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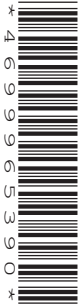
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MARINE SCIENCE

9693/02

Paper 2 AS Data-Handling and Free-Response

October/November 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 Limpets (*Patella vulgata*) and periwinkles (*Littorina littorea*) are two species of mollusc found on rocky shores.

Fig. 1.1 shows limpets, which feed on producers growing on the surface of rocks.

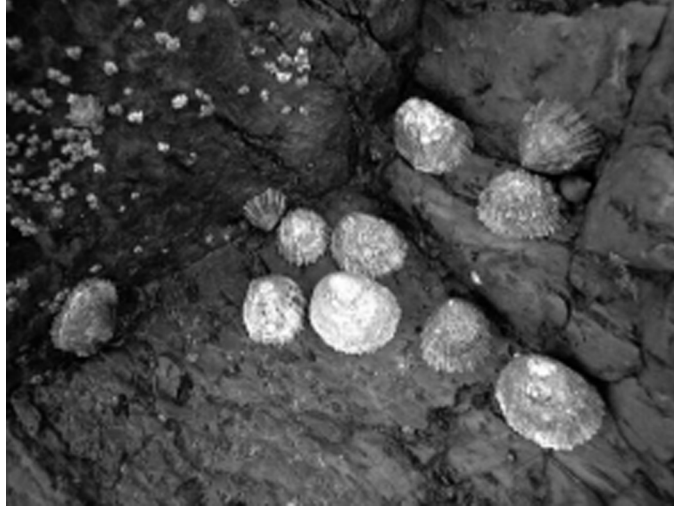


Fig. 1.1

- (a) State the trophic level occupied by limpets. Give an explanation for your answer.

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.....[2]

- (b) An investigation was carried out into the distribution of limpets and periwinkles on a rocky shore. A quadrat measuring 0.5m × 0.5m was used.

The numbers of these molluscs per quadrat were counted every two metres 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	number of limpets per quadrat	number of periwinkles per quadrat
0	0	0
2	0	4
4	0	3
6	0	2
8	0	3
10	0	2
12	0	3
14	3	2
16	6	1
18	10	0
20	13	0
22	2	0
24	1	0
26	0	0
28	0	0
30	0	0

- (i) Using the data in Table 1.1, compare the distribution of these two species of mollusc.

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.....[3]

(ii) Suggest **three** environmental factors that could influence the distribution of these molluscs on a rocky shore.

1

2

3[3]

(c) In a second investigation, a student measured the heights of the shells of 12 limpets on an exposed rocky shore. They then measured the heights of 12 limpets on a sheltered rocky shore.

Their results are shown in Table 1.2.

Table 1.2

height of limpet shell/mm	
exposed shore	sheltered shore
19	15
33	19
23	17
16	18
18	12
20	18
19	23
22	18
27	15
26	18
22	10
27	14
mean =	mean =

(i) Complete Table 1.2 by calculating the mean height of the shells on the exposed shore and on the sheltered shore. [2]

(ii) Formulate a hypothesis based on the data in Table 1.2.

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[1]

[Total: 11]

Question 2 starts on page 6

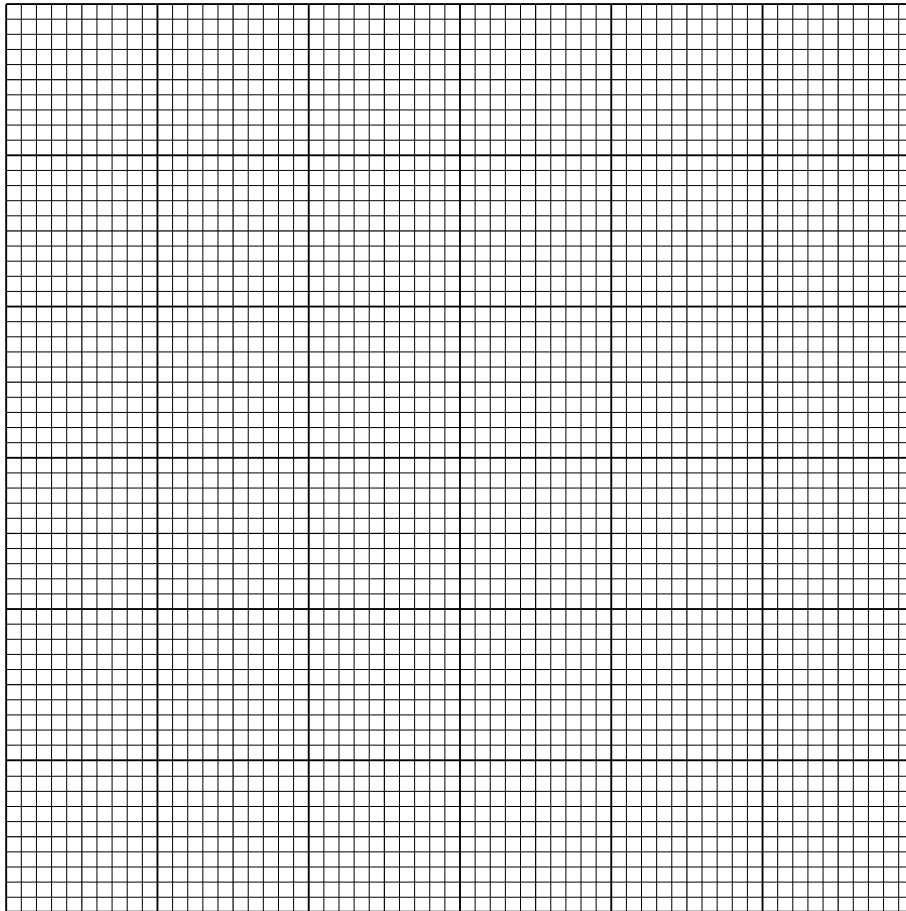
- 2 The concentration of phosphorus was measured in samples of sea water from six different depths, in an area of upwelling in the Atlantic Ocean. The phosphorus was in the form of phosphate ions.

Table 2.1 shows the results.

Table 2.1

depth/m	concentration of phosphorus /$\mu\text{mol dm}^{-3}$
250	3.0
500	2.2
1000	1.6
1500	1.4
2000	1.2
2500	1.2

- (a) Plot a graph of the data in Table 2.1. Join the points on your graph with straight lines.



[4]

(b) Describe the relationship between depth and the concentration of phosphorus.

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(c) Suggest what effect this upwelling would have on the productivity of producers in the surface water. Give an explanation for your answer.

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.....[2]

[Total: 9]

4 (a) Explain the meaning of each of the following terms used in ecology.

(i) *habitat*

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.....[1]

(ii) *community*

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.....[2]

(b) Striped bass are predators of other species of fish, including herring.

Explain how the populations of striped bass and herring may be interrelated.

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.....[4]

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