



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

CANDIDATE
NAME

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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	
1	
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Total	

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



Section A

Answer **both** questions in this section.

For
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Use

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

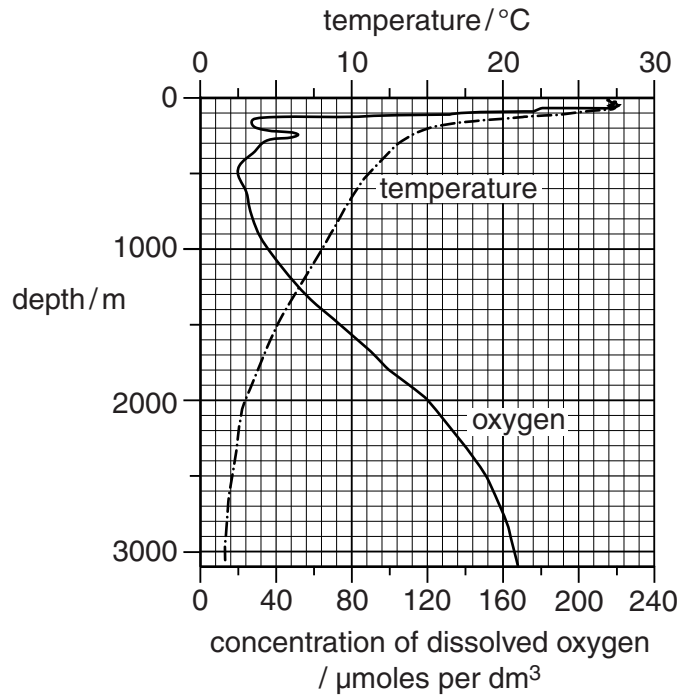


Fig. 1.1

- (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 $\mu\text{mol dm}^{-3}$

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[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 m² sample areas, numbered 1 to 10. The numbers per m² 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 ²	240	600	2000	1700	800	1100	720	260	30	0
number of <i>Hydrobia</i> in 1 m ²	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 m² 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 m² in an estuary.

1
2
3 [3]

- (e) In a further investigation, the researchers counted the numbers of *Hydrobia* and the 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.

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The results are shown in Table 2.2.

Table 2.2

numbers of <i>Corophium</i> per 0.01 m ²	mean number of <i>Hydrobia</i> per 0.01 m ²
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]

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Turn over for Section B

Section B

Answer **both** questions in this section.

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

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

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[Total: 15]

4 (a) Give **one** example of each of the following marine environments.

(i) stable and not extreme

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(ii) unstable

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(iii) extreme

..... [1]

(b) Explain why extreme and unstable marine environments tend to have a relatively low biodiversity.

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

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..... [5]

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[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.

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.

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