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

CANDIDATE NAME

CENTRE NUMBER | | | | | |

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2315971254

MARINE SCIENCE **9693/02**

Paper 2 AS Data Handling and Free Response **October/November 2011**

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.

Section A
Answer **all** questions.
Write your answers in the spaces provided on the question paper.

Section B
Answer **all** questions.
Write your answers on the lined pages provided.

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.

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1	
2	
3	
4	
Total	

This document consists of **6** printed pages and **6** lined pages.

UNIVERSITY of CAMBRIDGE International Examinations

Section A

Answer **all** questions.

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1 The ocean floor surrounding hydrothermal vents is colonised by a range of animals including tubeworms and molluscs. Tubeworms quickly colonise hydrothermal vents, followed by animals such as mussels and other species of worms. Tubeworms contain chemosynthetic bacteria.

(a) Describe the properties of sea water in a hydrothermal vent.

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..... [3]

(b) Researchers carried out an investigation into colonisation around a hydrothermal vent. The researchers investigated the effect of the mussel *Bathiomodiolus thermophilus* on the colonisation of a vent by the tube worm *Riftia pachyptila*.

The researchers put forward the following hypothesis:

The presence of *Bathiomodiolus thermophilus* prevents colonisation by the tube worm *Riftia pachyptila*.

The stages in this investigation were

- the area around a hydrothermal vent in the East Pacific Rise was cleared of the animal community
- about 200 individual mussels, *Bathiomodiolus thermophilus*, were placed in the cleared area
- the area was left for one year
- the number of each species of animal was then recorded
- the biomass of each species was also recorded.

The results of this investigation are shown in Table 1.1.

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Table 1.1

species	number of individuals	total biomass / g
Riftia pachyptila (tubeworm)	650	3250.00
Tevnia jerichonona (tubeworm)	23	0.14
Bathiomodiolus thermophilus (mussel)	6	0.23
Nereis sandersi (worm)	2	0.27

(i) Calculate the mean biomass of *Riftia pachyptila*.
Show your working.

mean biomass ..... [2]

(ii) Use the information in Table 1.1 to describe the composition of this community.

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..... [3]

(iii) State whether the results of this investigation support the hypothesis that the presence of *Bathiomodiolus thermophilus* prevents colonisation by the tubeworm *Riftia pachyptila*.

Give an explanation for your answer.

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..... [3]

(c) The researchers also measured the tube length and the percentage of the tube occupied by individual tube worms, *Riftia pachyptila*.

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The results are shown in Fig. 1.1.

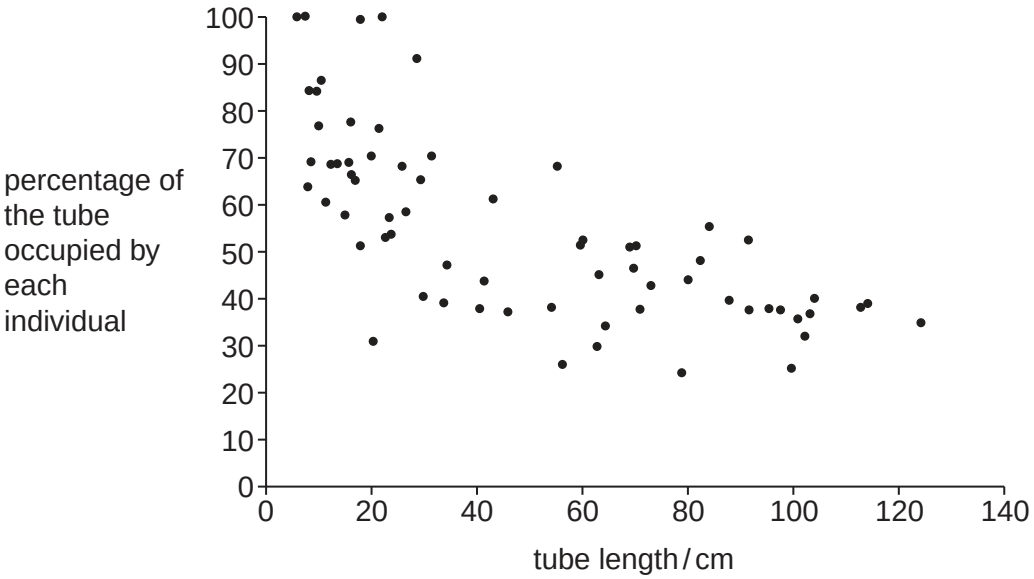

Fig. 1.1

Using the information in Fig. 1.1, suggest why using tube length may not be a reliable way of measuring the growth of *Riftia pachyptila*.

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..... [2]

[Total: 13]

2 An estuary is formed where a river flows into the sea.

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Fig. 2.1 shows part of the Estuary of St. Lawrence in northern Canada. The figures give the surface water salinities.

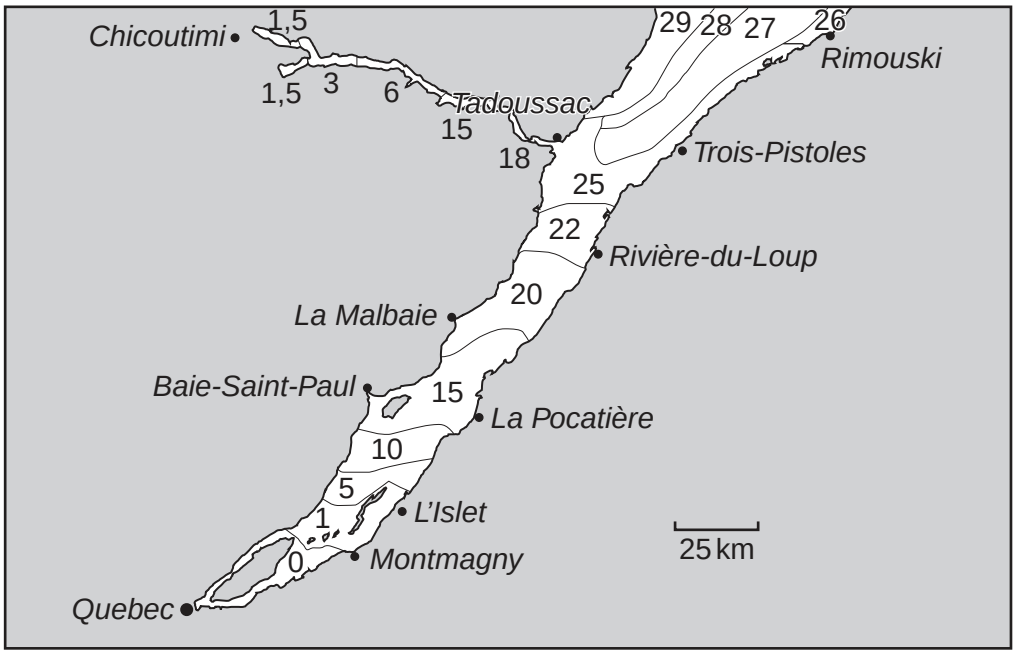

Fig. 2.1

(a) **(i)** With reference to Fig. 2.1, describe how the surface salinity changes as the distance away from Quebec increases.

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..... [2]

(ii) Suggest explanations for the changes you have described.

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..... [3]

(b) Suggest why, in an estuary, the salinity of the water usually increases as the depth increases.

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..... [2]

[Total: 7]

Section B

Answer **all** questions in this section on the lined pages provided.

3 **(a)** Describe the conditions required for the growth of warm water corals and for the formation of a coral reef. [5]

(b) Explain how carbon dating can provide evidence for the growth of coral reefs. [6]

(c) Suggest how coral reefs can provide evidence for changes in sea level. [4]

4 **(a)** State what is meant by the term *cyclone* and describe the factors required for the development of a tropical cyclone. [6]

(b) Describe the causes of El Niño events in the Pacific Ocean. [5]

(c) Suggest why El Niño events affect fish catches in the Pacific Ocean. [4]

[Total: 30]

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