



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

**May/June 2012**

**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.

For Examiner's Use	
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<b>Total</b>	

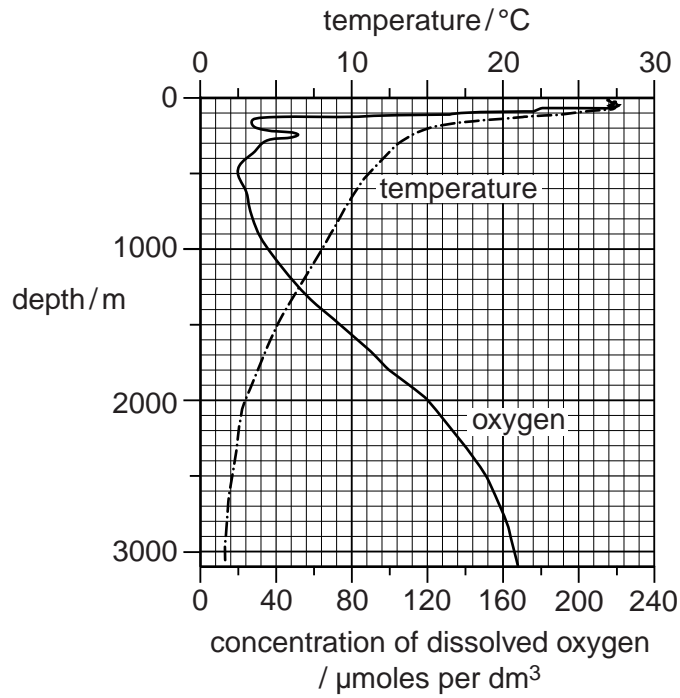
This document consists of **10** printed pages and **2** blank pages.



## Section A

Answer **both** questions in this section.

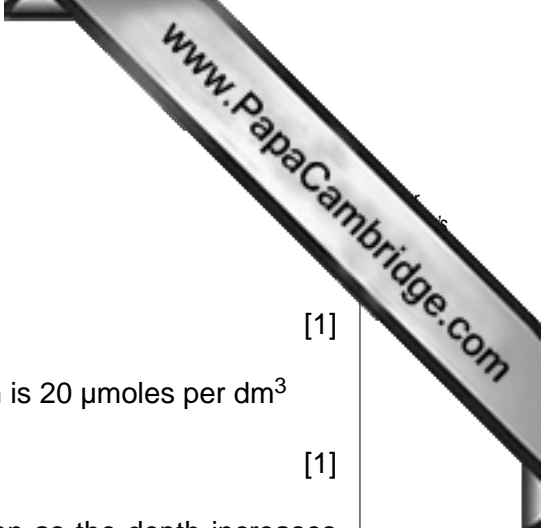
- 1 Fig. 1.1 shows how the temperature and the concentration of dissolved oxygen vary with depth in the Arabian Sea.



**Fig. 1.1**

- (a) State the term used to describe the region in which the gradient of temperature change is greatest.

..... [1]



(b) Use Fig. 1.1 to find each of the following.

(i) the temperature at a depth of 1000 m

..... [1]

(ii) the depth at which the concentration of dissolved oxygen is 20  $\mu\text{mol dm}^{-3}$

..... [1]

(c) Describe the change in the concentration of dissolved oxygen as the depth increases from 0 m to 100 m. Suggest an explanation for this change.

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..... [3]

[Total: 6]

- 2 An investigation was carried out into the abundance of two organisms living in the mud of an estuary, *Nereis* (a species of worm) and *Hydrobia* (a species of mollusc).

The numbers of each species were counted in ten 0.25 m<sup>2</sup> sample areas, numbered 1 to 10. The numbers per m<sup>2</sup> were then calculated.

The results are shown in Table 2.1.

**Table 2.1**

sample area	1	2	3	4	5	6	7	8	9	10
number of <i>Nereis</i> in 1 m <sup>2</sup>	240	600	2000	1700	800	1100	720	260	30	0
number of <i>Hydrobia</i> in 1 m <sup>2</sup>	0	1200	2500	1100	2600	1200	5600	10 100	18 100	50

- (a) Explain what is meant by the term *estuary*.

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..... [2]

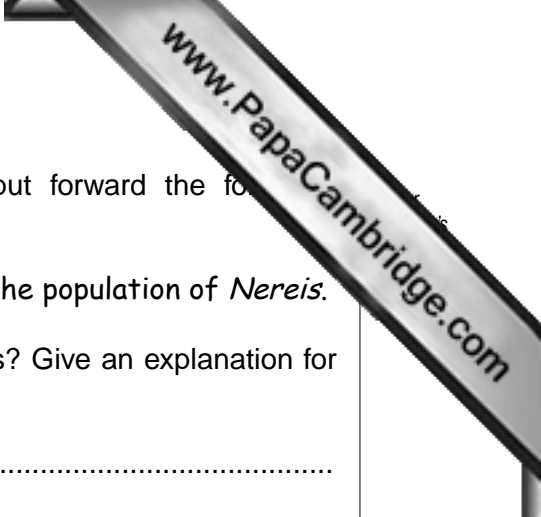
- (b) Calculate the mean numbers per m<sup>2</sup> for each species.

- (i) *Nereis*

..... [1]

- (ii) *Hydrobia*

..... [1]



(c) Using the results of this investigation, the researchers put forward the following hypothesis.

The population of *Hydrobia* in an estuary is greater than the population of *Nereis*.

Do the experimental results support or refute this hypothesis? Give an explanation for your answer.

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..... [3]

(d) Suggest **three** environmental factors that could affect the numbers of *Hydrobia* and *Nereis* per m<sup>2</sup> in an estuary.

1 .....

2 .....

3 ..... [3]

- (e) In a further investigation, the researchers counted the numbers of *Hydrobia* and the mean numbers of *Corophium* (a small shrimp-like organism) living together in the same area. *Corophium* lives in the upper layer of mud in estuaries and feeds on plankton.

The results are shown in Table 2.2.

**Table 2.2**

numbers of <i>Corophium</i> per 0.01 m <sup>2</sup>	mean number of <i>Hydrobia</i> per 0.01 m <sup>2</sup>
1 – 10	110
11 – 20	90
21 – 30	45
31 – 40	19
41 – 50	8
51 – 60	2
61 – 70	0
71 – 80	0
81 – 90	0
91 – 100	0

- (i) Using the information in Table 2.2, describe the relationship between the numbers of *Corophium* and the mean numbers of *Hydrobia*.

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 ..... [2]

- (ii) Suggest an explanation for the relationship you have described.

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 .....  
 ..... [2]

[Total: 14]

Turn over for Section B

**Section B**

Answer **both** questions in this section.



- 3 (a) Explain how the alignment of the Sun and the Moon affect the tidal range.

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[7]

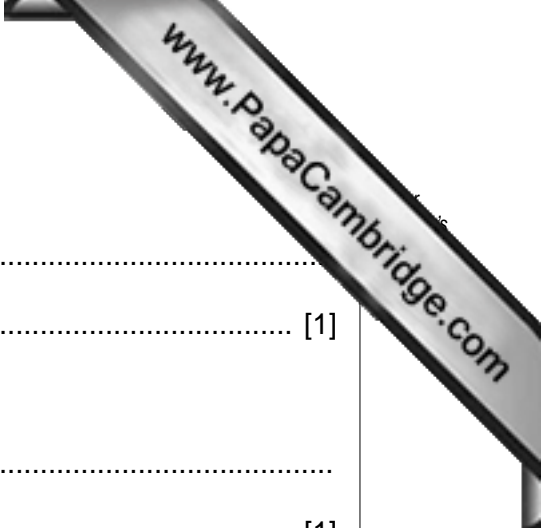
- (b) Suggest what effect each of the following would have on the tidal range.

- (i) a decrease in wind speed

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[1]





(ii) an increase in atmospheric pressure

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..... [1]

(iii) an increase in the size of a body of water.

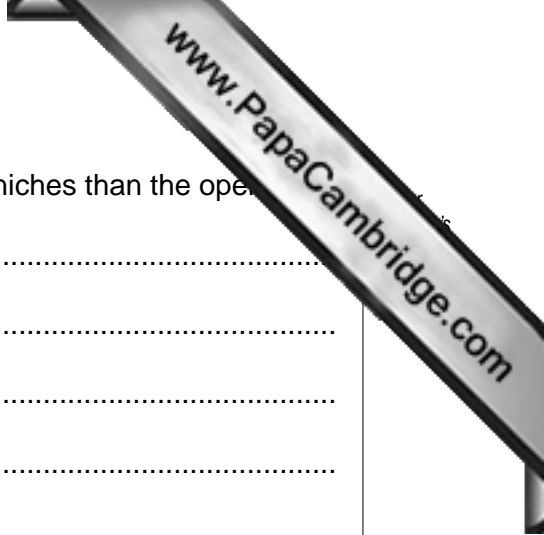
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..... [1]

(c) Explain how wind and the shape of the sea bed produce ocean currents and upwelling.

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[Total: 15]





(c) Suggest why coral reefs tend to contain narrower ecological niches than the open ocean.

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..... [5]

[Total: 15]

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*Copyright Acknowledgements:*

Question 1 © [http://www.nio.org/index/option/com\\_nomenu/task/show/tid/85/sid/92/id/176](http://www.nio.org/index/option/com_nomenu/task/show/tid/85/sid/92/id/176).

Question 2 © *The Ecology of a Mud-Flat*; [http://sabella.mba.ac.uk/1154/01/A\\_preliminary\\_study\\_of\\_the\\_ecology\\_of\\_a\\_mud-flat.pdf](http://sabella.mba.ac.uk/1154/01/A_preliminary_study_of_the_ecology_of_a_mud-flat.pdf).

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