

## **MARK SCHEME for the October/November 2014 series**

### **9693 MARINE SCIENCE**

**9693/02**

Paper 2 (AS 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.

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Question	Expected answers	Additional guidance	Marks
1 (a)	rough periwinkles are more abundant than edible periwinkles/ converse ;  credit reference to total numbers (15 edible, 39 rough) ;  rough more widely distributed than edible ;  edible found lower on the shore than rough/ converse ;  neither species found at {8/ 14/ 30} metres from low water mark ;		[4]
(b)	THREE of:  temperature ;  humidity ;  exposure time / sunlight / tides ;  slope ;  wave action ;		[3]
(c)	reference to no repeats / small sample size / small sample area ;  samples taken at 2 metre intervals ;  (therefore) results may not be representative / owtte ;		[2]
(d)	reference to random sampling ;  reference to repeats / large number of samples ;  count number of periwinkles in each quadrat / count numbers in each unit area ;  reference to running means ;  find total number and divide by the total area of quadrats ;		[3]
			[Total: 12]

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<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Marks</b>
<b>2 (a)</b>	reference to sea lice causing harm to salmon / reduce swimming endurance / owtte ;  sea lice obtain nutrients / energy from salmon ;		<b>[2]</b>
<b>(b)</b>	TWO of:  salinity / salt concentration ;  (concentration of dissolved) oxygen ;  pH ;		<b>[2]</b>
<b>(c)</b>	idea of removing a variable ;		<b>[1]</b>
<b>(d)</b>	results support hypothesis ;  results show that swimming endurance decreases as the number of lice increases ;  reference to results similar for 1, 2 and 3 lice ;  result for 2 lice could be an anomaly ;		<b>[3]</b>
			<b>[Total: 8]</b>

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<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Marks</b>
<b>3 (a)</b>	<p>increase in temperature decreases density / converse ;</p> <p>(therefore) warm water floats on top of cold ;</p> <p>temperature decreases as depth increases ;</p> <p>reference to thermocline in correct context ;</p> <p>as salinity decreases, density decreases / converse ;</p> <p>(therefore) less saline water floats on top of more saline ;</p> <p>salinity increases as depth increases ;</p> <p>reference to halocline in correct context ;</p>		<b>[6]</b>
<b>(b) (i)</b>	<p>concentration of dissolved oxygen will increase ;</p> <p>reference to mixing of water with air ;</p>		<b>[2]</b>
<b>(ii)</b>	<p>concentration of dissolved oxygen will decrease ;</p> <p>reference to decreased solubility of oxygen as temperature increases ;</p>		<b>[2]</b>
<b>(c)</b>	<p>idea that air over land heats up ;</p> <p>air (becomes less dense and) rises ;</p> <p>this draws in cooler air from the Indian Ocean ;</p> <p>from SW direction ;</p> <p>air from the Indian Ocean is saturated with water vapour ;</p> <p>this air rises and cools further ;</p> <p>water vapour condenses and falls as rain ;</p>		<b>[5]</b>
			<b>[Total: 15]</b>

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Question	Expected answers	Additional guidance	Marks
4 (a)	<p>suitable temperature ;</p> <p>clear water/ no silt ;</p> <p>reference to light (penetration) ;</p> <p>suitable depth ;</p> <p>substrate for attachment ;</p> <p>suitable salinity ;</p> <p>suitable pH/dissolved CO<sub>2</sub> ;</p>	range 16 to 35 °C	[4]
(b)	<p>reference to taking samples from different depths (of reef) ;</p> <p>by drilling ;</p> <p>reference to bands of growth ;</p> <p>reference to carbon-14 in context ;</p> <p>fixed during lifetime of coral ;</p> <p>reference to decay of carbon-14 ;</p> <p>measurements indicate age ;</p> <p>can compare ages at different depths ;</p> <p>reference to timescale ;</p> <p>reference to finding growth rate ;</p>		[8]
(c)	<p>THREE of:</p> <p>dissipate wave energy /owtte ;</p> <p>reduce coastal erosion ;</p> <p>create areas for (safer) anchorage ;</p> <p>provide habitat for marine organisms /increase biodiversity ;</p> <p>reference to benefit to (commercial) fishing ;</p> <p>reference to recreational diving ;</p> <p>reference to economic benefits /attract tourists / ecotourism ;</p>		[3]
			<b>[Total: 15]</b>