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**MARINE SCIENCE**

**9693/12**

Paper 1 AS Structured Questions

**May/June 2019**

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.

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This document consists of **17** printed pages.

**PUBLISHED****Generic Marking Principles**

These general marking principles must be applied by all examiners when marking candidate answers. They should be applied alongside the specific content of the mark scheme or generic level descriptors for a question. Each question paper and mark scheme will also comply with these marking principles.

**GENERIC MARKING PRINCIPLE 1:**

Marks must be awarded in line with:

- the specific content of the mark scheme or the generic level descriptors for the question
- the specific skills defined in the mark scheme or in the generic level descriptors for the question
- the standard of response required by a candidate as exemplified by the standardisation scripts.

**GENERIC MARKING PRINCIPLE 2:**

Marks awarded are always **whole marks** (not half marks, or other fractions).

**GENERIC MARKING PRINCIPLE 3:**

Marks must be awarded **positively**:

- marks are awarded for correct/valid answers, as defined in the mark scheme. However, credit is given for valid answers which go beyond the scope of the syllabus and mark scheme, referring to your Team Leader as appropriate
- marks are awarded when candidates clearly demonstrate what they know and can do
- marks are not deducted for errors
- marks are not deducted for omissions
- answers should only be judged on the quality of spelling, punctuation and grammar when these features are specifically assessed by the question as indicated by the mark scheme. The meaning, however, should be unambiguous.

**GENERIC MARKING PRINCIPLE 4:**

Rules must be applied consistently e.g. in situations where candidates have not followed instructions or in the application of generic level descriptors.

**GENERIC MARKING PRINCIPLE 5:**

Marks should be awarded using the full range of marks defined in the mark scheme for the question (however; the use of the full mark range may be limited according to the quality of the candidate responses seen).

**GENERIC MARKING PRINCIPLE 6:**

Marks awarded are based solely on the requirements as defined in the mark scheme. Marks should not be awarded with grade thresholds or grade descriptors in mind.

**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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Question	Answer	Marks	Guidance
1(a)	rich in minerals ; low pH / acidic ;	2	<b>A</b> rich in named mineral <b>I</b> black and white smokers
1(b)(i)	(all) living / biotic <b>AND</b> non-living / abiotic parts (interacting) ;	1	<b>A</b> living things <b>AND</b> their environment
1(b)(ii)	lack of light ;	1	<b>I</b> little / low / insufficient light
1(c)	<i>any 2 of:</i> plates, diverging / moving apart ; magma / mantle heats water ; minerals in (heated) water precipitate ;	2	<b>A</b> divergent boundary <b>A</b> minerals come out of solution
1(d)	chemosynthetic bacteria <b>AND</b> tube worms ;  <i>Tevnia</i> followed by <i>Riftia</i> ;	2	<b>A</b> Archaea <b>AND</b> tube worms <b>A</b> named tube worms <b>I</b> <i>Tevnia</i> and <i>Riftia</i> unqualified
1(e)	<i>any 2 of:</i> extreme environment ; few niches available ; few species are adapted ;	2	<b>A</b> correct reference to extremophiles <b>I</b> lack of food

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Question	Answer	Marks	Guidance
2(a)	fringing (reef) ;	1	
2(b)(i)	volcano was at less than 30m (depth) where coral could grow / attach ;  it is evidence that the volcano sank because coral cannot grow at 1200m / depth ;  atoll formed when volcano / island sank <b>OR</b> coral was left when the volcano / island sank <b>OR</b> coral died when the volcano / island sank ;	3	
2(b)(ii)	<i>any 3 of:</i>  drilling / cores ;  counting (growth) bands ;  geomorphological analysis ;  carbon dating ;  detail of one method e.g. width of bands varying with environmental conditions or description of ratios in carbon dating ;	3	

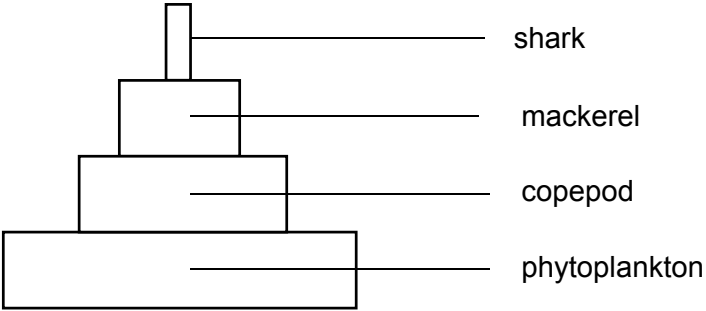
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Question	Answer	Marks	Guidance
3(a)(i)	tuna added to Fig. with links to shrimp, squid, mackerel, sharks and marlin ; arrows in correct direction ;	2	all 5 links must be present
3(a)(ii)	the role of a organism ; in an ecosystem ;	2	<b>A</b> species for organism <b>I</b> environment
3(a)(iii)	wide range of prey ;	1	<b>A</b> many types of prey
3(b)(i)	parasitism ;	1	
3(b)(ii)	third ;	1	
3(b)(iii)	<i>any 1 of:</i> the food web would be too complex ; difficult to assign trophic level ; these parasites digest the food the host / mackerel eats, not the host ; (most parasites have very) low biomass ;	1	<b>A</b> we do not know what the parasites feed on

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Question	Answer	Marks	Guidance
3(c)(i)	<p><i>any 3 of:</i></p> <p>(in mackerel)</p> <p>(energy) lost in respiration / heat ;</p> <p>for movement / swimming / active transport ;</p> <p>(energy) lost in urine / excretion ;</p> <p>(energy) lost in egestion / faeces ;</p> <p>(energy) is passed in waste / death to decomposers ;</p> <p>(in transfer to shark)</p> <p>not all mackerel are eaten ;</p> <p>(energy from undigested / unabsorbed material) lost in egestion / faeces ;</p> <p>mackerel are also eaten by lancet fish ;</p> <p>some energy is used by nematodes / parasites ;</p>	<b>3</b>	<p><b>A</b> any named process that requires energy e.g. digestion</p>



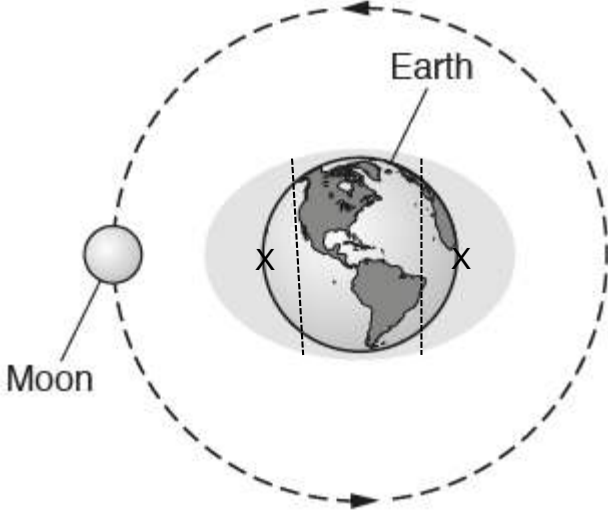
Question	Answer	Marks	Guidance
3(c)(ii)	 <p>4 closed horizontal bars, approximately centred and touching ; labelled in correct order ; correct proportions and wider nearer base ;</p>	3	<p><b>Note</b> – if draw a simple triangle, MP2 and / or MP3 can still be credited <b>I</b> height of bars <b>A</b> line for shark bar</p>
4(a)(i)	<p>salt marshes reduced wave height more / most ; mangroves <b>AND</b> seagrass and kelp reduce wave height less ; manipulation of data ;</p>	3	<p><b>A</b> salt marshes and coral reef reduce wave height by similar amounts</p>
4(a)(ii)	0.27 ; ;	2	<p><b>A</b> 0.63 for 1 mark e.g. by <math>0.9 \cdot \frac{70}{100} = 0.63</math> ;</p>
4(a)(iii)	<p><i>any 1 of:</i> (these coast types) do not form where larger waves are present ; no storms occurred (during the investigation) ;</p>	1	
4(a)(iv)	<p>decreases energy of waves ; waves do not travel as far inland ;</p>	2	<p><b>A</b> waves hit coast with less force</p>

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Question	Answer	Marks	Guidance
4(a)(v)	<p><i>any 2 of:</i></p> <p>flooding ;</p> <p>damage to property / infrastructure ;</p> <p>damage to beach <b>OR</b> coastal erosion <b>OR</b> more wave action ;</p> <p>damage to crops ;</p> <p>loss of tourism ;</p> <p>loss of (reef) fishery area ;</p> <p>loss of anchorages ;</p> <p>loss of habitat(s) ;</p> <p>loss of breeding grounds ;</p> <p>decreased biodiversity ;</p>	<b>2</b>	
4(b)(i)	<p><i>any 1 of:</i></p> <p>smoke / ash blocks light ;</p> <p>ash may change pH of the water ;</p>	<b>1</b>	<p><b>A</b> increased carbon dioxide changed / decreased pH of water</p>

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Question	Answer	Marks	Guidance
4(b)(ii)	<p><i>any 3 of:</i></p> <p><u>increases</u>, availability / concentration, of nutrients for, phytoplankton / algae ;</p> <p>(phytoplankton / algae) use nitrogen to make proteins ;</p> <p>(phytoplankton / algae) use phosphorus to make DNA ;</p> <p>increases, productivity / growth of, phytoplankton / algae ;</p> <p>(that) reduces light reaching zooxanthellae (in coral) ;</p> <p>algae smother coral polyps ;</p> <p>algae release toxins (related to red tides) ;</p> <p>decay of algae leads to loss of oxygen which kills polyps ;</p>	<b>3</b>	<p><b>A</b> eutrophication <b>OR</b> algal bloom</p> <p><b>A</b> zooxanthellae photosynthesise less / not at all</p>

Question	Answer	Marks	Guidance
5(a)	the moon is closer ;	1	<b>A</b> converse
5(b)(i)	X on left or right of Earth or in ocean in these locations ;	1	 <p data-bbox="1464 826 1671 858"><b>not to scale</b></p>
5(b)(ii)	<p data-bbox="300 906 421 938"><i>any 4 of:</i></p> <p data-bbox="300 976 479 1008">gravitational ;</p> <p data-bbox="300 1046 622 1078">pull of moon on oceans ;</p> <p data-bbox="300 1117 533 1149">causes high tide ;</p> <p data-bbox="300 1187 757 1219">which leads to low tide elsewhere ;</p> <p data-bbox="300 1257 824 1289">high tide moves as Earth spins on axis ;</p> <p data-bbox="300 1327 1151 1359">inertia causes high tide on opposite side of Earth from the Moon ;</p>	4	<p data-bbox="1413 976 1615 1008"><b>A</b> ref. to gravity</p> <p data-bbox="1413 1187 1995 1219"><b>A</b> low tide in parts perpendicular to the moon</p>

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Question	Answer	Marks	Guidance
5(b)(iii)	Sun shown on Fig. 5.1 in line with Earth and Moon to left hand side of Fig ;	1	ignore scale of Sun <b>A</b> the word Sun, or drawing of the Sun in correct location
5(c)(i)	<i>any 2 of:</i> large volume of water ; entering narrow channel ; <i>idea of</i> , funnel shape ; topography of (bay) sea bed ;	2	<b>A</b> Atlantic Ocean is a large body of water <b>A</b> size of channel <b>A</b> shape narrows <b>A</b> description
5(c)(ii)	wind (from south west) ; low (air / atmospheric) pressure ;	2	

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Question	Answer	Marks	Guidance
6(a)(i)	two arrows pointing towards each other (one on each plate) ;	1	
6(a)(ii)	convergent ;	1	<b>A</b> subduction zone
6(a)(iii)	(ocean) trench ;	1	<b>I</b> subduction zone
6(a)(iv)	<i>any 3 of:</i> oceanic crust is more dense than continental crust ; (therefore) sinks beneath continental crust ; (oceanic) crust melts ; and becomes / is less dense than surroundings ; so rises up forming volcanoes ;	3	<b>A</b> converse  <b>A</b> magma rises to form volcano
6(b)(i)	isostasy ;	1	
6(b)(ii)	<i>any 3 of:</i> (that because) continental crust is less dense than oceanic crust ; manipulation of figures ; continental crust is higher because it is thicker ; continental crust is higher because it is less dense ; edge of continental plates also covered in more sediment (from run-off) ;	3	<b>A</b> converse

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Question	Answer	Marks	Guidance
7(a)	<p><i>any 3 of:</i></p> <p>quicker to find higher concentrations of food ;</p> <p>reproduction more likely to be successful ;</p> <p>more likely to locate a mate ;</p> <p>reduction in energy usage ;</p> <p>reduce odds of predation <b>or</b> confuse predators ;</p> <p>protected in centre of shoal <b>or</b> affect vision of predators ;</p>	<b>3</b>	<b>A</b> increases hydrodynamic efficiency

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Question	Answer	Marks	Guidance
7(b)(i)	<p><i>any 3 of:</i></p> <p>catch is highest in months after highest runoff ;</p> <p>not exact match or converse relationship such as (small) peak in catch in Sept / Oct following period of low run off ;</p> <p>only shows data for one year ;</p> <p>data shows catch, not shoal size ;</p> <p>data shows runoff, not rainfall ;</p> <p>no indication of fishing effort ;</p> <p>does not account for temperature / light variation ;</p> <p>correlation is not evidence of causation ;</p> <p>other factors may affect shoal size e.g. light / temperature ;</p> <p>no evidence, with suitable example e.g. February high run off, but low catch ;</p>	<b>3</b>	



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Question	Answer	Marks	Guidance
7(b)(ii)	<p><i>any 3 of:</i></p> <p>introduces nutrients in runoff ;</p> <p>which increases phytoplankton / algal growth (therefore more food for fish) ;</p> <p>sediment in runoff blocking light decreasing phytoplankton / algal growth ;</p> <p>introduces toxins that poison fish ;</p> <p>changes water temperature ;</p> <p>dilutes nutrients ;</p> <p>rainfall affects salinity ;</p> <p>changes currents / upwellings ;</p> <p>correctly linked prediction of the change in fish population ;</p>	<b>3</b>	<p><b>A</b> converse</p> <p><b>A</b> increases productivity</p>