16** printed pages and **4** blank pages.



1 (a) Fig. 1.1 shows a dinoflagellate, a type of phytoplankton found in the Antarctic.

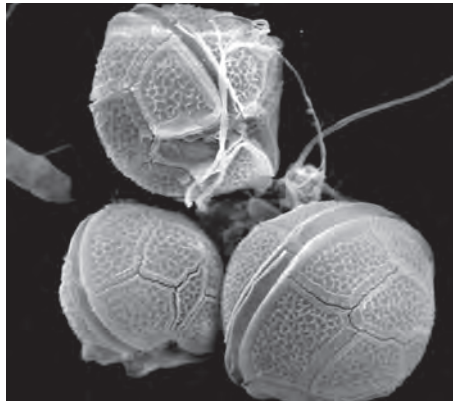


Fig. 1.1

(i) Name **two** other types of phytoplankton.

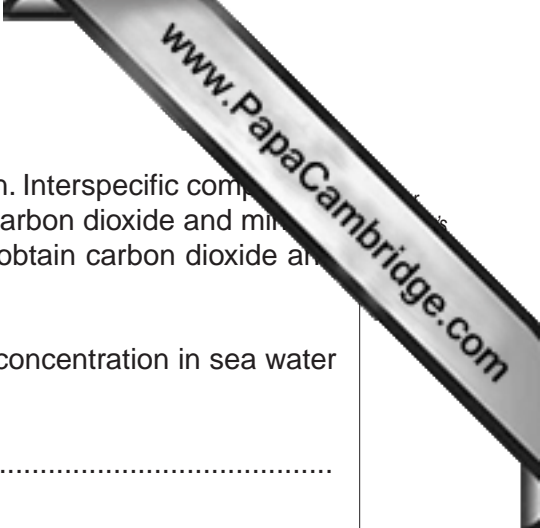
- 1 .....
- 2 ..... [2]

(ii) Explain why phytoplankton mostly live in the water layer that extends from the surface of the open ocean to a depth of 50-80m.

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

(iii) Describe the role of phytoplankton in the marine ecosystem.

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



(b) Carbon dioxide dissolves in water and forms an acidic solution. Interspecific competition occurs between different species of phytoplankton to obtain carbon dioxide and mineral salts from the water. Different species vary in their ability to obtain carbon dioxide and mineral salts.

(i) Suggest and explain how an increase in carbon dioxide concentration in sea water may affect the productivity of phytoplankton.

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

(ii) Suggest how an increase in carbon dioxide concentration in sea water might change the distribution of species in the Southern ocean.

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

**[Total: 12]**

- 2 (a) (i) State what is meant by the term *osmoregulation*.

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

- (ii) Explain why marine organisms may need to osmoregulate.

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

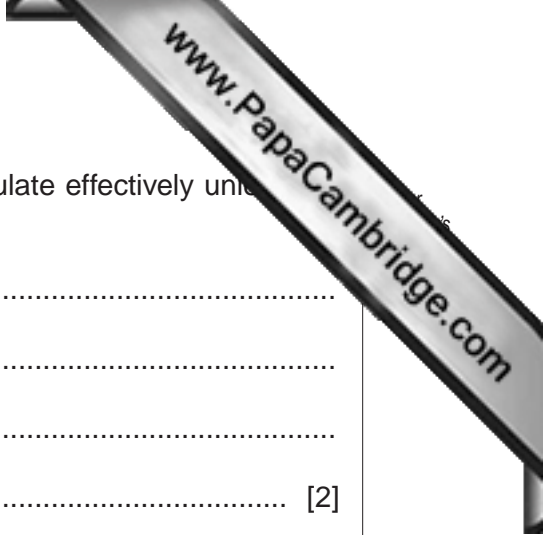
- (b) Table 2.1 shows the concentration of some solutes in sea water and the blood plasma of three species of fish.

**Table 2.1**

	concentration of solute/ $\text{mmol dm}^{-3}$			
	sodium	chloride	urea	total
Sea water	470	550	0	1000
Salmon ( <i>Salmo</i> )				
In the sea	212	200	<1	412
In freshwater	181	179	<1	360
Eel ( <i>Anguilla</i> )				
In the sea	177	175	<1	371
In freshwater	155	150	<1	323
Dogfish ( <i>Squalus</i> )	287	270	444	1000

- (i) Use the information in Table 2.1 to explain how euryhaline fish such as salmon and eel maintain the osmotic balance of their blood when they are living in the sea.

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



(ii) Explain why salmon raised in captivity cannot osmoregulate effectively unless the water is well oxygenated.

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

(iii) Dogfish live only in sea water. With reference to Table 2.1 suggest how dogfish maintain the osmotic balance of their blood.

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

**[Total: 11]**

3 (a) Internal fertilisation occurs in sharks. Outline the advantage of this type of fertilisation.

.....

.....

.....

.....

.....

.....

.....

..... [3]

(b) Table 3.1 shows three different ways in which the fertilised eggs of sharks develop.

Table 3.1

species	type of development	number of eggs	number of offspring
zebra shark	Oviparous – eggs laid inside cases and attached to coral. Embryos feed on food stored in egg.	150-200	50-60
great white shark	Ovoviparous – eggs develop inside female. No placenta, embryos feed on undeveloped eggs.	100-125	2-4
blue shark	Viviparous – eggs develop inside female. Embryos fed by a placenta.	100-125	80-100

Suggest how the different types of development in sharks affects the chances of survival of fertilised eggs.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [5]

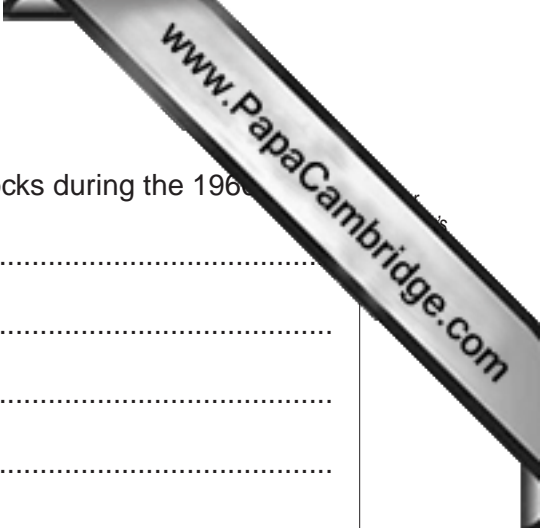
[Total: 8]



**Please turn over for Question 4.**







(iii) Suggest and explain **two** reasons for the trend in cod stocks during the 1960s.

1 .....

.....

.....

2 .....

.....

..... [4]

(b) State **one** short-term and **one** long-term sociological effect of fishing restrictions.

short-term effect .....

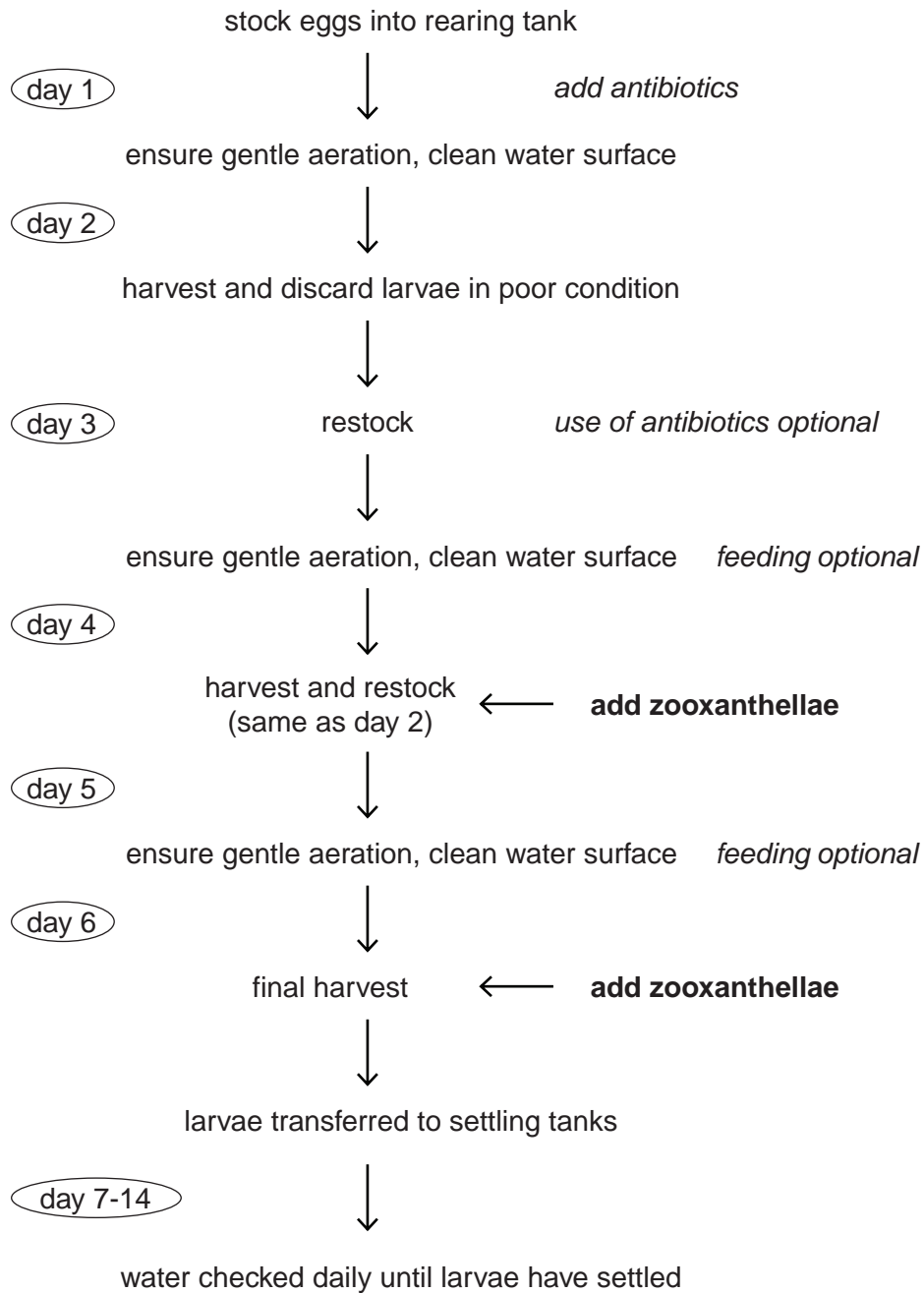
.....

long-term effect .....

..... [2]

**[Total: 11]**

- 5 Fig. 5.1 shows an aquaculture system used for rearing giant clam larvae to seed clams. Seed clams are sold as stock to be grown into adult clams.



**Fig. 5.1**

(a) (i) Suggest **one** reason for each of the processes.

1. adding antibiotics on day 1

..... [1]

2. adding zooxanthellae on days 4 and 6

..... [1]

3. providing aeration at all stages

..... [1]

(ii) Suggest **one** reason why feeding is optional on days 3 and 5.

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

(b) Fig. 5.2 shows a type of tank used for growing seed clams to adult clams. These tanks are kept inside mesh cages in sea water lagoons. The cages are often on legs and close to coral reefs.



Fig. 5.2

(i) Give **two** reasons why rearing the seed clams to adults is said to be an extensive aquaculture system but the rearing of the larvae is an intensive aquaculture system.

1 .....  
.....  
2 .....  
..... [2]

(ii) Suggest **one** reason why the tanks are enclosed within wire cages on legs.

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

- 6 (a) Table 6.1 shows estimates of some of the world input of petroleum hydrocarbons, oil industry, into the sea.

Table 6.1

source of petroleum hydrocarbons	million tonnes year <sup>-1</sup>
transportation	0.88
fixed installations	0.18
wastes	0.70
dumping	0.14
atmospheric emissions	4.05

- (i) Atmospheric emissions eventually reach the sea in rainwater or river run off.

Suggest **two** sources of atmospheric emissions from the oil industry.

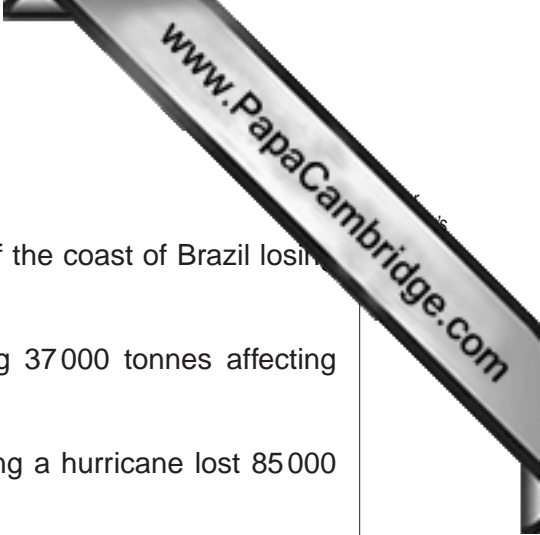
1 .....

2 ..... [2]

- (ii) The input from major oil tanker disasters is estimated to be 0.16 million tonnes year<sup>-1</sup>.

Calculate the percentage of the total world input per year caused by oil tanker disasters.

..... % [2]



(b) The following are all examples of major tanker disasters.

- 1960 *Sinclair Petrolore* exploded and caught fire off the coast of Brazil losing 60 000 tonnes causing little damage to the coastline
- 1989 *Exxon Valdez* ran aground in Alaska spilling 37 000 tonnes affecting 80 km of coastline
- 1993 *Braer* wrecked off the coast of Scotland during a hurricane lost 85 000 tonnes which disappeared with little effect

(i) The oil losses from the *Sinclair Petrolore* and *Braer* were far greater than from the *Exxon Valdez* but caused relatively little pollution compared to that caused by the *Exxon Valdez*.

Suggest reasons for the difference in the ecological impact of these oil losses.

.....

.....

.....

.....

.....

.....

.....

..... [4]

(ii) Explain **one** effect of oil pollution on algae growing on a rocky shore.

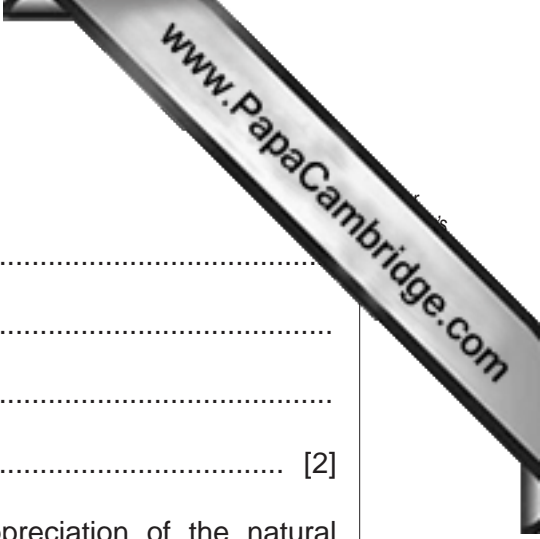
.....

.....

.....

..... [2]

[Total: 10]



7 (a) Explain what is meant by the term *conservation*.

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

(b) Ecotourism can be defined as tourism based on the appreciation of the natural environment.

Suggest **two** features of responsible ecotourism.

1 .....

.....

2 .....

..... [2]

(c) Read the following information about ecotourism.

The tourist industry and governments tend to treat ecotourism in the same way as any sort of tourism based in nature, leading to commercialisation of tourism schemes. These schemes can have a harmful effect on the environment. The development and success of large scale nature theme parks and resorts are energy intensive and ecologically unsustainable, but make huge profits due to the increasing popularity of ecotourism.

Ecotourists claim to be environmentally concerned, but they rarely understand the consequences of their visits and how their activities have physical effects on the environment. For example, how the meals they eat, the toilets they flush, the water they drink are all part of broader regional economic and ecological systems that are being changed as a result of these activities.

Use the information in the passage to answer the following questions.

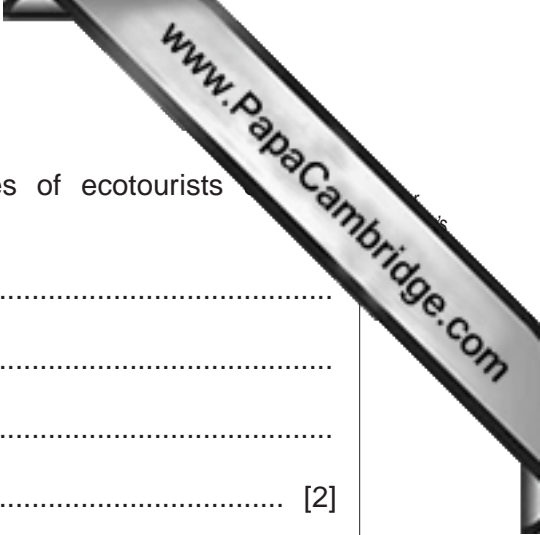
(i) Suggest **two** examples of additional development that may be needed to support ecotourism.

1 .....

.....

2 .....

..... [2]



(ii) Suggest **two** possible consequences of the activities of ecotourists environment.

1 .....

.....

2 .....

..... [2]

**[Total: 8]**

8 Fig. 8.1 is a flow diagram of the production of genetically engineered farmed salmon.

These salmon have an increased growth rate as they produce growth hormone throughout the year. Unmodified Atlantic salmon produce growth hormone only in the warmer summer months.

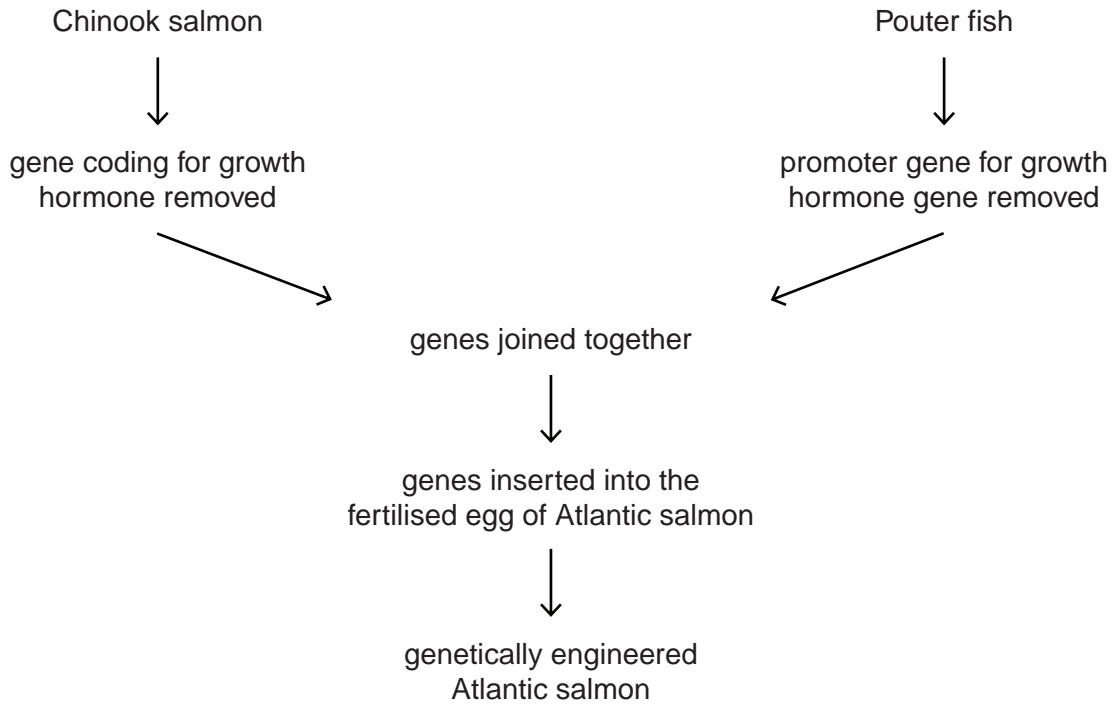


Fig. 8.1

(a) (i) State the purpose of the promoter gene.

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

(ii) Explain why the two genes are joined together before inserting into the fertilised egg of the Atlantic salmon.

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

(iii) State the part of the fertilised egg that the genes must reach for a genetically engineered salmon to develop.

..... [1]





(b) (i) Suggest **two** advantages of these genetically engineered salmon.

1 .....

.....

2 .....

..... [2]

(ii) Some environmentalists are concerned that these genetically engineered salmon may escape and eventually cause the extinction of wild salmon.

Suggest **three** reasons why these genetically engineered salmon may cause extinction of wild salmon.

1 .....

.....

2 .....

.....

3 .....

..... [3]

**[Total: 8]**





