

### **Cambridge International Examinations**

Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME				
CENTRE NUMBER		CANDIDA NUMBER		

MARINE SCIENCE 9693/04

Paper 4 A2 Data-Handling and Free-Response

May/June 2015
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.



## **Section A**

## Answer both questions in this section.

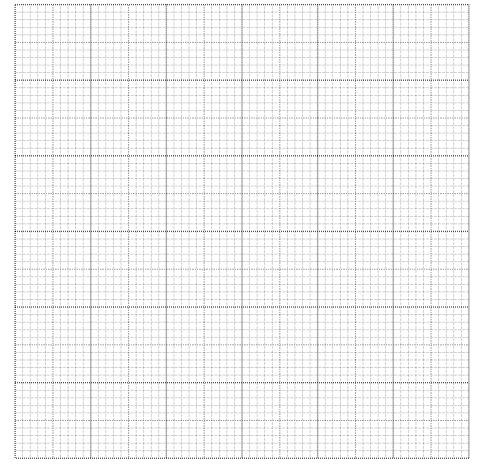
1 Mangrove forests in intertidal zones are considered to be areas of high ecological importance. A long term survey was carried out to investigate the change in area covered by mangroves in the Mekong Delta in Vietnam. The catch per unit effort of local fisheries in the same area was also determined.

Catch per unit effort is defined as the annual catch divided by the number of boat days.

Table 1.1

year	area of mangrove forest in Mekong Delta /hectares ×1000	catch per unit effort /tonnes per boat day
1978	72	3.0
1982	85	3.1
1986	76	2.9
1990	60	2.6
1994	63	1.0
1998	69	1.2

(a) On the grid below, plot a graph of the data in Table 1.1.



(b)	Mangrove forests are known to act as nursery grounds for fish and other animals. Efforts are being made in many areas to replant them in order to increase fish stocks.
	Using Table 1.1 and your graph, evaluate the proposals to replant mangrove forests in order to increase fish stocks.
	[1]

(c)	The Eritrean government has recently begun planting mangroves around coastal regions of
	the Red Sea where there have never previously been mangrove forests. This is reportedly
	increasing stocks of commercial fish and crustaceans such as shrimps. In these areas there
	is a high level of human poverty and malnutrition.

Discuss the possible benefits and disadvantages of the planting of these mangrove forests in Eritrea.
[4]

[Total: 13]

2 An investigation was carried out into the sizes of the eggs of different species of fish. The mean diameters of eggs were measured and the surface area to volume ratios calculated. The results are shown in Table 2.1.

Table 2.1

fish species	egg diameter/mm	surface area:volume ratio of egg
sun bass	1.25	4.80
Baltic herring	1.30	4.62
bream	1.64	3.66
whitefish	1.78	3.37
kutum	2.61	
rainbow trout	4.90	1.22
brown trout	5.01	1.20

(a)	Using the formulae below, calculate the surface area: volume ratio of the egg of the kutum.
	Show your working.
	surface area of sphere = $4 \pi r^2$
	volume of a sphere = $\frac{4}{3}\pi r^3$
	surface area: volume ratio =[2]
(b)	Describe how increasing egg diameter affects the surface area:volume ratio of the eggs.
	[1]
(c)	Rainbow trout and brown trout eggs require clean, running water with a high oxygen concentration to survive. Using Table 2.1 and your own knowledge, suggest and explain reasons for this.
	[2]

(d) Fish eggs consist of several parts including a yolk sac, perivitelline space and embryo as shown in Fig. 2.1.

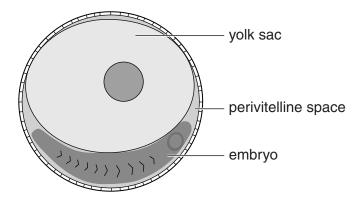


Fig. 2.1

A further investigation was carried out into the relative space in the egg taken up by the yolk sac and by the perivitelline space. The results are shown in Fig. 2.2.

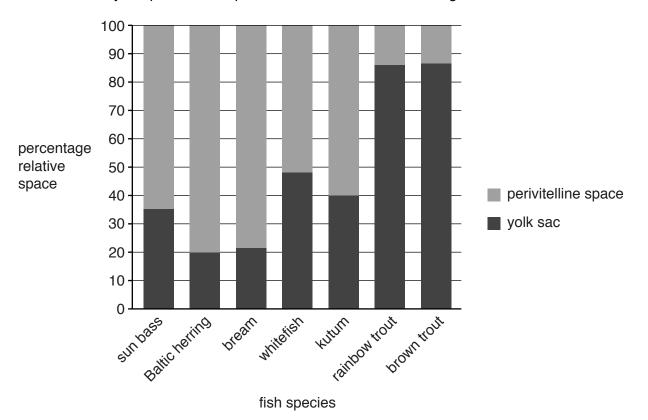


Fig. 2.2

The yolk sac contains nutrients that the fish uses during embryonic development and the first few days of free swimming life.

Suggest and explain one factor that may affect the size of the yolk sac that the different

species possess.			

[Total: 7]

# **Section B**

Answer **both** questions in this section.

3	(a)	(i)	Describe how salmon can be genetically modified to grow faster.

(11)	Discuss the				
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4	(a)	Discuss the arguments for and against the desirability of conserving a marine species.

)	Outline the methods that may be employed by fisheries m sustainable exploitation of fish stocks.	ninistries	in	order	to	achieve
						[10]

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