

CANDIDATE  
NAME

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CENTRE  
NUMBER

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**MARINE SCIENCE**

**9693/02**

Paper 2 AS Data-Handling and Free-Response

**October/November 2018**

**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 **10** printed pages and **2** blank pages.



**Section A**

Answer **both** questions in this section.

1 The cold-water coral species, *Lophelia pertusa*, lives at depths of between 39 m and 3000 m.

(a) Many species of coral are coloured, but *L. pertusa* is white.

With reference to the information provided, suggest why *L. pertusa* is white.

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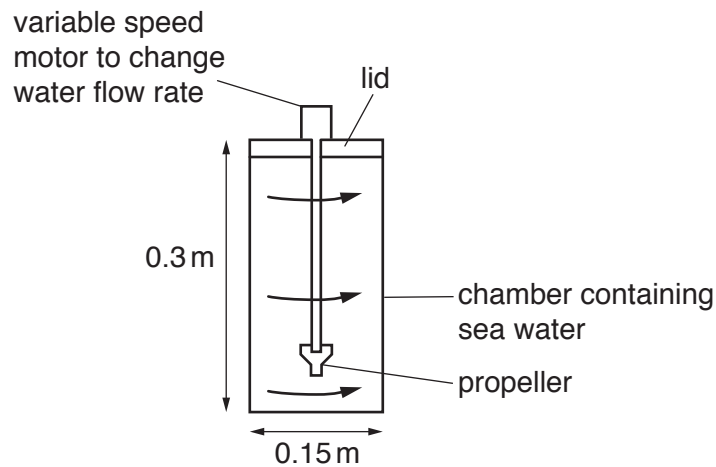
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..... [3]

(b) Scientists carried out an investigation into the effect of rate of flow of water on food capture by *L. pertusa*.

The apparatus used is shown in Fig. 1.1.



**Fig. 1.1**

Specimens of *L. pertusa* were placed into the chamber and left to settle for one hour. A known mass of zooplankton was then added to the chamber and a water flow rate set. The mass of zooplankton removed by the coral per hour was measured. This was recorded as the capture rate.

This was repeated at different flow rates.

The experiment was then repeated using phytoplankton instead of zooplankton.

The results are shown in Table 1.1.

**Table 1.1**

<b>flow rate</b>	<b>capture rate / mg zooplankton removed per hour</b>	<b>capture rate / mg phytoplankton removed per hour</b>
slow	24	21
medium	19	63
fast	11	0

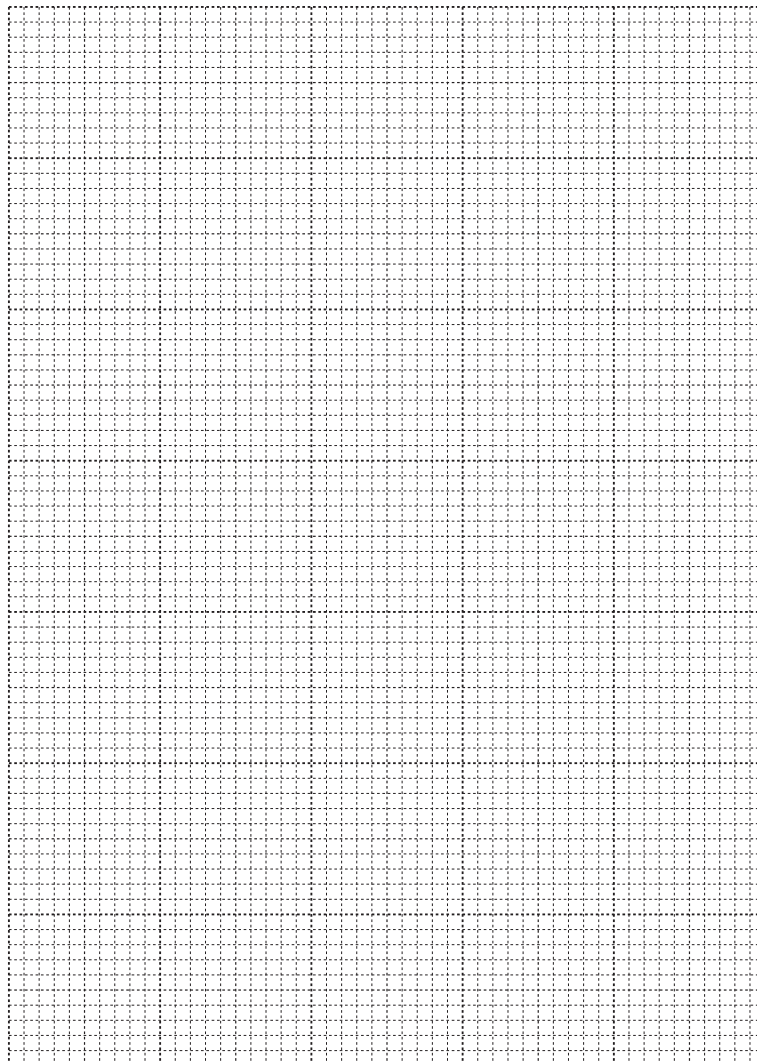
(i) Suggest **two** properties of the sea water that need to be kept constant in this experiment.

1 .....

2 .....

[2]

(ii) On the grid below, draw a bar chart to show the results from Table 1.1.



[4]

(iii) Write a hypothesis based on the results of this investigation.

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(iv) Predict the flow rate at which this species of coral would grow fastest.

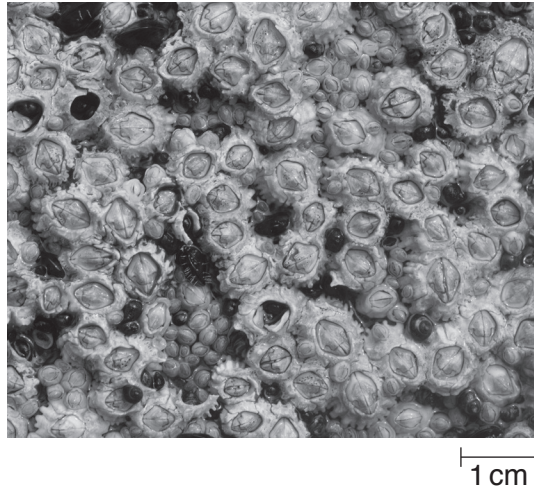
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Give a reason for your answer.

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..... [1]

[Total: 11]

- 2 Fig. 2.1 shows a settlement of acorn barnacles, *Semibalanus balanoides*, on a rocky shore.



**Fig. 2.1**

A student decided to look at the distribution of three different barnacle species on a rocky shore. The results of this investigation are shown in Table 2.1.

**Table 2.1**

distance above low water spring tide line / m	number of barnacles per unit area		
	species 1	species 2	species 3
0	0	98	13
2	1	42	49
4	6	3	87
6	49	0	63
8	91	0	15
10	84	0	5

- (a) Describe an experimental procedure the student could use to carry out this investigation.

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(b) Use the data in Table 2.1 to determine where the greatest biodiversity of barnacles is found.

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[1]

(c) Use the data in Table 2.1 to compare the distribution of the three barnacle species.

Suggest reasons for the differences in distribution.

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[Total: 9]







4 (a) Hydrothermal vent communities are areas of higher productivity than the surrounding areas.

(i) State the meaning of the term *community*.

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..... [2]

(ii) Describe how hydrothermal vents are formed.

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- (b) At hydrothermal vents, there is a mutualistic relationship between hydrothermal vent bacteria and tubeworms. Tropical coral polyps and zooxanthellae also have a mutualistic relationship.

Discuss the similarities and differences between these two relationships.

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differences .....

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[8]

[Total: 15]

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