Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

MARINE SCIENCE **9693/02**

Paper 2 AS Data-Handling and Free-Response **May/June 2016**

MARK SCHEME

Maximum Mark: 50

Published

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 2016 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

This mark scheme will use the following abbreviations:

;	separates marking points
/	separates alternatives within a marking point
()	contents of brackets are not required but should be implied / the contents set the context of the answer
R	reject
A	accept (answers that are correctly cued by the question or guidance you have received)
I	ignore (mark as if this material was not present)
AW	alternative wording (where responses vary more than usual, accept other ways of expressing the same idea)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by the candidate (grammatical variants excepted)
MAX	indicates the maximum number of marks that can be awarded
+	statements on both sides of the **+** are needed for that mark
OR	separates two different routes to a mark point and only one should be awarded
ECF	error carried forward (credit an operation from a previous incorrect response)

Question	Expected answers	Additional guidance	Marks
1 (a)	0.32 ;		[1]
(b)	mean rate (of N fixation) in areas with bacteria present is higher / **ORA** ; quantitative comparison, e.g. 54 × higher / difference of 17.05 ; bacteria able to fix nitrogen / **AW** ;	**ECF** from **1(a)**	[3]
(c)	idea that nitrogen fixation provides N in a form used by producers ; credit reference to ammonium ions / nitrites / nitrates ; (for) production of proteins / amino acids ; (therefore) increased growth / biomass of producers ;	**A** plants or phytoplankton for producers **A** any other N-containing organic molecule	[3]
(d)	*any two of:* eutrophication / description of process ; decomposition / decay ; harvesting / fishing ; losses to (deep) sediments ; upwelling ; excretion / egestion ;	**A** reference to runoff / leaching	[2]
			[Total: 9]

<table>
<tr><th>Question</th><th>Expected answers</th><th>Additional guidance</th><th>Marks</th></tr>
<tr><td>2 (a) (i)</td><td>1 use of quadrat / defined sample area ;

2 suggested size, e.g. 0.25 m^2 up to 1 m^2 ;

3 use of random sampling ;

4 count (number of) cockles in this area ;

5 repeat ;

6 calculate mean / average ;

7 find total per unit area OR description of calculation of total population ;</td><td>I ‘throw (the quadrat)’ without reference to random sampling</td><td>[4]</td></tr>
<tr><td>(ii)</td><td>protection from, predators / desiccation / waves / currents ;</td><td></td><td>[1]</td></tr>
<tr><td>(b) (i)</td><td><table><tr><th>percentage of cockles that burrowed in Group A</th><th>percentage of cockles that burrowed in Group B</th></tr><tr><td>5.0 ;</td><td>62.2 ;</td></tr></table></td><td></td><td>[2]</td></tr>
<tr><td>(ii)</td><td>suitable linear scale + bars not touching of equal width ;

both axes labelled ;

plots (bars) correct ± ½ square for both percentages ;</td><td>bars to cover at least ½ grid

ECF from 2(b)(i)</td><td>[3]</td></tr>
<tr><td>(iii)</td><td>idea that cockles collected from the surface have less burrowing ability than those from under the surface / ORA ;</td><td></td><td>[1]</td></tr>
<tr><td colspan="4">[Total: 11]</td></tr>
</table>

Question	Expected answers	Additional guidance	Marks
3 (a) (i)	idea of change in community ; over (a period of) time ; e.g. (*Tevnia* and *Riftia* of) hydrothermal vent communities / succession on a whale carcass ;	 example must be from marine environment	 [3]
(ii)	role of an organism ; in an ecosystem ; credit reference to a marine organism **AND** its role ;	 organism **AND** description of niche required e.g. • parrot fish eat corals • phytoplankton provides food for higher trophic levels	 [3]

Question	Expected answers	Additional guidance	Marks
(b)	**exposure / tide,** affects ability to withstand desiccation / drying out **availability of air / oxygen**, reference to gas exchange by gills or lungs **temperature**, affects desiccation / drying out **salinity**, reference to osmoregulation **wave action / erosion**, ability to hold on to rocks **substrate**, provides surface for attachment ; ; ; ; ; ;	maximum of 3 marks for **factors** without influence on community	[6]
(c)	*any three of:* sandy shores are unstable (environments) ; fewer niches / habitats / different food sources / lower productivity ; example of a changing condition ; few organisms are adapted to these conditions ;	e.g. sand subject to erosion / movement / drying out / no substrate for attachment	[3]
			[Total: 15]

Question	Expected answers	Additional guidance	Marks
4 (a)	layer / interface / zone of water ; in which there is the greatest change in temperature with depth / **AW** ;		[2]
(b) (i)	*any three of*: evaporation leads to loss of water ; increases salinity ; precipitation dilutes seawater / adds water ; reduces salinity ;		[3]
(ii)	drainage of water from land / run-off / icebergs / glacier / estuary / river ; brings (fresh) water / dilutes sea water (near coast) ;		[2]

Question	Expected answers	Additional guidance	Marks
(c)	*any eight of*: 1 idea that as salinity increases, density of water also increases / **ORA** ; 2 (therefore) more saline water will tend to sink / **ORA** ; 3 generally as depth increases, salinity also increases ; 4 correct description of a halocline ; 5 reference to storms / wind / hurricanes / monsoon / cyclones ; 6 reference to currents ; 7 reference to upwelling / downwelling ; 8 if surface water cools ; 9 it becomes more dense and sinks ;		[8]
			[Total: 15]