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

CANDIDATE NAME									
CENTRE NUMBER						CANDIDATE NUMBER				

5238985561

MARINE SCIENCE **9693/04**

Data-Handling and Free-Response **May/June 2009**

Paper 4

1 hour 15 minutes

Candidates answer Section A on the Question Paper.

Additional Materials: Answer Booklet/Paper

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.

Section A
Answer all questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer all questions
Answer the questions on the separate answer paper provided.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **7** printed pages and **1** blank page.

Section A

Answer both questions in this section.

For Examiner's Use

1 Fig. 1.1 shows the variation in the productivity of phytoplankton with latitude, in the surface waters of the oceans of the world, for the months January to March.

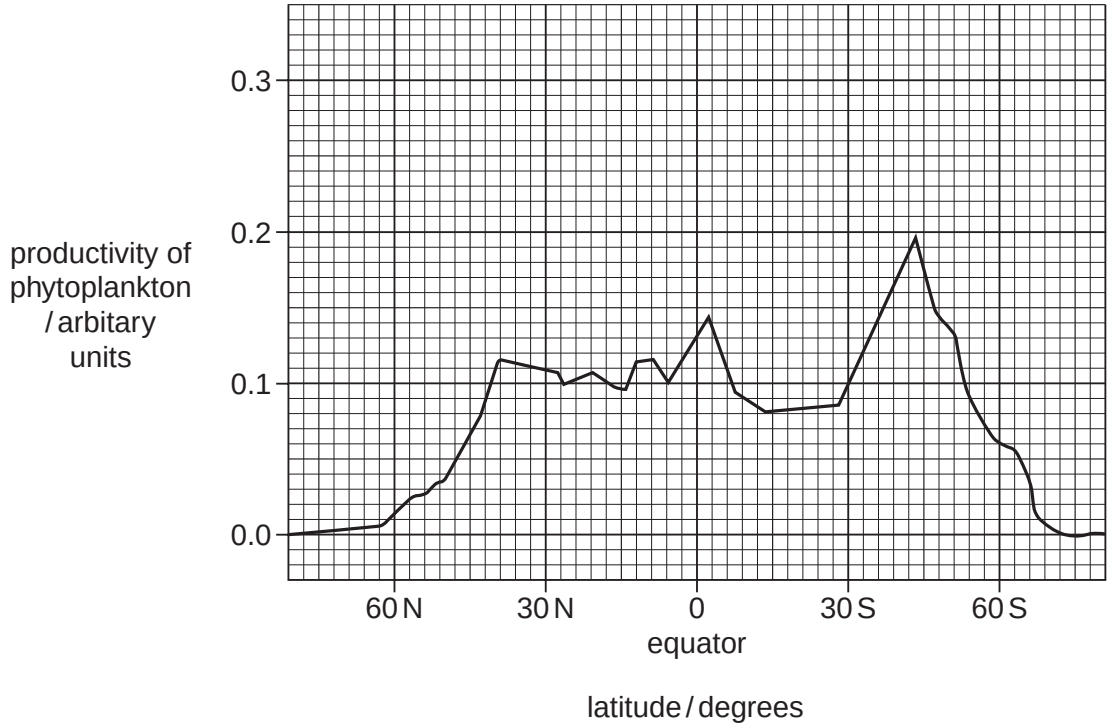

Fig. 1.1

(a) Describe the relationship between productivity of phytoplankton and latitude as shown in Fig. 1.1.

.....

.....

.....

..... [3]

(b) Suggest why the peak in productivity of phytoplankton occurs far away from the equator.

.....

.....

.....

..... [3]

Fig. 1.2 shows seasonal cycles in the biomass of phytoplankton and zooplankton for the temperate North Atlantic.

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key

——— biomass of phytoplankton

– – – – – – biomass of zooplankton

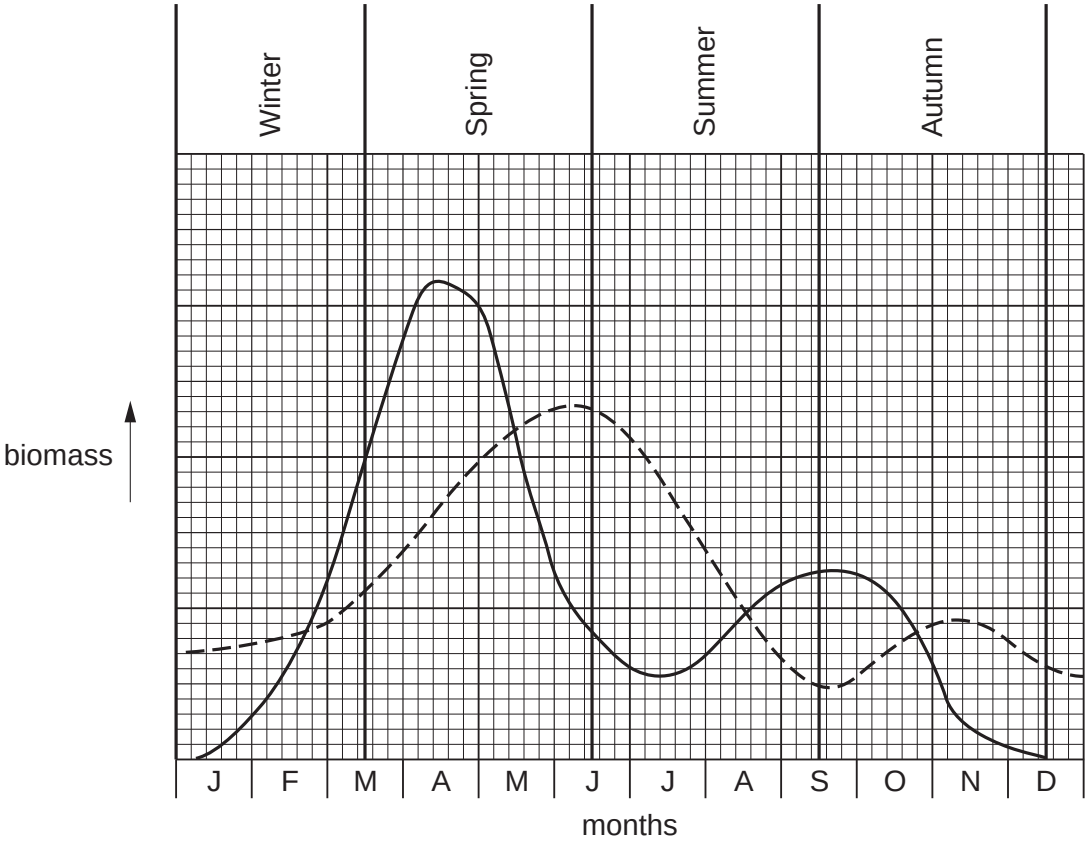

Fig. 1.2

(c) Describe the changes in zooplankton biomass.

.....

.....

..... [2]

(d) Suggest why the biomass of phytoplankton falls during May then increases again in July.

.....

.....

..... [2]

[Total: 10]

2 *Penaeus monodon* is the most widely cultured crustacean species in the world. Over 900 000 tonnes are consumed annually, most of it coming from aquaculture, chiefly in south-east Asia.

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Fig. 2.1 shows an adult *Penaeus monodon*.

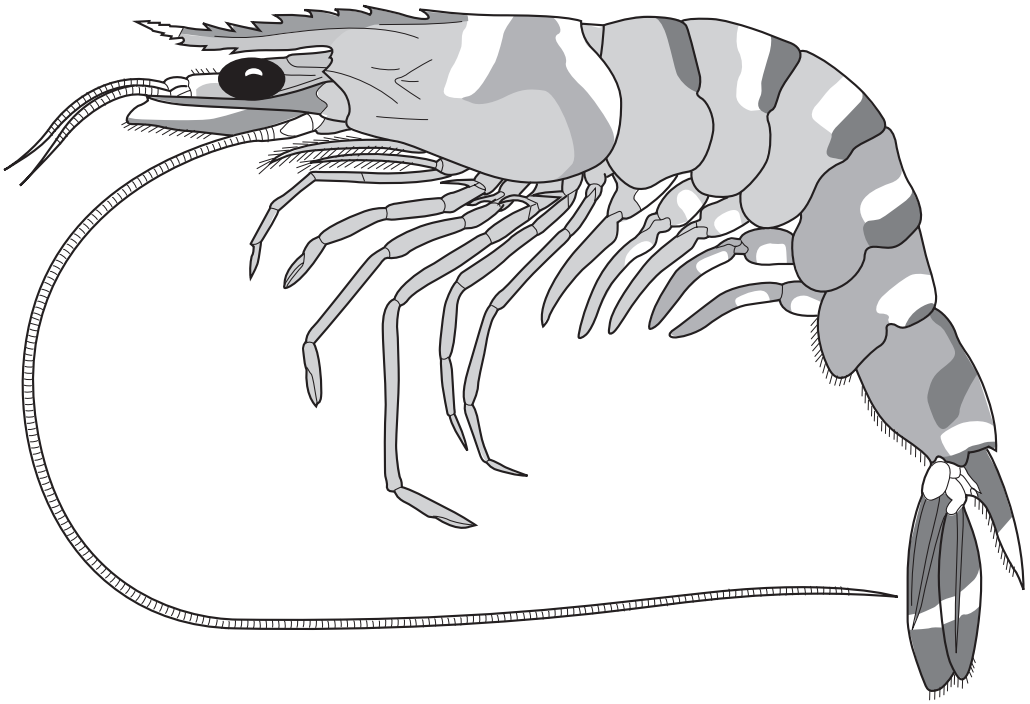

Fig. 2.1

(a) Give **two** ways in which shrimp aquaculture results in the destruction of habitats.

.....

.....

..... [2]

(b) Table 2.2 shows the main differences between extensive, semi-intensive and intensive aquaculture of *Penaeus monodon*.

Table 2.2

Type of aquaculture	Size of pond / hectares	Stocking density per metre^2	Feeding	Yield / kg per hectare	Production costs / $ per hectare	Percentage of total production (%)
extensive	2 to 100	2-3	none natural food	50-500	1-3	55-60
semi-intensive	2 to 30	10-30	ponds fertilised	500-5 000	2-6	25-30
intensive	0.1 to 1.5	40-50	specially formulated pellets	5 000-20 000	4-8	10-20

Using the information provided describe how yield varies with size of pond used.

.....

.....

..... [2]

(c) Using the information in Table 2.2, suggest which type of aquaculture is likely to have the biggest impact on natural ecosystems. Give an explanation for your answer.

.....

.....

.....

..... [3]

[Turn over

(d) Intensive aquaculture requires feeding with specially formulated pellets.

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Optimum daily feeding rates for different stages in growth are shown in Table 2.3.

Table 2.3

Mean body mass (g)	Daily Feeding Rate (% body mass)
3-5	3.0%
5-10	2.5%
10-20	2.0%
> 20	1.5%

A cast net is used to take samples to estimate both the average mass of shrimps and the total mass of shrimps in a pond.

Area of the cast net = 5 m^2
Number of casts with the net = 3
Total number of shrimp caught in 3 casts = 60
A total mass of shrimp caught in 3 casts = 600 (g)

Calculate the following using the above information.

(i) Total number of shrimp in a 3000 m^2 pond = ...

.....

(ii) Mean body mass = ...

.....

(iii) Total mass of shrimps in the pond = ...

.....

(iv) Total feed per day = ...

.....

[3]

[Total: 10]

Section B

Answer all questions in this section.

3 **(a)** Explain the effect of antifouling paint on food chains in the sea. [2]

(b) Describe the impact of global warming on coral reefs. [8]

(c) Discuss the evidence that global warming is caused by human activities. [5]

[Total: 15]

4 **(a)** Describe how the surface area to volume ratio of organisms varies with size. [2]

(b) Explain why large active organisms need to have transport systems. [8]

(c) Describe gaseous exchange in a named **marine** organism. [5]

[Total: 15]

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