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**MARINE SCIENCE**

**9693/23**

Paper 2 AS Data Handling and Free-Response

**May/June 2019**

MARK SCHEME

Maximum Mark: 50

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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 **7** 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.

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>	<b>Guidance</b>
1(a)	(animal) that, hunts / captures / traps / kills ;  <u>eats / consumes / feeds on</u> , other, animals / prey / consumers / named animal ;	<b>2</b>	
1(b)(i)	(rapid) drop / fall ; 80% to 14% / by 66% ;	<b>2</b>	<b>I</b> describing all of the points <b>A</b> 81% to 14% / by 67% <b>A</b> other manipulation of data
1(b)(ii)	<i>any two from</i> increase in COTS causes fall in % live coral cover ; (decrease in coral cover) causes decrease in COTS ; (decrease in COTS) which allows increase in % live coral cover ; <i>idea of</i> , COTS population response lagging slightly behind coral ;	<b>2</b>	
1(c)(i)	<i>any two from</i> small reef fish lost / eradicated ; ref. eventual decline in lionfish ; description of impacts on other species ;	<b>2</b>	<b>I</b> small reef fish decrease / decline
1(c)(ii)	removal of lionfish allows increase in small reef fish numbers ; number of small reef fish continue to decline if no control ;	<b>2</b>	

Question	Answer	Marks	Guidance
2(a)	ref. new biomass ; ref. rate / quantity ;	2	
2(b)(i)	both <b>axes</b> labelled ; <b>I</b> axis orientation all bars <b>plotted</b> correctly ( $\pm \frac{1}{2}$ small square) ; <b>bars</b> same width and equidistant between groups ; <b>scale</b> : bars to cover at least half grid, linear scale y-axis ; <b>key</b> to label bars ;	5	within group, bars can touch but between groups bars must not touch  if line graph plotted, max 4, MP1, 2, 4 and 5
2(b)(ii)	<i>any two from</i> initial increase / (approx.) constant ; then falls (to approx. constant value) ; manipulate figures 22 / 24 to 13 / 12 ;	2	
2(b)(iii)	<i>any one from</i> food more widespread ; differences in feeding efficiency ; less energy used up in hunting ; AVP ;	1	

Question	Answer	Marks	Guidance
3(a)	<p><i>any five from:</i></p> <ol style="list-style-type: none"> <li>1 <i>idea of</i>, (named) salt / (named) mineral input from volcanoes (increases) salinity ;</li> <li>2 volcanic gases contain, carbon dioxide / sulfur dioxide / hydrogen sulfide / hydrogen chloride ;</li> <li>3 gases dissolve / (atmospheric) dissolution ;</li> <li>4 carried into sea water <u>in rain</u> water / reference to <u>hydrological cycle</u> ;</li> <li>5 (ions) enter water directly through underwater volcano / hydrothermal vent ;</li> <li>6 <i>idea of</i>, (sea) water becomes more acidic / decreased pH ;</li> <li>7 gases are less soluble in hot water ;</li> <li>8 <i>idea of</i>, a lot of volcanic ash would raise pH ;</li> </ol>	<b>5</b>	I mixing
3(b)	<p><i>any four from</i></p> <p>evaporation increases salinity ;  evaporation removes water (leaves salt behind) ;  ref. shallow seas / coastal ;  direct precipitation adds (fresh) water / (fresh)-water run-off / melting glaciers (from precipitation) ;  lowers salinity ;</p>	<b>4</b>	effect is greater in shallow seas / along coastline
3(c)	<p><i>any six from</i></p> <p>high(est) at surface ;  due to turbulence ;  lots of producers / primary productivity (in surface layers) ;  photosynthesis (releases oxygen) ;  decrease with increasing depth (to oxygen minimum layer) ;  lots of respiration vs photosynthesis ;  usually at 500m (allow 100 to 1000m) ;  at greater depths starts to increase ;  lack of food – less respiration ;  increase solubility with lower temperatures ;  increasing pressure increases solubility ;</p>	<b>6</b>	

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Question	Answer	Marks	Guidance
4(a)	<p><i>any four from</i>            ref. deposition / sedimentation, greater than erosion ;            loose deposit / unconsolidated ;            ref. to size range of particles ;            shifting substrate / movement / unstable ;            ref. shallow slope / how slope allows for deposition ;            ref. action of tides / waves / storms / currents, related to erosion and/or movement ;            ref. long shore drift ;</p>	<b>4</b>	
4(b)	<p><i>any seven from</i>            ref. rock / stable substrate ; (idea that substrate isn't shifting)            ref. allows for attachment ;  <i>idea of</i>, resistance to erosion ;  <i>idea of</i>, shape of rocks creates habitat (e.g. rock pools, overhangs) ;            (exposure to) wave action ;            tides / tidal cycle, affects length of exposure ;            (exposure to) desiccation ;            effect of variable temp. / salinity / dissolved oxygen ;  <i>idea of</i>, zonation ;            (<i>because</i>) length of exposure to air impacts on position up the shore ;             ref. competition / predation (sets lower limit) ;            (community made up of) organisms with specific adaptation(s) / particular niches available ;</p>	<b>7</b>	<p><b>A</b> stated hard rock type e.g. granite</p> <p><b>A</b> differing degrees of tolerance to temp / drying impacts position up shore</p>
4(c)	<p><i>any 4 from:</i>            ref. to example of marine ecosystem with high biodiversity(e.g. coral reef) ;            (high biodiversity =) many different <u>species</u> (within one ecosystem / habitat);  <u>high degree competition</u> ;  <i>idea of</i>, narrow niches, prevent overlap <b>OR</b> reduce / avoid competition ;            ref. to specialist feeders / only eats coral / may only feed on one type of food ;</p>	<b>4</b>	