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**MARINE SCIENCE**

**9693/11**

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.

**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
<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)

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Question	Answer	Marks	Guidance
1(a)	53 (%) ;	1	<b>R</b> incorrect units
1(b)	idea of, (percentage of species) increases and then decreases (as depth increases) ;  idea of, maximum (percentage) at 40–59 (m) ;	2	
1(c)	low / little, <u>light</u> ;  for <u>photosynthesis</u> ;  by <u>zooxanthellae</u> ;	3	<b>A</b> reference to darkness / <b>ORA A</b> No light / not in photic zone  <b>I need</b> (sun)light
1(d)	<i>any 3 of:</i> idea of, older bands are below newer bands in the core / <b>ORA</b>  idea of, bands vary in width ;  in response to changes in (environmental) conditions ;  idea of, (chemical) composition of band(s) can be analysed to show conditions at the time ;  idea that each band relates to a period of time ;  shows growth <u>rate</u> of coral ; (cores used for) carbon dating ;  cores can be <u>related / compared</u> to, fossil record / ancient tree rings / ice cores (to look for commonalities/trends) ;  geomorphological analysis ;	3	<b>I</b> weather  <b>A</b> bands show age of coral  <b>I</b> ref. to C <sup>12</sup>

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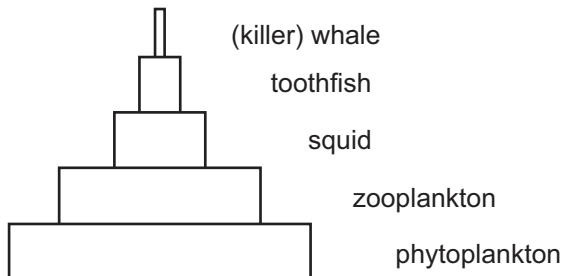
Question	Answer	Marks	Guidance
2(a)(i)	<p><i>any 3 of:</i></p> <p>minimum sea depth of 50 m ;</p> <p>sea surface (temperature) at least 26.5 °C / 80 °F ;</p> <p>idea of, rotating winds <b>OR</b> winds from different directions ;</p> <p>sufficiently far from equator to provide spin or twist / Coriolis effect ;</p> <p>low (air) pressure / low (air) pressure system ;</p> <p>moist air (over sea) ;</p> <p>low wind-shear / description of ;</p>	<b>3</b>	<p><b>A</b> sea at least 26.5 °C</p> <p><b>A</b> warm water at sea <u>surface</u></p> <p>warm sea water unqualified is insufficient</p> <p><b>A</b> circling / spiralling</p> <p><b>I</b> strong wind unqualified</p>

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Question	Answer	Marks	Guidance
2(a)(ii)	<p>any 4 of:</p> <p>(evaporation leads to) moist <u>air</u> / <u>atmosphere</u> ;</p> <p><u>warm</u> air rises ;</p> <p><u>creating</u> a low pressure area ;</p> <p>meets cooler air ;</p> <p>water <u>vapour</u> condenses ;</p> <p>(condensation) releases <u>latent</u> (heat) ;</p> <p>which provides energy ;</p> <p>(heat) warms cool air ;</p> <p>which increases evaporation ;</p>	<b>4</b>	<b>R</b> idea of making / producing energy
2(a)(iii)	<p>idea of, <u>cold</u> water (from below / deep water) ;</p> <p>comes to the <u>surface</u> / reduces <u>surface</u> temperature ;</p>	<b>2</b>	<b>A</b> reduces temp in the top layer / at the top
2(b)(i)	<p>30 ;</p> <p>km ;</p>	<b>2</b>	28 to 32 is acceptable range

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Question	Answer	Marks	Guidance
2(b)(ii)	<p>any 2 of:</p> <p>stronger wind / greater wind speed ;</p> <p>more rainfall ;</p> <p>more cloud (rather than sunny) ;</p> <p>cooler ;</p>	2	A more wind

Question	Answer	Marks	Guidance						
3(a)	<table border="1"> <thead> <tr> <th>organism</th> <th>trophic level</th> </tr> </thead> <tbody> <tr> <td>ice algae</td> <td>1</td> </tr> <tr> <td>Antarctic silverfish</td> <td>3</td> </tr> </tbody> </table>	organism	trophic level	ice algae	1	Antarctic silverfish	3	2	<p>A producer</p> <p>A secondary consumer</p>
organism	trophic level								
ice algae	1								
Antarctic silverfish	3								
3(b)(i)	<p>five horizontal bars of decreasing width (widest bar at base) ;</p> <p>labelled in correct order ;</p> <p>stacked approximately centrally ;</p>	3							
3(b)(ii)	<p>energy loss at each stage / only 10% transferred ;</p> <p>due to, respiration / movement / growth / excretion / not eaten ;</p>	2	A heat loss / waste (products)						



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Question	Answer	Marks	Guidance
3(b)(iii)	(eco-type) B ;  increased survival if, food chain / habitat / environment, is disrupted ;	<b>2</b>	<b>A</b> variety of food sources / can live in variety of habitats <b>I</b> more food (key is more TYPES of food)
3(c)	any valid statement regarding impact of reduced toothfish on either Weddell seals or silverfish or squid ;  appropriate <u>linking</u> statement(s) between change in, Weddell / silverfish / squid, populations and Adélie penguins ;  relevant effect on Adélie penguin numbers / population ;	<b>3</b>	<i>For example:</i> increase in population / numbers of Antarctic silverfish ; so more food for penguins ; increase in population / numbers of (Adélie) penguins ;  <b>OR</b> increased numbers of squid ; so silverfish population goes down, so less food for penguins ; fall in population / numbers of (Adélie) penguins ;
3(d)	idea of (removal would have) large effect on many other organisms in the food web ;  idea of, prey for many predators / provides food for many other organisms / <b>AW</b> ;	<b>2</b>	

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Question	Answer	Marks	Guidance
3(e)	<p><i>any 3 of:</i>            taken up / absorbed by, phytoplankton / ice algae / producers ;</p> <p>(passes to) zooplankton / squid (then to toothfish) ;</p> <p>taken up / absorbed, through <u>gills</u> of toothfish ;</p> <p>(used for) formation of bones / teeth ;</p>	<b>3</b>	<b>R</b> consumed by producers / phytoplankton / ice algae

Question	Answer	Marks	Guidance
4(a)	<p>circular / ring / round ;</p> <p>lagoon ;</p>	<b>2</b>	<p><b>A</b> idea of same shape</p> <p><b>A</b> both surrounded by water ;</p>
4(b)(i)	<p>idea of, suitable substrate e.g. volcano at / near surface, island, coastline, landmass ;</p> <p>suitable conditions for growth <b>OR</b> at least one named condition for growth ;</p> <p>idea of, colonised by corals / corals (start to) grow (on substrate) ;</p>	<b>3</b>	e.g. shallow, suitable temperature, clear water remember polyps are corals
4(b)(ii)	<p>(deep(er)) lagoon / body of water / channel of water present (barrier reef) ;</p> <p>idea of, a greater distance from, shore / coastline / landmass / island / volcano (barrier reef) ;</p>	<b>2</b>	<p><b>A</b> fringing reef has no lagoon <b>OR</b> shallower / smaller lagoon</p> <p><b>A</b> idea of, fringing reef attached directly to shore</p>

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Question	Answer			Marks	Guidance
5(a)	type of plate boundary	description	geological feature	3	
	<b>divergent / constructive ;</b>	two plates move away from each other	<b>(ocean) ridge / rift valley / volcano / hydrothermal vent ;</b>		
	transform or conservative	<b>idea of, two plates sliding / AW past one another ;</b>	earthquakes		
5(b)(i)	trench ;			1	
5(b)(ii)	opposing arrows pointing towards each other ;			1	
5(b)(iii)	<p><i>any 3 of:</i></p> <p>subduction / one plate is <u>forced under</u> other / one plate <u>slides under</u> another ;</p> <p>converging plates / <b>AW</b> ;</p> <p>(due to) varying densities of plates ;</p> <p>melting (of subducting plate / plate A) ;</p>			3	<p>I one plate sinks under another</p> <p>I weight of plates R if densities are the wrong way round</p>

Question	Answer	Marks	Guidance
6(a)	runoff ;	1	

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Question	Answer	Marks	Guidance
6(b)	<p><i>any 1 of:</i>            nitrate ;            phosphate ;            potassium ;            magnesium ;  <b>A</b> sulfate ;  <b>A</b> carbon ;</p>	<b>1</b>	<p><b>A</b> nitrogen  <b>A</b> phosphorus</p>
6(c)	<p><i>any 3 of:</i>            lack of oxygen / not enough oxygen / water becomes anoxic ;            (for) respiration ;            lack of (dissolved) nutrients ;            algae produce toxins / poisons ;            algae block out light ;            (for) photosynthesis ;            idea of, algae smother / clog (e.g. smother polyps, fish gills) ;</p>	<b>3</b>	<p><b>I</b> bacteria use up large amounts of oxygen (as this is in the figure)  <b>I</b> algae use up oxygen  <b>A</b> any named mineral ions</p>

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
6(d)	<i>any 2 of:</i> <i>(growth will increase because...)</i> rainfall increases (volume of) runoff ;  idea of, more, fertilisers / nutrients, washed into sea ;  <i>(growth will decrease because...)</i>  increased rainfall dilutes ocean water ;  reduces concentration of nutrients (therefore reduced growth of algae) ;	<b>2</b>	

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Question	Answer	Marks	Guidance
7(a)	<p><i>any 3 of:</i>  supplies / replenishes, oxygen ;  and, nutrients / food ;  (oxygen / nutrients) for respiration ;  maintains / decreases, temperature ;  removes waste (products) ;  dispersal of, larvae / gametes / mates <b>OR</b> idea of, allows colonisation ;  maintains / decreases, salinity ;  idea of, prevents desiccation ;</p>	<b>3</b>	<p><b>A</b> removes CO<sub>2</sub> / prevents CO<sub>2</sub> build-up  <b>A</b> eggs / sperm for gametes</p>
7(b)	<p>little sedimentation (compared to erosion) <b>OR</b> any particles brought in quickly washed away (on rocky shore) ;  more wave action / more exposed (on rocky shore) ;  non-estuarine (rocky shore) ;  (usually) steeper incline (rocky shore) ;  hard substrate / large(r) substrate particles (rocky shore) / idea of, resistant to erosion ;</p>	<b>2</b>	<p>Assume answer is in terms of rocky shore, unless clearly stated otherwise. <b>ORA</b> is allowable if clearly talking about muddy shores.</p> <p><b>A</b> idea of, resistant to weathering  <b>A</b> muddy shore has finer particles as <b>ORA</b> for larger particles</p>

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Question	Answer	Marks	Guidance
7(c)	<p><i>any 2 of:</i></p> <p>less (interspecific) competition ;</p> <p>narrower range of food sources (to specialise on) ;</p> <p>less variation within habitat / habitat more uniform ;</p>	<b>2</b>	<p><b>R</b> idea of, intraspecific competition</p> <p><b>A</b> nutrient sources / energy sources for food sources</p>

Question	Answer	Marks	Guidance
8(a)(i)	thermocline ;	<b>1</b>	
8(a)(ii)	<p><i>any 3 of:</i></p> <p>1 salinity <u>at surface</u> is high(er) but density is low ;</p> <p>2 at / near the <u>surface</u>, as salinity decreases, density increases ;</p> <p>3 <u>at (greater) depth(s)</u>, as salinity increases density increases ;</p> <p>4 as temp. decreases, density increases / cold water is more dense / <b>ORA</b> ;</p> <p>5 (usually more saline water is denser ;</p> <p>6 <u>at surface</u>, salinity and temperature are highest ;</p> <p>7 <u>near surface</u>, as temperature decreases, salinity decreases ;</p> <p>8 <u>at (greater) depth(s)</u>, as temperature decreases, salinity increases ;</p>	<b>3</b>	

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Question	Answer	Marks	Guidance
8(b)	<p><i>any 3 of:</i></p> <p>(greatest oxygen concentration near surface) due to more light (energy) for photosynthesis ;</p> <p>(atmospheric) dissolution at surface ;</p> <p>turbulence / wave action, increases amount of oxygen ;</p> <p>(reducing oxygen with depth) due to respiration / decay ;</p> <p>ref. to / description of, compensation point ;</p> <p>increasing oxygen solubility (with depth) as water is colder / higher pressure ;</p>	3	<p><b>ORA</b></p> <p><b>A</b> enters at surface from the atmosphere</p> <p><b>I</b> turbidity</p>