

Cambridge
International
AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

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MARINE SCIENCE

9693/02

Paper 2 AS Data-Handling and Free-Response

May/June 2015

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 an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO **NOT** WRITE IN ANY BARCODES.

Section A

Answer **both** questions in this section.

Write your answers in the spaces provided on the Question Paper.

Section B

Answer **both** questions in this section.

Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

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.

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

Section A

Answer **both** questions in this section.

- 1 Dog whelks (*Nucella* sp.) are molluscs found commonly on rocky shores. They adhere to the surface of a rock by means of a muscular foot.

Dog whelks are predators, feeding on other species of molluscs and on barnacles.

- (a) With reference to dog whelks, explain what is meant by the term *niche*.

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..... [2]

- (b) The shape of the shell of dog whelks varies and can be investigated by determining the length:aperture ratio. This is found by dividing the overall length of the shell (**L**) by the length of the aperture (**Ap**). These measurements are shown in Fig. 1.1.

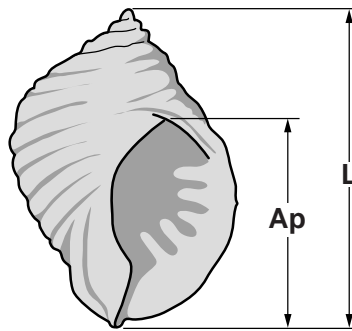


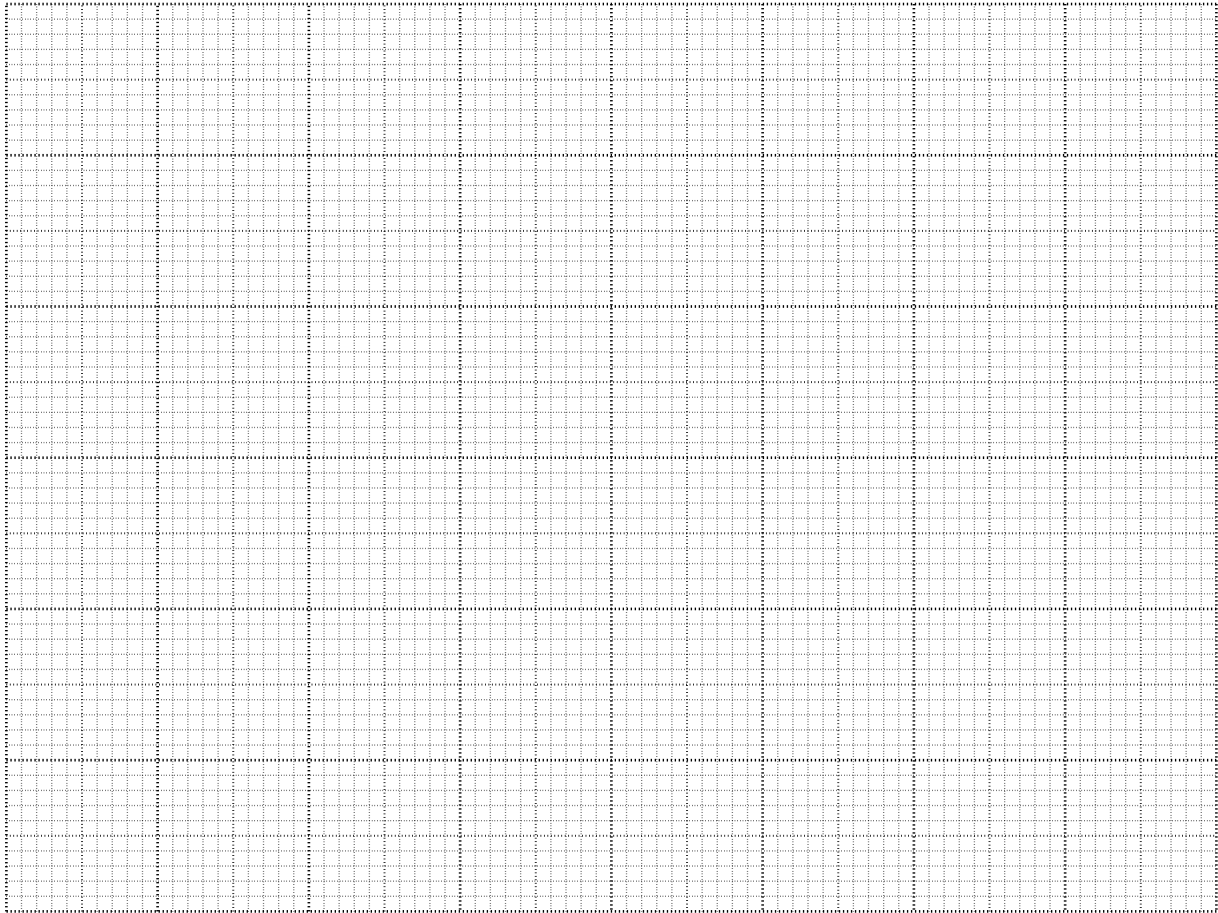
Fig. 1.1

An investigation was carried out into the relationship between the length:aperture ratio of dog whelks and the degree of exposure of the rocky shore. The exposure was assessed according to a scale from 1 to 8, where 1 is extremely exposed and 8 is extremely sheltered. Table 1.1 shows the results of this investigation.

Table 1.1

exposure of shore	mean length:aperture ratio
1	1.24
2	1.27
3	1.31
4	1.33
5	1.38
6	1.41
7	1.44
8	1.46

- (i) On the grid below, plot a graph to show the relationship between the exposure of the shore and the mean length : aperture ratio. Draw a line of best fit through the points.



[4]

- (ii) Describe the relationship between the exposure of the shore and the mean length : aperture ratio.

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..... [2]

- (iii) Suggest an explanation for this relationship.

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..... [2]

(c) The rate of feeding of dog whelks is influenced by temperature.

Describe a **laboratory-based** experiment you could carry out to investigate the effect of temperature on the rate of feeding of dog whelks on barnacles.

Your answer should include references to the control of variables and the collection of quantitative data.

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[Total: 15]

Question 2 begins on page 6

- 2 An investigation was carried out into the relationship between depth and the salinity of water in an estuary.

For each depth, the salinity was measured at five different sites.

The results are shown in Table 2.1.

Table 2.1

depth / m	salinity / parts per thousand					
	site 1	site 2	site 3	site 4	site 5	mean
2	21.2	22.0	19.8	20.3	21.4	
4	22.2	22.6	22.3	22.4	21.9	22.28
6	23.2	23.8	22.5	23.1	22.8	23.08
8	27.6	27.3	27.7	28.1	28.0	27.74
10	29.3	28.7	29.1	29.2	29.4	29.14
12	30.0	29.3	31.1	29.8	30.2	30.08

- (a) Complete Table 2.1 by calculating the mean salinity at a depth of 2 m.

[1]

- (b) (i) Using the information in Table 2.1, describe the relationship between depth and salinity.

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..... [2]

(ii) Suggest an explanation for this relationship.

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..... [2]

[Total: 5]

Section B

Answer **both** questions in this section.

3 (a) State **one** biological use of each of the following nutrients in marine ecosystems.

(i) nitrogen

..... [1]

(ii) magnesium

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(iii) phosphorus

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(b) Suggest why an increase in the concentration of carbon dioxide in the atmosphere could result in an increase in the productivity of consumers in a marine ecosystem.

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4 (a) Explain the meaning of each of the following terms used in ecology.
Give **one** example of each from the marine environment.

(i) *population*

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..... [3]

(ii) *producer*

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(b) Explain how environmental factors influence the ecological communities on a sandy shore.

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(c) Discuss the reasons why coral reefs contain narrow ecological niches.

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[Total: 15]

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