



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

CANDIDATE
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MARINE SCIENCE

9693/02

Paper 2 AS Data Handling and Free Response

October/November 2013

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	
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3	
4	
Total	

This document consists of **11** printed pages and **1** blank page.



Section A

Answer **both** questions in this section.

For
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Use

- 1 Brown algae, illustrated in Fig. 1.1, are commonly found growing on rocky shores.



Fig. 1.1
magnification $\times 0.3$

An investigation was carried out to measure the distribution of two species of brown algae, *Ascophyllum nodosum* and *Pelvetia canaliculata*, on a rocky shore.

The researchers marked out a 0.5 m^2 area just above the low water mark and the percentage cover of each species was recorded. The percentage cover is the percentage of the 0.5 m^2 area which is occupied by each species. This process was repeated at 2 metre intervals, from the low water mark to the top of the shore.

The results are shown in Table 1.1.

Table 1.1

distance from low water mark / m	percentage cover of <i>A. nodosum</i>	percentage cover of <i>P. canaliculata</i>
0	80	0
2	90	0
4	100	0
6	70	0
8	65	0
10	70	0
12	90	0
14	80	0
16	70	0
18	0	0
20	0	45
22	0	80
24	0	70
26	0	20
28	0	0

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Use

(a) Using the data in Table 1.1, compare the distribution of these two species of algae.

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.....[3]

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

P. canaliculata is more resistant to drying out than *A. nodosum*.

(i) Explain how the data in Table 1.1 support this hypothesis.

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..... [2]

(ii) Outline a **laboratory-based** experiment that the researchers could carry out to investigate whether *P. canaliculata* dries out more slowly than *A. nodosum*.

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

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(c) Suggest **two** environmental factors, other than temperature and exposure, that could influence the distribution of these two algae.

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2

[2]

[Total: 12]

- 2 (a) In an investigation, the concentration of sodium chloride was measured in six samples of water taken from the surface of an estuary.

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The results are shown in Table 2.1.

Table 2.1

sample	concentration of sodium chloride / moles per dm^3
1	0.37
2	0.15
3	0.30
4	0.21
5	0.46
6	0.25

- (i) Calculate the mean concentration of sodium chloride in these samples.

Show your working.

[2]

- (ii) Suggest reasons for the differences between the measured concentrations of these six samples.

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- (b) In another investigation, the salinity of water was measured at different depths in an estuary.

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The results are shown in Fig. 2.1.

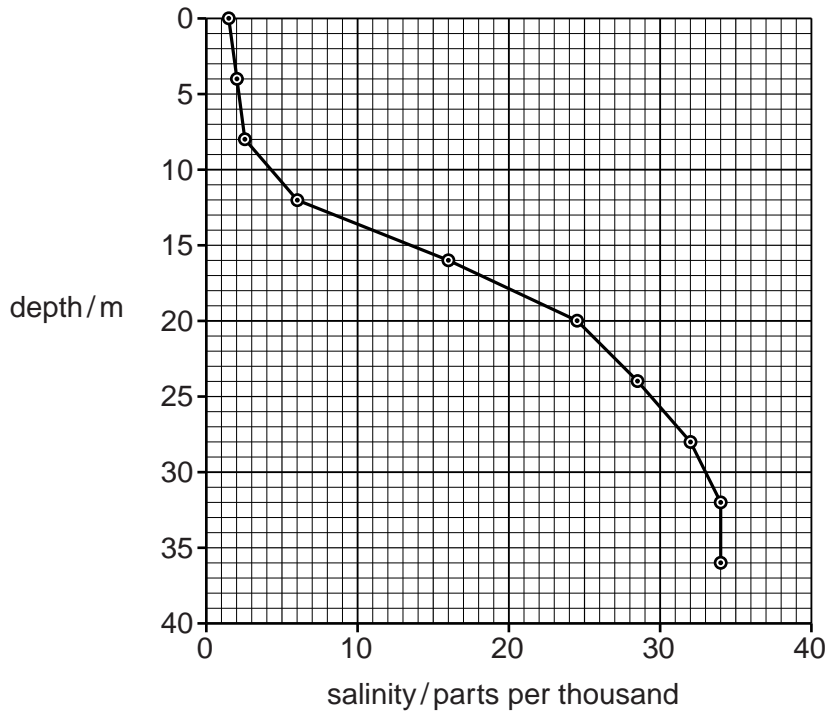


Fig. 2.1

- (i) Describe the relationship between salinity and depth, as shown by Fig. 2.1.

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 [2]

- (ii) Suggest an explanation for this relationship.

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 [2]

[Total: 8]

4 (a) Explain what is meant by each of the following terms used in ecology.

(i) consumer

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..... [2]

(ii) productivity

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(b) Describe the biological uses of carbon and calcium in marine ecosystems.

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