



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

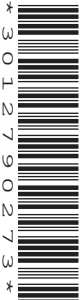
CANDIDATE  
NAME

CENTRE  
NUMBER

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**MARINE SCIENCE**

**9693/04**

Data-Handling and Free-Response

**May/June 2010**

Paper 4

**1 hour 15 minutes**

Candidates answer Section A on the Question Paper.

Additional Materials: Answer Booklet/Paper

**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 on both sides of the paper.  
 You may use a soft pencil for any diagrams, graphs or rough working.  
 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.

**Section A**

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

**Section B**

Answer **all** questions.  
 Answer the questions on the separate answer paper provided.

For Examiner's Use	
1	
2	
3	
4	
<b>Total</b>	

This document consists of 7 printed pages and 1 blank page.



## Section A

Answer **both** questions in this section

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- 1 The amount of light, of a particular wavelength, that a pigment absorbs can be measured. It is possible to plot a graph to show how much light is absorbed at different wavelengths. This is called the absorption spectrum.

Fig. 1.1 shows the absorption spectra of two pigments, chlorophyll a and fucoxanthin, found in marine algae.

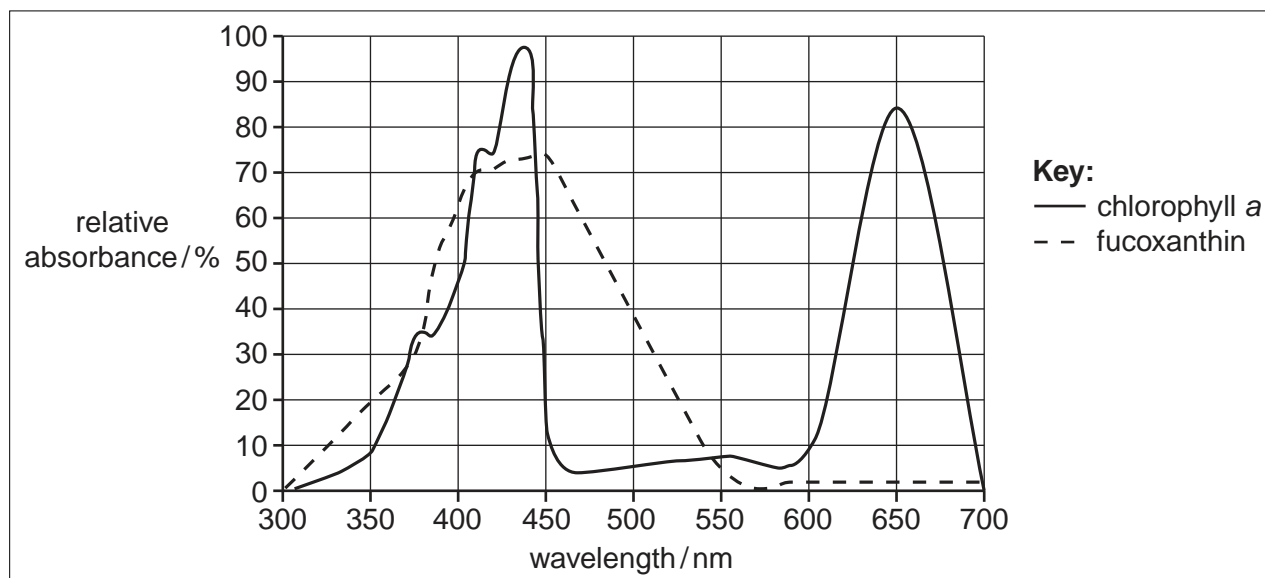


Fig. 1.1

- (a) (i) Describe the absorption spectrum for chlorophyll a shown in Fig 1.1.

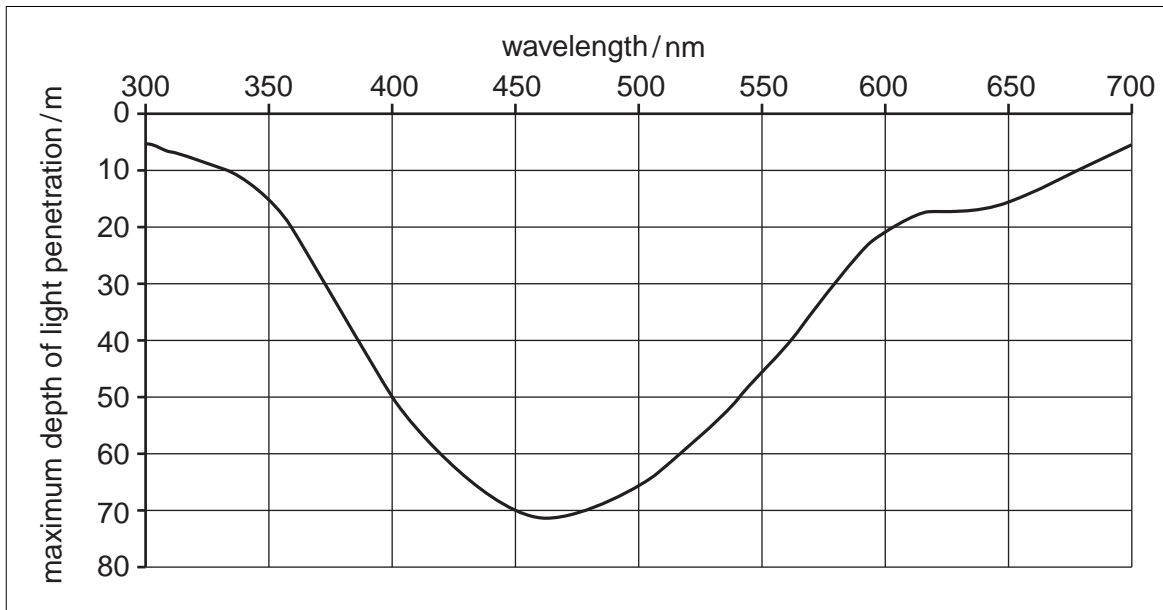
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 ..... [2]

- (ii) Describe **two** differences between the absorption spectra of fucoxanthin and chlorophyll a.

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- (b) Fig. 1.2 shows the maximum depth that light of different wavelengths penetrates through sea water off the west coast of Chile.

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**Fig. 1.2**

Suggest why green algae are found mainly near the surface of the water.

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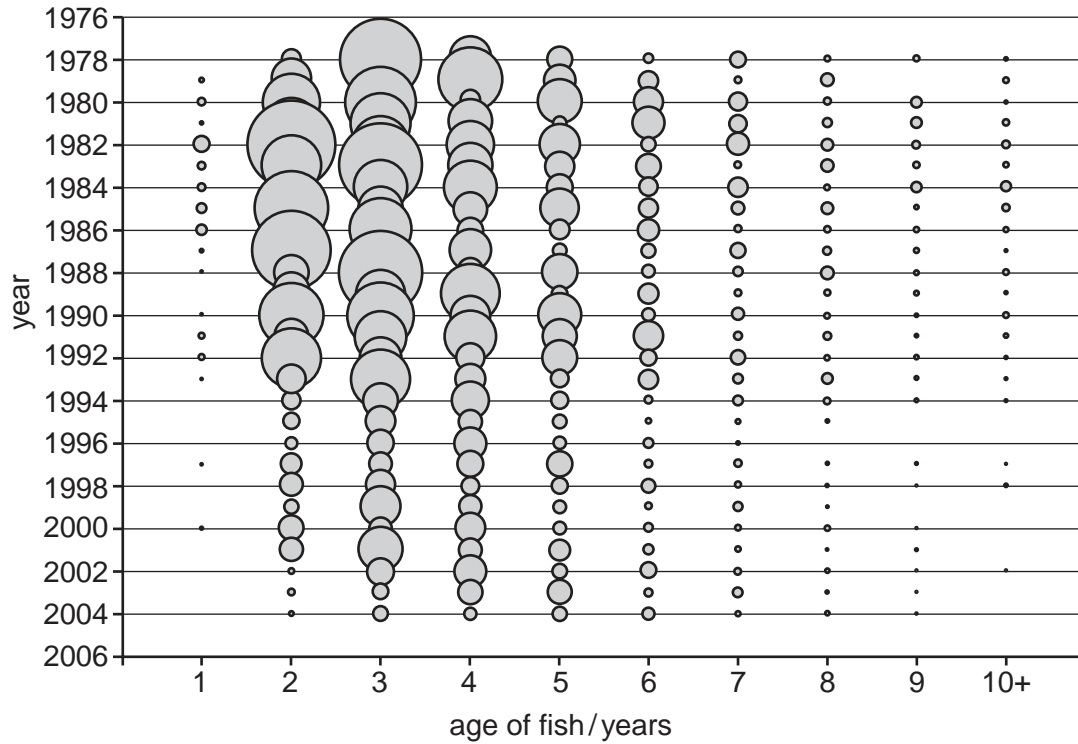
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..... [2]



- 2 Fig. 2.1 shows the age of Georges Bank Atlantic cod commercial landings over the period of 1978–2004. The width of each circle represents the size of the catch at a particular age.



**Fig. 2.1**

- (a) Describe the general trends in catches between 1978–2004.

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 ..... [2]

- (b) Using the data in Fig. 2.1 predict what will happen to cod stocks from 2004 and beyond. Explain your predictions.

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 ..... [3]

- (c) Table 2.1 shows the total international catches of North Sea cod for the period 1981–1991.

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**Table 2.1**

<b>year</b>	<b>Total cod catch / 1000 tonnes</b>
1981	325
1982	300
1983	260
1984	225
1985	210
1986	200
1987	210
1988	195
1989	150
1990	130
1991	110

Calculate the percentage decrease of total cod catch for the entire 10 year period 1981–1991. Show all working.

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..... [2]

- (d) Suggest which fishing methods could be used to prevent the overfishing of the Georges Bank Atlantic cod, and how these methods could impact on the fishing towns of the area.

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..... [4]

**[Total: 11]**

**Section B**

Answer **all** questions in this section.

- 3 (a) Describe the life cycle of the salmon stating the habitats for each stage. [7]
- (b) Discuss the advantages and disadvantages of internal and external fertilisation in marine organisms. [3]
- (c) Describe the care of the offspring of tuna and whale and in each case explain how maximal survival of the offspring is achieved. [5]
- 4 (a) State what is meant by *intensive* and *extensive* aquaculture. [2]
- (b) Name one marine species that is produced by aquaculture and describe the requirements for a successful and sustainable aquaculture venture. [6]
- (c) Suggest the likely impacts that aquaculture could have on local ecosystems and human populations. Discuss the steps that could be taken to minimise the impact. [7]

**[Total: 30]**

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*Copyright Acknowledgements:*

Question 2 Figure 2.1 © Graph of Georges Bank cod commercial landings by age between 1974-2004; <http://www.nefsc.noaa.gov/sos/spsyn/pg/cod/>

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