Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

MARINE SCIENCE **9693/02**

Paper 2 AS Data Handling and Free Response **May/June 2014**

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.

Electronic calculators may be used.

For Examiner's Use	
1	
2	
3	
4	
Total	

This document consists of **9** printed pages and **3** blank pages.

CAMBRIDGE International Examinations

Section A

Answer **both** questions

1 Fig. 1.1 represents a food chain in the marine environment. The figures show the productivity, measured in kJ m^{-2} $year^{-1}$, of each trophic level.

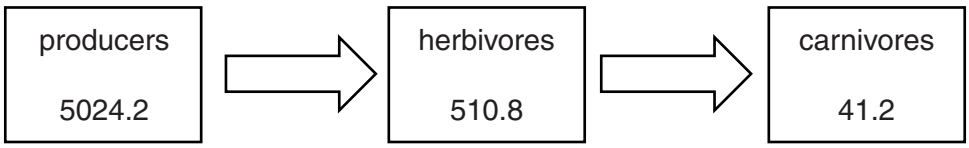

Fig. 1.1

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

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..... [2]

(b) **(i)** Calculate the difference between the productivity of the herbivores and the productivity of the producers.

[1]

(ii) Express your answer to **(b)(i)** as a percentage of the productivity of the producers.

Show your working.

[2]

(c) Suggest **three** reasons to account for the difference between the productivity of the herbivores and the productivity of the producers.

1 .....

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2 .....

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3 .....

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[3]

(d) Suggest why the productivity of producers in an estuary is usually higher than it is in the open ocean.

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..... [2]

[Total: 10]

2 Single-celled marine algae, such as *Isochrysis* sp., are grown on a large scale to provide food for cultivated molluscs and fish larvae.

An experiment was carried out to investigate the effect of temperature on the growth of *Isochrysis*. In this experiment, cultures of *Isochrysis* were grown in test tubes containing a culture solution of mineral salts. These solutions included magnesium and phosphorus.

At the beginning of the experiment, each test tube contained 5×10^4 cells of *Isochrysis*.

All tubes were illuminated with fluorescent lights and incubated at a range of temperatures from 14 °C to 34 °C. After 10 days, the cells were counted using a counting chamber and a microscope.

The results are shown in Table 2.1.

Table 2.1

temperature / °C	number of cells cm^{-3}
14	250×10^4
18	120×10^5
22	614×10^5
26	845×10^5
30	722×10^5
34	230×10^5

(a) Suggest reasons for each of the following.

(i) The cultures were illuminated during the experiment.

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..... [1]

(ii) The culture solution contained magnesium and phosphorus.

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..... [2]

(b) Using the data in Table 2.1, describe the effect of temperature on the growth of *Isochrysis*.

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..... [3]

(c) The growth of *Isochrysis* is also affected by other factors, including salinity.

Outline a laboratory-based experiment to investigate the effect of salinity on the growth of *Isochrysis*.

Your answer should include reference to the control of variables, and the collection of quantitative results.

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..... [4]

[Total: 10]

Section B

Answer **both** questions

3 (a) (i) Explain what is meant by the term *succession*.

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..... [2]

(ii) Outline **one** example of succession in the marine environment.

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..... [3]

(b) Herrings are similar to sardines and form large shoals. Suggest why shoaling may be an advantage to herrings.

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..... [10]

[Total: 15]

4 **(a)** Outline the evidence in support of the theory of plate tectonics.

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..... [3]

(b) Explain how tectonic processes give rise to the formation of each of the following.

(i) ocean trenches

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..... [2]

(ii) mid-ocean ridges

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..... [2]

(iii) tsunamis

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(c) Describe the physical and chemical environmental factors associated with hydrothermal vents that affect the living organisms in these marine environments.

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..... [5]

[Total 15 marks]

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