

## **MARK SCHEME for the May/June 2014 series**

### **9693 MARINE SCIENCE**

**9693/04**

Paper 4 (Data Handling and Free Response),  
maximum raw mark 50

This mark scheme is published as an aid to teachers and candidates, to indicate the requirements of the examination. It shows the basis on which Examiners were instructed to award marks. It does not indicate the details of the discussions that took place at an Examiners' meeting before marking began, which would have considered the acceptability of alternative answers.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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<b>Question</b>	<b>Answer</b>	<b>Additional Guidance</b>	<b>Mark</b>
<b>1 (a)</b>	as temperature increases, incubation time decreases / negative correlation <u>and</u> none develop at / above 33 °C ;		[1]
<b>(b) (i)</b>	axes correct way round and labelled with units ; plots correct ; straight line drawn ;	ensure points joined with a ruler	[3]
<b>(ii)</b>	3 values in accordance with candidate's graph ;	check these from candidate's graph	[1]
<b>(c) (i)</b>	adult female death rate is higher than males AW ; females have to migrate to beach / males remain in sea AW ; time laying eggs on beach leaves risk of predation / exposure to hazards / killed or collected by humans ; egg production weakens females ;	must be comparative  typical hazards may include litter / beach equipment	[3]
<b>(ii)</b>	proportion of females increases / males decreases ; less successful mating AW ; none hatch if temperature exceeds 33 °C ; young hatch earlier / faster egg development ; seasonal food is not available AW ; credit manipulated numerical effect of a raised temperature ;		[4]
		<b>Total</b>	<b>[12]</b>

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<b>2</b>	<b>(a) (i)</b>	22 mm ;	<b>A</b> 21 mm–23 mm	[1]
	<b>(ii)</b>	2.2 mm ;	<b>A</b> ecf	[1]
	<b>(b)</b>	year 1 greater than other years ; food / nutrient availability ; disease / pollution ; temperature ; ref. to age dependent factors ;		[2]
	<b>(c)</b>	(determine the) ratio of fish ages AW ; (determine the) number at reproductive age ; (determine if) population is sustainable / measures are needed to restrict fishing efforts AW ; (identify) problems with fish nutrition / stress AW ; (identify) illegal catches in markets ; (identify) where fish have migrated from / to / locations visited AW ;		[4]
			<b>Total</b>	<b>[8]</b>

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<b>3 (a) (i)</b>	lives in salt and fresh water / wide range of salinities ; salmon ;	<b>A</b> any other euryhaline fish	[2]
<b>(ii)</b>	has same salt concentration / water potential as water ; mussel ;	<b>A</b> any named osmoconformer <b>lg</b> non-specific names, e.g. molluscs	[2]
<b>(b)</b>	higher salt outside body / ref. to water potential ; loss of water ; by <u>osmosis</u> ; drink water ; secrete / pump out salt via gills / kidney / urine ; ref. to active process / ATP use / membrane pumps ; scales act as a barrier to water loss ; low urine volume ; hypertonic urine AW ; ref. to role of urea in shark osmoregulation ;		[6]



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<p><b>4 (a)</b></p>	<p>red light only penetrates a short distance/low penetration/blue-green has higher penetration ;</p> <p>ref. to relative distances each colour of light penetrates/stated depths ;</p> <p>green algae rely/utilise/have abundant chlorophyll ;</p> <p>(green algae/chlorophyll) mainly absorb red/blue areas of spectrum/do not absorb green ;</p> <p>(for) photosynthesis ;</p> <p>(for) glucose/carbohydrate production ;</p> <p>(for) growth/cell division/respiration ;</p> <p>accessory pigments/named pigment absorb other light wavelengths/colours ;</p> <p>red algae grow in areas with no red light/only blue and green light ;</p> <p>ref. to competition ;</p> <p>extra pigments are energetically costly and not needed at the surface water ;</p>	<p><b>A</b> correct light wavelength ranges for colours</p>	<p>[8]</p>
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<p><b>4 (b)</b></p>	<p><i>advantages:</i></p> <p>rapid growth/larger fish ;</p> <p>reach sale/market weight more quickly ;</p> <p>reduces pressure on wild salmon/sustainable ;</p> <p>less (salmon) food waste ;</p> <p>less eutrophication ;</p> <p><i>disadvantages:</i></p> <p>may escape into wild AW ;</p> <p>outcompete wild salmon ;</p> <p>disrupt food chains ;</p> <p>interbreeding with wild salmon ;</p> <p>passing genetic modification onto new hybrids ;</p> <p>ref. to consumer resistance ;</p> <p>ref. to transmission of (infectious) disease ;</p>	<p>accept maximum of 3 benefits and 4 drawbacks</p> <p>OR</p> <p>4 benefits and 3 drawbacks</p>	<p>[7]</p>
		<b>Total</b>	<b>[15]</b>