
MARINE SCIENCE

9693/02

Paper 2 AS Data-Handling and Free Response

October/November 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.

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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
<u>underline</u>	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)

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Question	Answer	Marks	Guidance
1(a)	trophic level 2;	1	
1(b)(i)	3011; kJ per m ² per year / kJ m ⁻² yr ⁻¹ ;	2	
1(b)(ii)	appropriate calculation; 55.3%;	2	ECF b(i)
1(b)(iii)	total losses 5511 kJ m ⁻² yr ⁻¹ ; are greater than mussel productivity (5440 kJ m ⁻² yr ⁻¹); mussel population will decrease over time;	3	

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Question	Answer	Marks	Guidance
2(a)	idea that, atmospheric carbon dioxide concentration has increased; increased dissolution / more carbon dioxide in sea water; more carbonic acid formed; pH of sea water falls / acidity increases / more H ⁺ ; increased hydrogencarbonate ;	3	
2(b)(i)	both axes correctly labelled with units; plots correct $\pm \frac{1}{2}$ square;; key / lines labelled correctly;	4	
2(b)(ii)	<i>any two of:</i> corals from site A show a decrease in growth rate; corals from site B small fluctuations; credit manipulation of data to show <u>comparison</u> ;	2	
2(b)(iii)	results from site A support the hypothesis and results from site B refute the hypothesis; because growth rate has decreased in site A; because growth rate is stable / increased slightly in site B;	3	

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Question	Answer	Marks	Guidance
3(a)(i)	idea that, it is the place where an organism lives;	1	
3(a)(ii)	group of similar organisms; that can interbreed / produce fertile offspring / AW ;	2	
3(b)	<ol style="list-style-type: none"> 1. marine example; <i>any five from:</i> 2. population of predators is (usually) smaller than prey / ORA; 3. prey biomass is (usually) larger than that of predator / ORA; 4. availability of prey is a limiting factor on predator population; 5. if prey population increases, more food available for predators / ORA; 6. (prey population increases) allows predator population to increase / ORA; 7. (predator population increases) causes prey population to decrease / ORA; 8. time lag; 9. idea of, cyclical changes; 	6	both predator and prey must be given
3(c)	<i>any six of:</i> <ol style="list-style-type: none"> 1. coral reefs have a high biodiversity; 2. coral reefs have a large range of niches / food sources / habitats; 3. niche explained as role of organism in ecosystem; 4. example of organism with narrow niche; 5. narrow niches reduce competition; 6. e.g. competition for food; 7. niches do not overlap; 8. ref. to competitive exclusion; 	6	e.g. coral-eating butterfly fish

Page 6	Mark Scheme	Syllabus	Paper
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Question	Answer	Marks	Guidance
4(a)	<p><i>any six of:</i></p> <ol style="list-style-type: none"> 1. tidal range explained as distance between low water and high water; 2. idea that tides are caused by combined gravitational effects of Sun and Moon; 3. when Earth, Moon and Sun are in a straight line; 4. full Moon or new Moon; 5. greater gravitational effect / solar tide has additive effect; 6. greater tidal range / spring tide; 7. when Moon and Sun at right angles / AW; 8. crescent Moon / AW; 9. reduced gravitational effect / solar tide partially cancels lunar tide; 10. smaller tidal range / neap tide; 	6	
4(b)	<p><i>any six of:</i></p> <ol style="list-style-type: none"> 1. develop over warm sea water; 2. water depth 50–60 m; 3. temperature 26–30 °C; 4. evaporation occurs; 5. water vapour rises and, cools / condenses; 6. water vapour (condenses) releasing (latent) heat energy; 7. idea that this causes further evaporation; 8. ref. to spinning; 9. Coriolis effect; 	6	
4(c)	<p><i>lagoon has:</i></p> <ol style="list-style-type: none"> 1. higher temperature; 2. less wave action; 3. higher salinity; 4. fewer producers; 5. appropriate reference to factor reducing the solubility of oxygen; 	3	