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

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

1128384848

MARINE SCIENCE **9693/02**

Paper 2 AS Data Handling and Free Response **May/June 2011**

1 hour 15 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 a pencil for any diagrams, graphs or rough work.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO **NOT** WRITE IN ANY BARCODES.

Answer **all** questions.

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.

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1	
2	
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Total	

This document consists of **5** printed pages, **6** lined pages and **1** blank page.

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Section A

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1 The growth of corals is affected by a number of different factors. Investigations have been carried out to study the effect of various factors on the growth of a temperate coral, *Oculina arbuscula*.

In one investigation, the growth rates of *Oculina* were measured both in the laboratory and on a sunken ship.

In the laboratory, corals were grown in sea water at 24 °C and at 13 °C. These cultures were illuminated with fluorescent lights.

On the sunken ship, measurements were made during the summer and during the winter.

The growth rate of the coral was measured as the mean changes in the surface area of the coral, expressed as cm^2 per week.

The results are summarised in Table 1.1.

Table 1.1

investigation	growth rate of coral / cm^2 per week
Coral growing in the laboratory at 24 °C	1.0
Coral growing in the laboratory at 13 °C	0.3
Coral growing on sunken ship in summer	2.1
Coral growing on sunken ship in winter	0.4

(a) Suggest why the corals grown in the laboratory were illuminated.

.....

..... [2]

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(b) From these results, the researchers put forward the following hypothesis:

The coral growing on the sunken ship receives more light in the summer than the coral growing in the laboratory at 24 °C.

Describe how this hypothesis could be tested. Your answer should include references to the collection of quantitative results.

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.....[4]

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(c) Suggest **three** factors, other than temperature and light, which may affect the growth of *Oculina* in the marine environment. For each factor, predict its possible effect on growth.

factor 1 .....

effect on growth .....

.....

factor 2 .....

effect on growth .....

.....

factor 3 .....

effect on growth .....

.....[6]

[Total: 12]

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2 **(a)** Explain what is meant by the term *productivity*.

.....

.....

.....[2]

(b) Fig. 2.1 shows the energy flow in part of an aquatic ecosystem.
The figures are MJ per year.

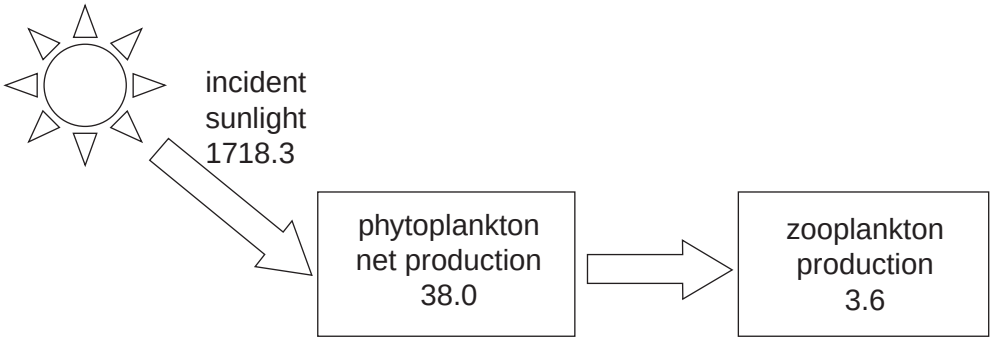

Fig. 2.1

(i) Calculate the percentage of incident sunlight that becomes available as net production in phytoplankton.

Answer: .....[1]

(ii) Not all of the energy in the incident sunlight becomes available as net production in phytoplankton. Give an explanation for this.

.....

.....

.....[3]

(iii) Using the information in Fig. 2.1, explain why food chains rarely have more than five trophic levels.

.....

.....

.....

.....

.....[2]

[Total: 8]

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Section B

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Answer **both** questions in this section.

3 **(a)** Describe the biological roles of magnesium, calcium and phosphorus in marine ecosystems. [6]

(b) Organisms living in the surface layer of an ocean take up nutrients. Describe the ways in which these nutrients may then be lost from this surface layer. [4]

(c) Explain how the nutrients in the surface layer of an ocean are replenished. [5]

4 **(a)** Explain what is meant by each of the following terms used in ecology, giving **one** example of each.

(i) *producer* [2]
(ii) *succession* [2]

(b) Explain how environmental factors affect the communities on a rocky shore. [5]

(c) With reference to examples, explain why extreme and unstable environments tend to have a low biodiversity. [6]

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