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**MARINE SCIENCE**

**9693/13**

Paper 1 AS Structured Questions

**May/June 2018**

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.

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**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.

**PUBLISHED****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>OR</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>any two from:</i> high (water) temperature ; high (water) pressure ; low oxygen concentration ; no light ; high hydrogen sulfide levels ; low pH / very acidic ;	<b>2</b>	I depth
1(b)(i)	Water, in contact with / heated by, magma / mantle ; minerals <u>dissolve</u> / <u>leach</u> (more easily) ;	<b>2</b>	I nutrients
1(b)(ii)	(phosphorus): (formation of) DNA / RNA / ATP / bone / phospholipid ; (calcium): (formation of) bone / teeth / shell / tube worm tube ;	<b>2</b>	
1(c)	<i>any three from:</i> formed along plate boundaries ; (cold) sea water seeps into cracks / fissures ; underlying magma heats water ; hot water <u>forced</u> back to surface ; dissolved minerals <u>precipitate</u> as water cools ;	<b>3</b>	<b>A</b> ref. to divergent boundary  <b>A</b> spews out, pushed out, pressure builds

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Question	Answer	Marks	Guidance
1(d)(i)	chemosynthetic bacteria live within tube worms / named benefit to bacteria ;  producing organic substances / glucose / <u>provides</u> energy ;  for benefit of both organisms / interdependent for survival / need each other to survive ;	<b>3</b>	<b>A</b> have a safe habitat / provide protection  <b>A</b> correct named substance <b>R</b> creates energy
1(d)(ii)	change in community (structure) / change in species in an environment ;  over time ;  <i>Tevnia</i> replaced by <i>Riftia</i> ;	<b>3</b>	<b>A</b> description of this

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Question	Answer	Marks	Guidance								
2(a)	<p><i>any four from:</i></p> <table border="1" data-bbox="327 284 1232 756"> <tr> <td data-bbox="327 284 439 331">1</td> <td data-bbox="439 284 1232 331">oceanic volcano emerges / volcanic island / seamount ;</td> </tr> <tr> <td data-bbox="327 331 439 451">2</td> <td data-bbox="439 331 1232 451">colonised by reef-building corals ; <u>fringing reef</u> develops ;</td> </tr> <tr> <td data-bbox="327 451 439 639">3</td> <td data-bbox="439 451 1232 639">island begins to sink ; <u>barrier reef</u> develops ; lagoon formed between reef and island ;</td> </tr> <tr> <td data-bbox="327 639 439 756">4</td> <td data-bbox="439 639 1232 756">island eventually disappears ; sea level rises / coral growth = rate of sinking / <b>AW</b> ;</td> </tr> </table>	1	oceanic volcano emerges / volcanic island / seamount ;	2	colonised by reef-building corals ; <u>fringing reef</u> develops ;	3	island begins to sink ; <u>barrier reef</u> develops ; lagoon formed between reef and island ;	4	island eventually disappears ; sea level rises / coral growth = rate of sinking / <b>AW</b> ;	<b>4</b>	<p>'read through' boxes when marking. Mark only 4 points.</p> <p><b>A</b> corals growing / colonising</p> <p><b>R</b> island eroded (but can still score 4 other MP's)</p> <p><b>A</b> lagoon in 3 or 4</p>
1	oceanic volcano emerges / volcanic island / seamount ;										
2	colonised by reef-building corals ; <u>fringing reef</u> develops ;										
3	island begins to sink ; <u>barrier reef</u> develops ; lagoon formed between reef and island ;										
4	island eventually disappears ; sea level rises / coral growth = rate of sinking / <b>AW</b> ;										
2(b)	<p><i>any three from:</i></p> <p>quoted temperature range between 16–35 °C ;</p> <p>clear water / silt-free water / low turbidity ;</p> <p>depth up to stated acceptable depth (up to 120 m) / light availability ;</p> <p>firm substrate for attachment ;</p> <p>movement of water (for feeding) / <b>AW</b> ;</p> <p>salinity between 32–38 ppt ;</p> <p>pH between 8.1–8.3 ;</p>	<b>3</b>	<p>do not accept 'suitable' for temp., light or substrate</p> <p><b>I</b> warm water unqualified</p> <p><b>I</b> low depths <b>A</b> shallow water</p> <p><b>A</b> description e.g. hard and stable surface</p> <p><b>I</b> 8.5</p>								

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
2(c)	<p><i>any two from:</i></p> <p>storm damage ;</p> <p>predation ;</p> <p>exposure to air ;</p> <p>temperature change / global warming ;</p> <p>acidification / decrease in pH ;</p> <p>coral bleaching ;</p> <p>named human damage ;</p> <p>eutrophication / description of ;</p> <p>abrasion from sediment / particulate matter ;</p> <p>sediment causes smothering of polyps / prevents feeding ;</p>	<b>2</b>	<p><b>A</b> crown of thorns (COT) starfish</p> <p><b>A</b> exposure during very low tides</p> <p>e.g. salinity rises due to desalination plant</p>
2(d)	<p><i>any two from:</i></p> <p><u>drilling</u> (on atolls / corals / reefs);</p> <p>geomorphological analysis ;</p> <p>carbon dating / Carbon 14 to find age ;</p> <p><b>AVP</b> ;</p>	<b>2</b>	<p><b>A</b> ref to fossil analysis</p> <p><b>A</b> stratigraphy</p> <p>e.g. surveying / seismic profiling</p>



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Question	Answer	Marks	Guidance
3(a)	use (light) <u>energy</u> (from the Sun) ; to synthesise organic molecules / biomass ;	<b>2</b>	<b>A</b> solar energy <b>A</b> fix carbon / carbon dioxide 'makes energy available to the rest of the food chain' gains 2 marks
3(b)	89.42 ;;	<b>2</b>	<b>A</b> 89.4 or 89 <b>A</b> with or without an indication of 'minus'  10,820 / 12,100 × 100 scores 1 mark
3(c)	<i>any three from:</i>  (used in respiration for) growth ;  (used in respiration for) movement ;  lost (to surroundings) as heat ;  lost (to surroundings) via excretion / faeces / waste ;  not all zooplankton are eaten ;  lost in respiration ;	<b>3</b>	allow 1 mark for respiration alone if growth / movement not mentioned  <b>I</b> if in terms of zooplankton
3(d)	five horizontal bars of decreasing width (widest bar at base) ;  labelled in correct order ;  stacked approximately centrally ;	<b>3</b>	<b>I</b> heights of bars

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
3(e)	<p><i>any three from :</i></p> <p>zooplankton increase, due to less predation / as they are herring food ;</p> <p>phytoplankton decrease, due to increased predation ;</p> <p>salmon decrease, due to reduced food supply ;</p> <p>orca decrease, due to reduced food supply ;</p> <p>idea of, no change if food chain not in isolation / <b>AW</b> ;</p>	<b>3</b>	<p>Orca mark must be consequential on salmon, e.g. salmon and orca decrease because they have less food = 1 mark only, but salmon decrease as they have less food, so orca then decrease = 2 marks</p>

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Question	Answer	Marks	Guidance
4(a)	monsoon (winds)	1	
4(b)	<i>any three from :</i> air over land is warmed ; lowering its density ; warm air / less dense air rises ; leaving lower air pressure over land ; (cooler) air drawn in from sea ;	3	
4(c)	sea temperature higher than land temperature / <b>ORA</b> ; so wind pattern reversed ;	2	<b>A</b> wind travels from land to sea

Question	Answer	Marks	Guidance
5(a)(i)	occupies upper shore / near high water mark ; able to withstand long periods of exposure / desiccation ; <b>OR</b> length insufficient to survive at greater depths ; <b>OR</b> green algae absorb red / long wavelength light, not available at depth ;	2	<b>A</b> reference to green algae absorbing less penetrating wavelengths of light

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Question	Answer	Marks	Guidance
5(a)(ii)	occupies middle section of shore ; able to withstand some exposure / desiccation ; <b>OR</b> air bladders allow buoyancy to assist in photosynthesis ; <b>OR</b> references to green pigments inability to absorb light at greater depths ;	<b>2</b>	<b>A</b> idea of, middle in length, so middle in terms of depth to be able to reach surface ;
5(a)(iii)	occupies lower section of shore ; length allows for better light gathering ; <b>OR</b> less able to cope with exposure / desiccation ; <b>OR</b> references to brown pigments ability to absorb light at greater depths ;	<b>2</b>	<b>A</b> fronds suspended in water for max. light absorption
5(b)(i)	oxygen (concentration) decreases as temperature increases / <b>ORA</b> ;	<b>1</b>	
5(b)(ii)	<i>any two from:</i> temperature (in shallow pools) may increase (significantly) ; lowering (concentration of) oxygen available / oxygen lost to atmosphere ; (insufficient oxygen) for respiration ;	<b>2</b>	<b>A</b> decreases solubility of oxygen

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Question	Answer	Marks	Guidance
5(b)(iii)	precipitation adds fresh water ; precipitation may reduce temperature ; dilutes sea water in rockpool / reduces salinity; so (dissolved) oxygen concentration increases ;	3	
5(c)	salinity may increase ; due to (evaporation) removing water ;	2	

Question	Answer	Marks	Guidance
6(a)(i)	high (tide) ;	1	
6(a)(ii)	<i>any three from:</i> pull of Moon ; reference to gravity / gravitational force ; causes bulging of seawater (around Earth's surface) / creates tidal bulge ; tides rise and fall as Earth turns / spins ; inertial forces causes bulge on opposite side ;	3	pull of Moon's gravity = 2 marks  <b>A</b> ref. to Moon moves around Earth

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Question	Answer	Marks	Guidance
6(b)	<p><i>any two from :</i></p> <p>(gravitational) pull of Sun combines with that of Moon ;</p> <p>if Sun and Moon aligned then exaggerates bulging / causes spring tides ;</p> <p>if Sun and Moon perpendicular / <b>AW</b>, water bulges less / causes neap tides ;</p>	<b>2</b>	
6(c)	<p><i>any three from :</i></p> <p>wind direction ;</p> <p>wind speed / strength ;</p> <p>air pressure ;</p> <p>size / depth / area / volume of body of water ;</p> <p>idea of, geomorphology</p>	<b>3</b>	<p>I tsunamis</p> <p>I wind unqualified</p> <p>e.g. shape of, coast / shore / seabed, slope of the coast ;</p>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
7(a)	parasite lives, in / on, host / ref. endo or ecto parasite ; parasite benefits / host organism harmed / lives at host organism expense ;	<b>2</b>	
7(b)(i)	decreased co-ordination <b>OR</b> decreased feeding ability ; increased chance of predation ; increased chance of parasite reaching next host / reduces time for parasite to reach next host ;	<b>3</b>	e.g blindness causes fish to starve
7(b)(ii)	<i>any two from:</i> parasite relies on hosts to provide nutrients / loss of nutrient source ; death of one host decreases chance of parasite, reaching next host OR completing its cycle ; (death of bird) prevents release of parasite eggs ; (death of snail) prevents release of parasite larvae ;	<b>2</b>	