



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

CANDIDATE  
NAME

CENTRE  
NUMBER

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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	
<b>1</b>	
<b>2</b>	
<b>3</b>	
<b>4</b>	
<b>Total</b>	

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  $0.5\text{ m}^2$  area just above the low water mark and the percentage cover of each species was recorded. The percentage cover is the percentage of the  $0.5\text{ m}^2$  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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(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]

[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 <sup>3</sup>
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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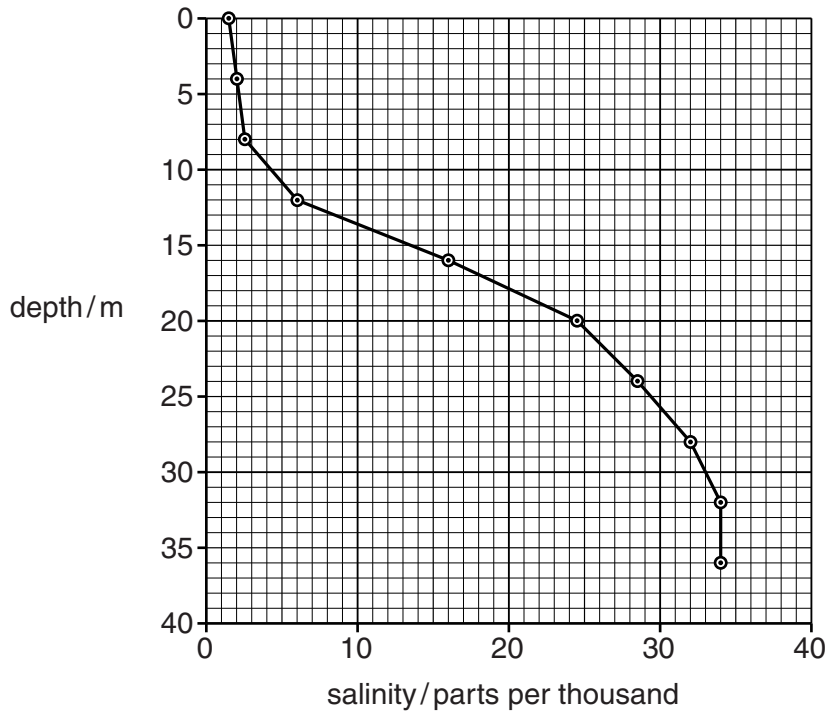
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- (b) In another investigation, the salinity of water was measured at different depths in an estuary.

For  
Examiner's  
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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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[Total: 8]







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

(i) consumer

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(ii) productivity

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

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