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

CANDIDATE NAME	
CENTRE NUMBER	
CANDIDATE NUMBER	

0928021555

MARINE SCIENCE **9693/02**

Paper 2 AS Data Handling and Free Response **May/June 2010**

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 **8** printed pages, **6** lined pages and **2** blank pages.

Section A

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1 The concentration of carbon dioxide in the Earth's atmosphere is increasing. An investigation was carried out to determine the effect of increased dissolved carbon dioxide on the distribution and abundance of marine organisms.

In the Mediterranean Sea, off the coast of Italy, several volcanic vents release gases containing over 90% carbon dioxide. The remainder of the gas is made up of nitrogen, oxygen, argon and a little methane. These gases are at a similar temperature to the water into which they are discharged.

(a) The gases released by most volcanic vents are very hot, and contain significant amounts of hydrogen sulfide as well as carbon dioxide.

Explain why this type of vent would have been unsuitable for this investigation.

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(b) The researchers measured the pH of the sea water at different distances from the vents. They also investigated the species of organisms living at different distances from the vents.

Fig. 1.1 shows the pH values of the water at distances of between 0 and 300 metres from one of the vents, and the distributions of coralline algae and sea urchins.

(i) With reference to Fig. 1.1, describe the effect of the volcanic vents on the pH of the sea water in the area around them.

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(ii) Coralline algae have skeletons made of aragonite, a form of calcium carbonate which is soluble in acidic solutions. Explain the distribution of the coralline algae around the volcanic vents.

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(iii) Sea urchins have skeletons made of magnesium calcite. These skeletons are also affected by acidity.

With reference to Fig. 1.1, explain why this cannot be the **only** reason for their abundance at different distances from the volcanic vents.

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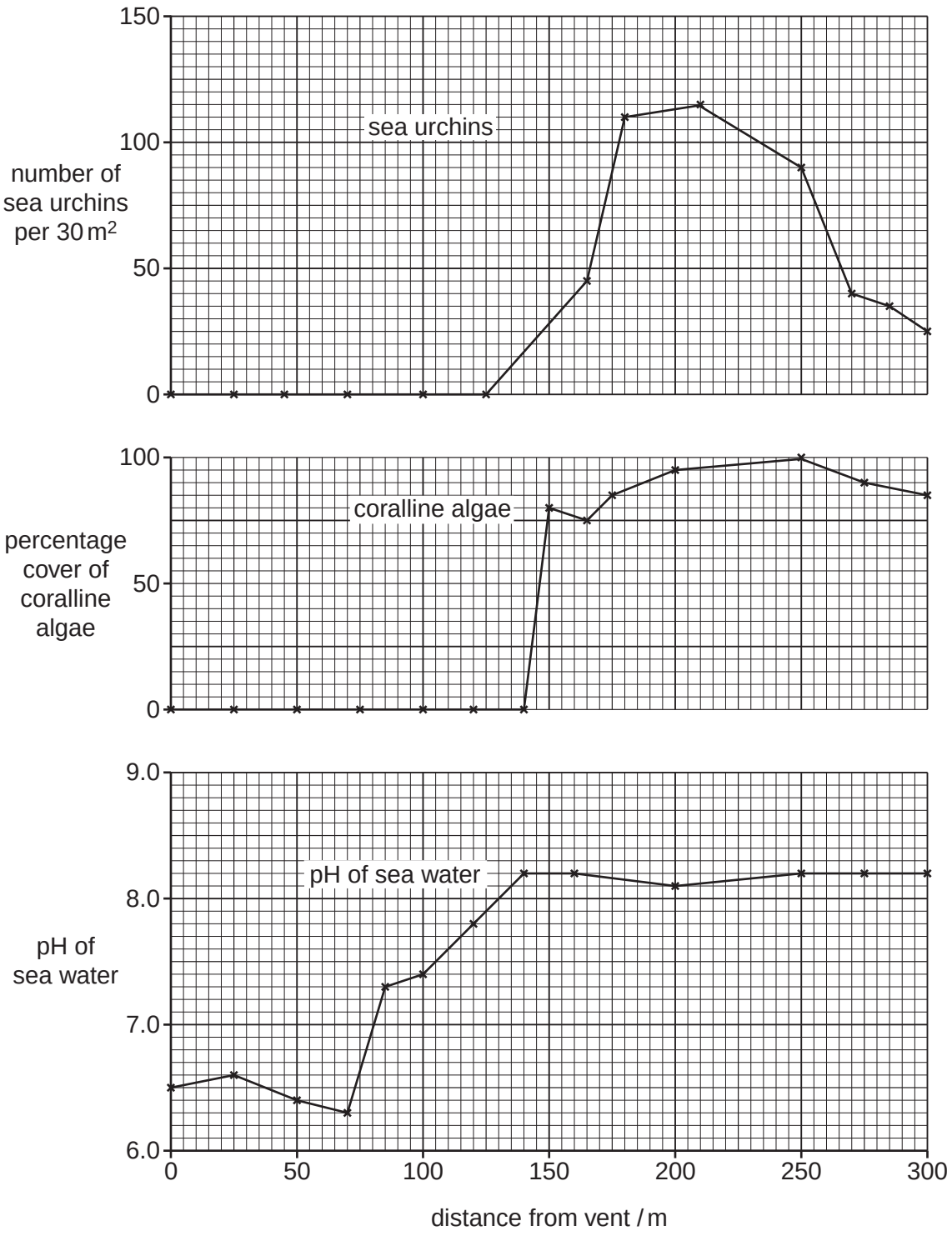

Fig. 1.1

(c) The researchers also investigated the population density of the sea grass *Posidona* around the volcanic vents. The leaves of this grass are often covered with growths of coralline algae.

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Fig. 1.2 shows the coverage of coralline algae growing on a leaf of sea grass at four different sites around one of the volcanic vents. It also shows the number of shoots of sea grass per square metre, at each of these four sites.

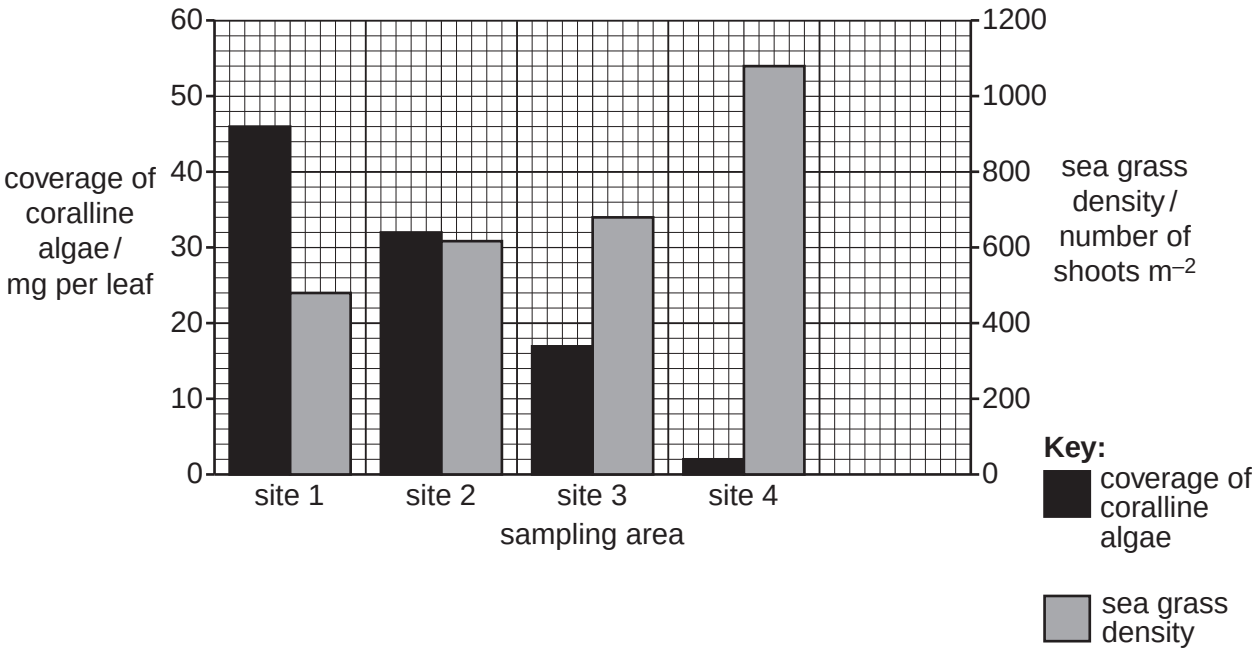

Fig. 1.2

(i) The researchers put forward the following hypothesis:

> If leaves of *Posidona* are partly covered by coralline algae, the growth of *Posidona* is reduced.

Outline a **laboratory-based** experiment that the researchers could do to test their hypothesis.

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

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(ii) The researchers also measured the pH of sea water at each of sites 1 to 4. The results are shown in Table 1.1.

Table 1.1

site	pH range
1	8.17 to 8.15
2	8.17 to 8.13
3	8.00 to 7.67
4	7.60 to 6.98

With reference to the information in Fig. 1.2, Table 1.1 and your knowledge of photosynthesis, suggest **one other** hypothesis that could explain the effect of the volcanic vents on the distribution of the sea grass *Posidona*.

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[Total: 15]

[Turn over

2 Fig. 2.1 shows a food web on a continental shelf.

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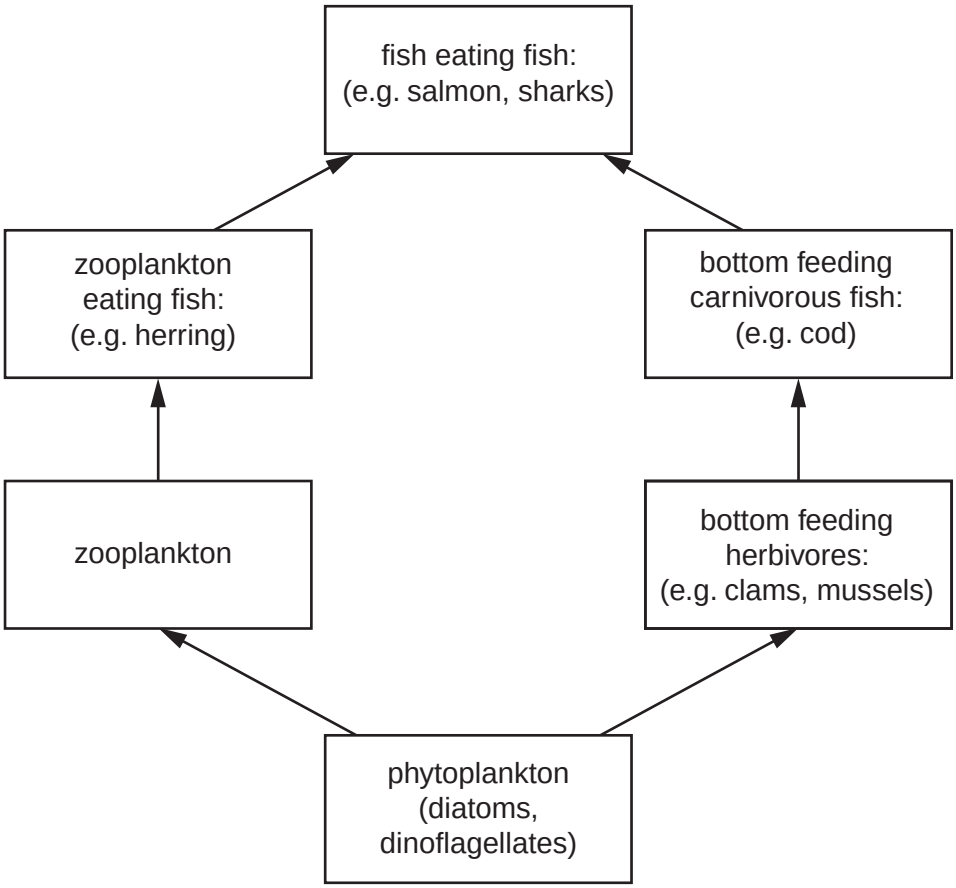

Fig. 2.1

(a) State the number of trophic levels in this food web.

.....[1]

(b) Productivity can be measured as the mass of carbon incorporated into biological molecules per unit area per unit time.

The primary productivity of the phytoplankton in this food web is 90 g of carbon per m^2 per year.

The efficiency of transfer between phytoplankton and herbivores is approximately 10%.

Assuming that zooplankton and bottom-feeding herbivores eat equal quantities of phytoplankton, calculate the amount of carbon incorporated into zooplankton per m^2 per year. Show your working.

..... $g\,C\,m^{-2}\,year^{-1}$ [2]

(c) Suggest why the efficiency of transfer between phytoplankton and herbivores is only 10%.

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[Total: 5]

Section B

Answer **both** questions in this section.

3 **(a)** With reference to two named organisms, describe what is meant by a *specialised* ecological niche and a *general* ecological niche. [5]

(b) With reference to examples, explain why habitats with high biodiversity tend to contain narrow ecological niches. [5]

(c) Discuss the statement that unstable environments tend to have relatively low biodiversity. [5]

4 **(a)** Explain what is meant by the terms *population* and *community*. [3]

(b) Describe the environmental factors that influence the communities that develop on a sandy shore. [6]

(c) Explain how different patterns of erosion and sedimentation give rise to rocky shores and muddy shores. [6]

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