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**MARINE SCIENCE**

**9693/01**

Paper 1 AS Structured Questions

**October/November 2017**

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 International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the October/November 2017 series for most Cambridge IGCSE<sup>®</sup>, Cambridge International A and AS Level components and some Cambridge O Level components.

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)

Question	Answer	Marks	Guidance
1(a)(i)	March <b>AND</b> April ;	1	
1(a)(ii)	<i>any 3 of:</i> Jan to Aug – non-landfall higher each month / <b>ORA</b> ;  Sep to Dec – landfall higher each month / <b>ORA</b> ;  smallest difference in March ;  greatest difference in August ;  <b>AVP</b> ;	3	any valid comparison
1(a)(iii)	(seas) warm enough in July and Aug / <b>ORA</b> ;  <b>OR</b>  convergence of trade winds in July (in Philippine Sea) ;	1	'hot air' unqualified is insufficient
1(b)(i)	<i>any 2 of:</i> destroy crops ;  cause floods ;  physical damage to buildings / infrastructure / example of ;  deaths ;  (coastal) erosion ;  disruption of economic activity ;	2	

Question	Answer	Marks	Guidance
1(b)(ii)	<i>any 2 of:</i> reduce drought ;  reduce temperatures ;  refill reservoirs / lakes / rivers ;  idea of, increased land suitable for crops ;  rebuilding storm resistant infrastructure ;	<b>2</b>	A idea of, (fresh) water replenishment
1(c)	<i>any 2 of:</i> idea of, meets resistance (from trees or buildings) ;  idea of, less energy ;  (due to) no evaporation (over land) ;  less water to sustain cyclone ;	<b>2</b>	

Question	Answer	Marks	Guidance
2(a)	rate ; at which, organic material / biomass, is produced ; by phytoplankton / producers ;	3	idea of 'time' must be present for MP1  <b>A</b> autotroph or chemosynthetic organism
2(b)(i)	decreases then increases ;	1	
2(b)(ii)	as (sun)light increases, phytoplankton increases ; <b>+ any 2 of:</b> phytoplankton, use / need / absorb, (sun)light ; for photosynthesis ; <u>increased</u> photosynthesis allows growth / faster reproduction ; becoming limited by available nutrients ;	3	idea of, <u>more</u> growth / reproduction is needed
2(b)(iii)	nutrient level falls ; <b>+ any 2 of:</b> <u>more</u> nutrients absorbed / used (by phytoplankton) ; increase in phytoplankton ; (nutrients used by) phytoplankton for (rapid) growth / reproduction ; no mixing of water at that time of year ;	3	<b>A</b> 'producer' for 'phytoplankton'  <b>A</b> increased productivity of phytoplankton
2(b)(iv)	line increases (from Jan) then decreases (to June) ; with peak between mid-March and May ;	2	

Question	Answer	Marks	Guidance
2(b)(v)	<p><i>any 3 of:</i> zooplankton rises as, phytoplankton / food, does ;</p> <p>zooplankton (almost) always below phytoplankton level / <b>ORA</b> ;</p> <p>zooplankton falls as phytoplankton falls ;</p> <p>ref. to lag / phytoplankton peaks before zooplankton ;</p>	3	

Question	Answer	Marks	Guidance
3(a)(i)	<u>volcanic</u> island / volcano / cone ;	1	
3(a)(ii)	<p><i>any 4 of:</i> (stage 2) the island / volcano / cone, collapses / erodes / subsides ;</p> <p>ref. to coral growth ;</p> <p>enabled by suitable substrate / conditions for coral growth ;</p> <p><u>fringing</u> reef formed ;</p> <p>ref. to lagoon ;</p> <p>(stage 3) (fringing reef) becomes a <u>barrier</u> reef ;</p> <p>(stage 4) island collapses ;</p> <p><u>barrier reef</u> becomes an atoll ;</p>	4	description can start from any stage BUT if not in correct sequence, MAX 3

Question	Answer	Marks	Guidance
3(b)	<i>any 2 of:</i> wave action / storms ;  abrasion (by sediments) ;  breakage by parrot fish ;  named human activity that breaks coral skeleton ;  acidity of sea water / description of ;	<b>2</b>	e.g. anchoring, trampling from divers, dredging, dynamite fishing  <b>A</b> increased CO <sub>2</sub> in sea water
3(c)(i)	as age increase, % <sup>14</sup> C decreases / <b>ORA</b> ;	<b>1</b>	
3(c)(ii)	10 000 ( ±100) ; construction lines leaving the x <b>and</b> y axes ;	<b>2</b>	<b>ECF</b> construction line mark can be awarded if it correctly matches incorrect MP1
3(c)(iii)	5700 to 6000 (years) ;	<b>1</b>	
3(c)(iv)	idea of, too little <sup>14</sup> C for (accurate measurement) ;	<b>1</b>	<b>I</b> idea of, none left

Question	Answer					Marks	Guidance																									
4(a)(i)	<table border="1"> <thead> <tr> <th>organism</th> <th>predator</th> <th>primary consumer</th> <th>secondary consumer</th> <th>prey organism</th> </tr> </thead> <tbody> <tr> <td>tuna</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>zooplankton</td> <td></td> <td>✓</td> <td></td> <td>✓</td> </tr> <tr> <td>squid</td> <td>✓</td> <td></td> <td>✓</td> <td>✓</td> </tr> <tr> <td>sardines</td> <td>✓</td> <td>✓</td> <td>✓</td> <td>✓</td> </tr> </tbody> </table>	organism	predator	primary consumer	secondary consumer	prey organism	tuna	✓		✓	✓	zooplankton		✓		✓	squid	✓		✓	✓	sardines	✓	✓	✓	✓					4	Ignore primary and secondary columns 1 mark per correct row
organism	predator	primary consumer	secondary consumer	prey organism																												
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sardines	✓	✓	✓	✓																												
4(a)(ii)	<p>any 2 of:</p> <p>anchovies ;</p> <p>sardines ;</p> <p>squid ;</p> <p>herring ;</p> <p>tuna ;</p>					1																										
4(b)	<p>any 3 of:</p> <p>easy access to / find, mates for reproduction ;</p> <p>easier for fish to find food ;</p> <p>hydrodynamic efficiency / less energy used when swimming ;</p> <p>provides protection from predators ;</p> <p>easier to see predators / <b>AW</b> ;</p>					3	<p><b>A</b> safety in numbers</p>																									



Question	Answer	Marks	Guidance
4(c)(i)	parasite benefits / <b>AW</b> ; organism which lives in / on another, <b>OR</b> has a host ; which is harmed / <b>AW</b> ;	3	
4(c)(ii)	23.5 ;	1	A 23.25–23.75
4(c)(iii)	older the fish, the longer the larvae / <b>ORA</b> ;	1	A <u>positive</u> (linear) relationship / correlation <b>OR</b> directly proportional

Question	Answer	Marks	Guidance								
5(a)	<table border="1"> <thead> <tr> <th>biological use</th> <th>nutrient</th> </tr> </thead> <tbody> <tr> <td>to make proteins amino acids / DNA</td> <td>nitrogen ;</td> </tr> <tr> <td>to make chlorophyll</td> <td>magnesium ;</td> </tr> <tr> <td>to make shells / bones / teeth</td> <td>calcium ;</td> </tr> </tbody> </table>	biological use	nutrient	to make proteins amino acids / DNA	nitrogen ;	to make chlorophyll	magnesium ;	to make shells / bones / teeth	calcium ;	3	A other valid nutrients A carbon once only
biological use	nutrient										
to make proteins amino acids / DNA	nitrogen ;										
to make chlorophyll	magnesium ;										
to make shells / bones / teeth	calcium ;										
5(b)	<p><i>any 4 of:</i> named, ion / nutrient / pollutant ;</p> <p>affects acidity / pH ;</p> <p>affects salinity / salt concentration ;</p> <p>decreases oxygen concentration (from eutrophication) ;</p> <p>affects <u>surface</u> water (more than deep water) ;</p> <p>effects occur <u>close to land</u> ;</p>	4									

Question	Answer	Marks	Guidance
5(c)	decrease in temperature of water at surface ; + <i>any 3 of:</i> increase in density ;  cold water sinks ;  replaced by water moving up from below / <b>AW</b> ;  decrease in density ;  ref. to convection ;	4	<b>A</b> water is cooled at surface       <b>A</b> idea of, water moving up from depth

Question	Answer	Marks	Guidance
6(a)	<i>any 3 of:</i> fit between continental coastlines ;  magnetic 'stripes' on sea floor ;  distribution of fossils / living organisms ;  plate boundaries moving can be measured ;  seismic / volcanic / geothermal activity greatest along plate boundaries ;  formation of ridges or mountain ranges as evidence of moving plates ;  <b>OR</b>  idea of, age of rock at ridges and ranges correlates with hypothesised formation ;	3	<b>A</b> idea of, jigsaw pieces

Question	Answer	Marks	Guidance
6(b)(i)	<p><i>any 4 of:</i>            ref. to mid-ocean ridges ;            ref. to divergent plate boundaries ;            sea water enters cracks in sea bed ;            heated by magma ;            picks up minerals / <b>AW</b> ;            (hot) water <u>forced</u> / <u>pushed</u> (out of sea bed) ;            meets cold water ;            minerals precipitate out / <b>AW</b> ;            solidify to form deposits / chimney ;</p>	4	A heated by mantle
6(b)(ii)	<p><u>no</u> light for photosynthesis ;            +  <i>any 2 of:</i>            idea of, extreme environment and plants do not have correct adaptations ;            hydrogen sulphide / low pH, (toxic to plants) ;            high pressure (would crush plants) ;            high temperature (would denature enzymes) ;</p>	3	I low light

Question	Answer	Marks	Guidance
6(b)(iii)	<u>chemosynthesis</u> ; + <i>any 2 of:</i> ref. to chemical (potential) energy ;  from dissolved minerals / named minerals ;  (bacteria) make carbohydrate / named carbohydrate available ;	<b>3</b>	e.g. hydrogen sulphide  <b>A</b> sugar / food <b>I</b> sucrose