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**MARINE SCIENCE**

**9693/01**

Paper 1 AS Structured Questions

**October/November 2016**

MARK SCHEME

Maximum Mark: 75

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**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 October/November 2016 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

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This mark scheme will use the following abbreviations:

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

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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
1(a)(i)	produce own food from inorganic material + e.g. vent bacteria / phytoplankton ;  feed off / get energy from other organisms + e.g. riftia worms / zoarcid fish / zooplankton / sardines ;	<b>2</b>	must have an appropriate example for each mark point  2 correct definitions without examples gain 1 mark / 2 correct examples without definitions gain 1 mark
1(a)(ii)	<i>any 2 of:</i> both make carbohydrate / organic nutrients ;  both use carbon dioxide ;  chemosynthesis vs. photosynthesis ;  light energy vs. chemical energy ;  (chemosynthesis) uses (dissolved) minerals / hydrogen sulfide / hydrogen / methane ;	<b>3</b>	<b>A</b> CO <sub>2</sub>
1(b)	<i>any 3 of:</i> lack of light ;  high acidity ;  very hot water ;  high pressure ;  toxic chemicals ;	<b>3</b>	<b>I</b> no O <sub>2</sub>        <b>A</b> named examples <b>A</b> toxic gases
		<b>Total: 8</b>	

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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
2(a)	<p><i>any 4 of:</i>  Earth's (lithosphere) is made up individual plates ;  (which) lie on top of mantle / asthenosphere ;  plates move (independently) ;  movement caused by convection / gravity / Earth's rotation ;  ref. plate boundaries ;  e.g. convergent / divergent / transform ;</p>	<b>4</b>	<p><b>A</b> Earth's crust</p> <p><b>A</b> plates move apart / away</p> <p><b>A</b> mantle convection</p>
2(b)	<p><i>any 4 of:</i>  two plates are pulling apart from each other / are divergent ;  (hot) magma emerges (as lava) ;  (<u>lava</u>) <u>cools</u> and <u>solidifies</u> ;  forming new ocean floor / crust ;</p>	<b>4</b>	
2(c)(i)	transform / convergent / divergent ;	<b>1</b>	
2(c)(ii)	convergent / subduction zone ;	<b>1</b>	
2(c)(iii)	divergent / convergent ;	<b>1</b>	
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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>												
3(a)(i)	(feeding) level / position + in a food web / chain ; named example from the food web ;	<b>2</b>	e.g. cockles at second trophic level												
3(a)(ii)	pyramid of energy with 4 levels + names of organisms ; rectangular boxes centred on each other, decreasing in size from base upwards ;	<b>2</b>													
3(a)(iii)	all the organisms of all the species ;  (interacting together) within a habitat ;	<b>2</b>	<b>A</b> idea of, everything shown in the food web <b>A</b> different species / organisms												
3(b)(i)	<table border="1"> <thead> <tr> <th><b>shore type</b></th> <th><b>geological conditions</b></th> <th><b>community</b></th> </tr> </thead> <tbody> <tr> <td>muddy ;</td> <td>sedimentation of silt, little erosion</td> <td>mangroves</td> </tr> <tr> <td>sandy</td> <td>sedimentation of sand, some erosion</td> <td>burrowing animals</td> </tr> <tr> <td>rocky</td> <td>little or no sedimentation ;</td> <td>any named organism from rocky shore, e.g. limpet / attached organisms / rock pool ;</td> </tr> </tbody> </table>	<b>shore type</b>	<b>geological conditions</b>	<b>community</b>	muddy ;	sedimentation of silt, little erosion	mangroves	sandy	sedimentation of sand, some erosion	burrowing animals	rocky	little or no sedimentation ;	any named organism from rocky shore, e.g. limpet / attached organisms / rock pool ;	<b>3</b>	
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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
3(b)(ii)	<i>any 3 of:</i> wave action ; desiccation / <b>AW</b> ; temperature (changes) ; salinity (changes) ; wind exposure ; predation ; competition ; tides ;	<b>3</b>	
		<b>Total: 12</b>	

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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
4(a)(i)	line falling to left throughout ; small fall in surface layer ; larger fall within thermocline ; small fall to sea bed ;	<b>4</b>	I starting point  I if touches left axis
4(a)(ii)	thermocline correctly positioned and labelled ;	<b>1</b>	
4(b)	<i>description</i> salinity increases as depth increases ;  <i>explanation</i> <i>any 2 of:</i> as the salinity increases the density increases ;  more saline water sinks / <b>ORA</b> ;  ref. halocline ;	<b>3</b>	
4(c)(i)	<i>any 2 of:</i> storms / <u>strong</u> wind ;  waves ;  currents ;  upwellings <b>OR</b> downwellings ;	<b>2</b>	

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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
4(c)(ii)	<i>any 2 of:</i> brings nutrients from deep ocean layers / replenishes surface dissolved nutrients ;  for algae / phytoplankton / producers ;  ref. photosynthesis ;	<b>2</b>	
		<b>Total: 12</b>	

<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
5(a)(i)	larger area, higher value ;	<b>1</b>	<b>A</b> directly proportional
5(a)(ii)	<i>any 1 of:</i> more nursery / fish-breeding areas ;  more habitats ;  higher productivity / <b>AW</b> ;  increased biodiversity ;	<b>1</b>	



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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
5(a)(iii)	<p><i>any 2 of:</i>  less well developed tourism industry in the Pacific ; <b>ORA</b></p> <p>other factors, e.g. climate ;</p> <p>reefs more accessible ;</p> <p>more money in Japan ;</p> <p>reefs are protected in Japan ;</p> <p>more biodiversity in Japan ;</p>	<b>2</b>	<b>A</b> idea that Japan is a popular tourist destination
5(a)(iv)	<p><i>any 2 of:</i>  idea of, influences income / profit ;  from tourism, fisheries etc. ;</p> <p>services provided by biodiversity / example of ;</p> <p>future uses of species / example of ;</p>	<b>2</b>	<p>e.g. nutrient cycling</p> <p>e.g. drug development, future food sources</p>
5(b)	<p><i>any 3 of:</i>  dissipate wave energy ;</p> <p>slowing down waves, reducing wave action ;</p> <p>act as breakwater between sea and land / <b>AW</b> ;</p> <p>prevent erosion ;</p>	<b>3</b>	
		<b>Total: 9</b>	

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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>
6(a)	idea of, role of an organism, that is not specific to any one habitat or food chain ;  named example ;	<b>2</b>	
6(b)(i)	as damage increases, number of species decreases / negative correlation ;	<b>1</b>	
6(b)(ii)	loss of food sources ;  loss of habitats ;  linking damage to fishing ;  less fish present / more fish removed ;	<b>2</b>	<b>1</b> ref. to less food, <i>idea</i> of diversity or variety required  <b>A ECF</b> from <b>(b)(i)</b>
6(b)(iii)	need to know change in number of species after blast fishing / no data for before and after blast fishing ;  less subjective / more precise method of grading reef destruction / more objective method ;  repeats ;  in another area ;	<b>2</b>	
		<b>Total: 7</b>	

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<b>Question</b>	<b>Expected answers</b>	<b>Marks</b>	<b>Additional guidance</b>										
7(a)(i)	A – runoff/leaching ; B – feeding ; C – decomposition/decay/deposition/sedimentation/sinking ; D – upwelling ;	<b>4</b>	<b>A</b> dissolving <b>A</b> consumption										
7(a)(ii)	<i>any 1 of:</i> make chlorophyll ; activation of certain enzymes ; activation of ATP ; stability of phosphate compounds (e.g. DNA and RNA) ;	<b>1</b>	<b>I</b> chloroplast										
7(b)	<table border="1"> <thead> <tr> <th><b>nutrient</b></th> <th><b>biological use</b></th> </tr> </thead> <tbody> <tr> <td>nitrogen/ nitrate ;</td> <td>make proteins/ amino acids/ named example ;</td> </tr> <tr> <td>carbon ;</td> <td>make organic materials/ named example ;</td> </tr> <tr> <td>calcium ;</td> <td>make bones, corals, shells ;</td> </tr> <tr> <td>phosphorus ;</td> <td>make DNA/ bone ;</td> </tr> </tbody> </table>	<b>nutrient</b>	<b>biological use</b>	nitrogen/ nitrate ;	make proteins/ amino acids/ named example ;	carbon ;	make organic materials/ named example ;	calcium ;	make bones, corals, shells ;	phosphorus ;	make DNA/ bone ;	<b>4</b>	<b>A</b> other valid nutrients / salts  to gain biological use mark, use must match nutrient it is paired with
<b>nutrient</b>	<b>biological use</b>												
nitrogen/ nitrate ;	make proteins/ amino acids/ named example ;												
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8(a)	idea of, one organism benefits whilst another is harmed ; named <b>marine</b> example ;	<b>2</b>	example must be from the marine environment
8(b)	idea of, both organisms benefitting ; named <b>marine</b> example ;	<b>2</b>	example must be from the marine environment
8(c)	idea of, change in communities /species ; idea of, altering of environment by each community over time ; named <b>marine</b> example ;	<b>3</b>	<b>A</b> change in present population
			<b>[Total: 7]</b>