
MARINE SCIENCE

9693/04

Paper 4 A2 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.

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Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

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)

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

Question	Expected answers	Additional guidance	Marks
1 (a)	<p>temperature AND (solar) exposure reduce zooxanthellae number / ORA ;</p> <p>temperature has greater effect (than solar exposure) / ORA ;</p> <p>suitable manipulation of data to support description ;</p>		[3]
(b)	<p><i>any 4 of:</i></p> <p>place coral <u>in tanks</u> with different salinities ;</p> <p>two stated variables constant (pH/temperature/illumination/mass of corals/sediment/oxygen/carbon dioxide/species of coral ;</p> <p>leave for a stated time ;</p> <p>count number of zooxanthellae in each polyp ;</p> <p>using a microscope/counting grid/AVP ;</p> <p>repeat and find means ;</p>		[4]
(c)	<p><i>any 3 of:</i></p> <p>loss of habitats for reef fish ;</p> <p>less (primary) productivity/photosynthesis ;</p> <p>less, energy flow/food transfer through food chain ;</p> <p>idea of time taken for stocks to recover/breed ;</p>		[3]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

Question	Expected answers	Additional guidance	Marks
[Total: 10]			
2 (a)	<p><i>any 3 of:</i></p> <p>increased diffusion path / distance ;</p> <p>reduced surface area leads to less oxygen uptake ;</p> <p>less <u>respiration</u> ;</p> <p>less energy release (for growth)/less production of ATP ;</p> <p>impaired water flow ;</p> <p>reduced blood flow ;</p>		[3]
(b) (i)	<p>both axes labelled with units ;</p> <p>suitable linear scales ;</p> <p>plots correct $\pm \frac{1}{2}$ square ;</p>		[3]
(ii)	<p>extrapolation of appropriate curve/line of best fit ;</p> <p>value in line with candidate's line ;</p>	ECF incorrect line	[2]
(c)	<p><i>any 2 of:</i></p> <p>lower oxygen (in warmer water) ;</p> <p>higher <u>respiration</u> rate of fish (in warmer water) ;</p> <p>less <u>diffusion</u> of oxygen ;</p>		[2]
[Total: 10]			

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

Question	Expected answers	Additional guidance	Marks
3 (a)	<p><i>any 2 of:</i> (extensive) part of the natural water ; natural water provides cleaning ; natural water provides food ; no control over temperature / pH / oxygen ; low(er) stocking density ; no / less use of pesticides / antibiotics ; more labour intensive ;</p>	ORA if phrased in terms of intensive but must be clear which system is discussed	[2]

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

Question	Expected answers	Additional guidance	Marks
(b)	<p><i>any 8 of:</i></p> <p>SPAWNING AND LARVAE</p> <ol style="list-style-type: none"> adult brood fish kept for spawning / not taking grouper from wild ; place eggs / larvae into (plastic) <u>tanks</u> OR (outdoor) (concrete) <u>ponds</u> ; (larvae) feed with larvae / rotifers / shrimp / plankton OR keep illuminated for phytoplankton growth ; <p>JUVENILES / FINGERLINGS</p> <ol style="list-style-type: none"> (transfer fingerlings into) <u>nursery</u> tanks ; feed on fish / <u>protein</u> pellets ; from trimmings / plant protein OR not from wild fish ; <p>ADULT</p> <ol style="list-style-type: none"> put (larger fish) into cages in open water / ponds ; 	<p>I cages</p> <p>A other named small invertebrate I feed with pellets</p>	

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

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	<p>GENERAL POINTS</p> <p>8. monitor / adjust oxygen ;</p> <p>9. maintain / monitor temperature ;</p> <p>10. separate different sizes / ages of fish ;</p> <p>11. ref. to nets / cage to prevent predator access / escape of grouper ;</p> <p>12. ref. to antibiotics / pesticides / vaccines / sterilising tanks ;</p> <p>13. ref. to restricted use of antibiotics ;</p> <p>14. ref. to filtration of waste / cleaning of water / preventing waste entering water / not overfeeding ;</p> <p>15. ref. to low stocking densities ;</p> <p>16. example of economic sustainability ;</p>	<p>A not overcrowded</p> <p>e.g. food from local sources / transport costs</p>	[8]

Page 8	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

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(c)	<p><i>any 5 of:</i> release of pollution / disease from shrimp farm OR eutrophication ;</p> <p>loss of reefs / beaches / mangroves / coastal areas / areas of beauty ;</p> <p>reducing biodiversity / fish populations ;</p> <p>smell / unsightliness due to shrimp farms ;</p> <p>loss of <u>tourists</u> / <u>tourism</u> ;</p> <p>conflicts / competition for employment ;</p> <p>tourist traffic disrupting aquaculture ;</p> <p>conflict over land usage / less land for hotels ;</p>		[5]
			[Total: 15]

Page 9	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

Question	Expected answers	Additional guidance	Marks
4 (a)	<p><i>any 10 of:</i></p> <ol style="list-style-type: none"> 1. (physical) damage to coral/sea bed/reefs/ seafloor ; 2. leakage of heavy metals/corrosion/toxins/ dispersants ; 3. accumulation into food chains ; 4. ref. to TBT ; 5. (oil) loss of habitats/mangroves/coastal areas ; 6. (oil) causes feather or fur damage/poisoning/ inhalation ; 7. (oil) causes fish death due to gill damage ; 8. (oil) reduces light penetration ; 9. (resulting in) reduced phytoplankton / coral productivity ; 10. (wreck) negative value of tourism ; 11. positive value of ecotourism on species conservation/awareness ; 12. substrate for growth of coral/provides habitat / nursery grounds/artificial reef ; 13. creates niches/food chains ; 14. increases biodiversity/conservation of species ; 	<p>A both damage sea bed / tanker causes more damage to seabed</p> <p>A reduced photosynthesis</p> <p>A both eventually provide substrate</p>	[10]

Page 10	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – May/June 2016	9693	04

Question	Expected answers	Additional guidance	Marks
(b)	<p><i>any 5 of:</i></p> <p>lower trophic levels have lower concentrations ;</p> <p><u>bioaccumulation</u> / <u>biomagnification</u> ;</p> <p>fish at higher trophic levels eat many of those at lower trophic levels ;</p> <p>mercury does not break down / is not digested ;</p> <p>mercury is not excreted / removed from tissues / AW ;</p> <p>mercury damages CNS / can cause miscarriage / fetal abnormalities ;</p> <p>mercury can cross placenta ;</p>		[5]
			[Total: 15]