

CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Subsidiary and Advanced Level

MARK SCHEME for the May/June 2015 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.

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Mark schemes will use these abbreviations:

- ; separates marking points
- / alternatives
- () contents of brackets are not required but should be implied
- R reject
- A accept (for answers correctly cued by the question, or guidance for examiners)
- Ig ignore (for incorrect but irrelevant responses)
- AW alternative wording (where responses vary more than usual)
- 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 candidate (grammatical variants excepted)
- max indicates the maximum number of marks that can be given
- + statements on both sides of the + are needed for that mark

Question	Expected answers	Additional guidance	Marks
1 (a)	the <u>role</u> of an organism (in an ecosystem) ; reference to <i>Nucella</i> / dog whelk as a predator ;	A the range of environmental space occupied by an organism A dog whelks feed on molluscs	[2]
(b) (i)	1. suitable linear scale + suitable size (min. ½ page) ; 2. both axes labelled + correct orientation (x-axis exposure, y-axis ratio or length : aperture ratio) ; 3. all points plotted correctly ; 4. suitable line of best fit ;	if scale jumps from 0 to 1.2 broken axis req'd R extrapolation of line	[4]
(ii)	as exposure decreases, ratio increases / as shelter increases, ratio increases / ORA ; credit a manipulated quantitative reference, e.g. an increase of 0.22 ;	A inverse relationship / negative correlation I direct quotation of figures from table	[2]
(iii)	larger ratio indicates a smaller aperture (in relation to shell length) / ORA ; larger aperture indicates a larger foot ; reference to attachment to rocks / can hold on to rocks ;	A idea of not being washed off rocks	[max 2]

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Question	Expected answers	Additional guidance	Marks
(c)	<ol style="list-style-type: none"> reference to (a) container(s) of (sea) water ; each at a stated temperature / temperature range suggested ; at least two stated variables controlled, e.g. salinity, volume of sea water, dissolved oxygen, pH, same sized dog whelks, substrate, light, size of container ; known / stated number / area / mass of barnacles ; known / stated number of dog whelks ; leave for stated time ; count number of barnacles eaten by dog whelks (at each temperature) ; reference to replicates (at each temperature) + calculation of means ; 	<p>min. 2 sensible ($\leq 40^{\circ}\text{C} / 104^{\circ}\text{F}$) temperatures</p> <p>R amount</p> <p>A “one dog whelk per container”</p> <p>A measure mass of barnacles</p>	[max 5]
[Total 15]			
2 (a)	20.94 ;		[1]
(b) (i)	<p>as depth increases, salinity increases / ORA ;</p> <p>credit a manipulated quantitative reference, e.g. overall increase in salinity of 9.14 ‰ / reference to greater change between 6 m and 8 m ;</p>	A more saline at 12 m than at 2 m	[2]
(ii)	<ol style="list-style-type: none"> idea of freshwater and seawater in an estuary ; freshwater is less <u>dense</u> than seawater / converse ; (therefore) freshwater floats (on top of seawater) / sea water sinks (below freshwater) ; 	<p>A lower salinity water floats on top / ORA</p> <p>A less dense water floats on top / ORA</p>	[max 2]
[Total 5]			

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Question	Expected answers	Additional guidance	Marks
3 (a) (i)	(named) proteins ;	A other N-containing organic substances, e.g. amino acids, DNA	[1]
(ii)	chlorophyll ;	A bone / shell	[1]
(iii)	DNA / bone ;	A other P-containing organic substances, e.g. phospholipids, ATP	[1]
(b)	<ol style="list-style-type: none"> 1. (increased) dissolution (of carbon dioxide) ; 2. (increased) availability of carbon dioxide / hydrogencarbonate to producers / named example ; 3. (increase in) photosynthesis ; 4. (more) organic substances produced ; 5. increased productivity of producers ; 6. more food / organic substances available to consumers / next trophic level / AW ; 7. biomass of consumers increases ; 	<p>A CO₂ no longer a limiting factor to producers</p> <p>A named example, e.g. glucose</p> <p>A more energy / biomass</p>	[max 5]

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Question	Expected answers	Additional guidance	Marks
(c)	1. turbulence/wave action ; 2. helps (atmospheric) oxygen to dissolve ; 3. photosynthesis ; 4. produces oxygen/increases oxygen ; 5. respiration ; 6. uses oxygen/reduces oxygen ; 7. temperature ; 8. reference to reduced solubility as temperature increases/ORA ; 9. depth ; 10. (dissolved) oxygen decreases (as depth increases)/ORA ;	A water movement at surface A mixes oxygen with water A algae / producers produce oxygen A consumers use up oxygen	[max 7]
[Total 15]			
4 (a) (i)	organisms of same species ; living in same area/habitat/ecosystem/place ; credit suitable example with qualification, e.g. ghost crabs on a shore, a school of tuna, butterfly fish on a reef ;		[3]
(ii)	organism which synthesises organic substances / eq ; reference to photosynthesis/chemosynthesis ; e.g. algae / phytoplankton / bacteria / zooxanthellae ;	A ref. to make energy available to rest of food chain A glucose / biomass	[3]

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Question	Expected answers	Additional guidance	Marks
(b)	<ol style="list-style-type: none"> 1. reference to sandy shore as an unstable (habitat) ; 2. subject to erosion/ description ; 3. organisms unable to attach/ no suitable substrate for attachment ; 4. (sandy shore) prone to drying out/ desiccation ; 5. low biodiversity/ description ; 6. reference to burrowing organisms/ named example ; 	<p>A sand is eroded/ blown away by wind</p> <p>A idea of porosity/ fast draining</p>	[max 4]
(c)	<ol style="list-style-type: none"> 1. reference to coral reefs as <u>stable</u> + not extreme (environment) ; 2. coral reefs have a high biodiversity/ description ; 3. organisms occupy specialised niches/ roles ; 4. credit example, e.g. butterfly fish, parrot fish, etc. ; 5. (reduce) overlap of niches/ ORA ; 6. (narrow niches) reduce (interspecific) competition/ ORA ; 	<p>A variety of species</p> <p>A “zooxanthellae”</p>	[max 5]
[Total 15]			