MARINE SCIENCE **9693/22**

Paper 2 AS Data Handling and Free Response **May/June 2018**

MARK SCHEME

Maximum Mark: 50

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 **10** printed pages.

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.

Question	Answer	Marks	Guidance
1(a)	*any three of:* producers / trophic level 1 ; capture <u>chemical energy</u> (of dissolved minerals) ; idea of, make biomass / organic compounds ; idea of, making energy available (to rest of food chain) ;	3	**R** idea of energy production
1(b)	both **axes** labelled with units ; linear **scale** ; all points **plot**ted correctly ; points joined with ruled **lines** ;	4	plots to cover at least half grid +/– half square **R** extrapolation beyond +/– half square Max 3 for other types of graph (not MP4)
1(c)	*any two of* general trend increases ; rapid increase at first then levels off / slower after 14 months ; manipulation of data ;	2	

Question	Answer	Marks	Guidance
2(a)	mutualistic / mutualism ;	1	
2(b)(i)	increase in algae (cover) ; decrease in coral (cover) ; decrease in number of fish (species) ;	3	
2(b)(ii)	*any two of* algae block light (to zooxanthellae) ; (which) prevents photosynthesis ; prevent settlement of new coral ; prevent polyps from feeding / blocks mouths of polyps ;	2	
2(c)(i)	idea of, counting / estimate / calculate (%) cover ; *any one of* idea of, quadrats ; appropriate sample area (e.g. per m^2) ; ref. to how placed – transect / random ; idea of, repeats **+** calculating mean ;	2	
2(c)(ii)	idea of, species present is similar to <u>previous levels</u> / **AW** ; idea of, coral cover returns to (nearly) <u>previous levels</u> / **AW** ; idea of, fish returns to (nearly) <u>previous levels</u> / **AW** ; idea of, algae cover returns to <u>previous levels</u> / **AW** ;	2	
2(c)(iii)	fish eat algae (so as algae changes, fish density changes) ;	1	**A** clear description that shows the data of fish and algae are correlated

Question	Answer	Marks	Guidance
3(a)	*any five of* sea surface (temperature) at least 26.5 °C / 80 °F ; low (air) pressure / low (air) pressure system ; minimum sea depth of 50 m ; idea of, sufficiently far from equator to provide spin or twist / Coriolis effect ; idea of, rotating winds **OR** winds from different directions ; evaporation ; (gives rise to warm) moist air ; (air) rises and cools **OR** rises and draws in/up cooler air ; condensation ; release of latent heat ; idea of, this energy perpetuates cyclone further ; low wind-shear ;	5	**A** sea at least 26.5 °C **A** warm <u>water</u> at <u>surface</u> warm sea water unqualified is insufficient **A** circling / spiralling **I** strong wind unqualified

Question	Answer	Marks	Guidance

3(b)	*any five of*
	ecosystem
	    interaction between ;
	
	    (community of) living organisms **AND** non-living components / biotic **AND** abiotic factors ;
	
	    linked through, nutrient cycles ;
	
	    (and) movement of, energy / nutrients, through, food chains / food webs ;
	
	biodiversity
	    ref. number of species ;
	
	    idea of, ref. evenness / relative abundance of each / **AW** ;
	
	    (in an) ecosystem / habitat ;
		5	

3(c)	*any five of* idea of, mangroves live in intertidal regions / delta regions / salt tolerant ; idea of, interlocking / thick / complex, root (system) ; idea of, protect from wave (action) ; energy dissipation ; reduction in, current / flow, speed ; reduce erosion ; increase sedimentation / fine sediment accumulates ; **AVP** ;	5	e.g. ref. extreme events

Question	Answer	Marks	Guidance
4(a)	*any five of* nutrient rich water ; ref. named nutrient ; rise up from depth / upwellings ; idea of, replenishing nutrients in surface ; stimulates growth / reproduction of phytoplankton / producers ; increases productivity ; increase food / energy / (zoo)plankton, for fish (such as anchoveta) ;	**5**	

Question	Answer	Marks	Guidance
4(b)	*any five of* successful strategy for feeding / helps feeding ; by, idea of, more eyes to spot the food ; by, idea of, corralling prey / splitting up schools of prey fish / break-up bait balls ; successful predator avoidance / helps avoid predation / reduces predation ; by, idea of, more eyes to spot the predators ; by, idea of, large numbers will confuse predator ; by, idea of less chance of predation on an individual / forming a bait ball ; successful strategy for reproduction / assists in reproduction / easier reproduction ; due to, proximity of mates / increased chance of finding a mate / easier to find a mate ; increase chance of fertilisation ; (increase) hydrodynamic efficiency / reduce drag ; saves energy / increase swimming speed (for same amount of energy) ;	5	

Question	Answer	Marks	Guidance
4(c)	*any five of* winds reverse / change direction ; decreased wind from E / change in trade winds ; less upwelling ; ref. warmer (surface) water (over Humboldt Current) ; lowers thermocline / thermocline found deeper in ocean ; prevents nutrient rich water reaching surface / less nutrients at surface ; reduction in phytoplankton / productivity ; decreased zooplankton / decreased food source (for anchoveta) ; increased rainfall ; (may) alter nutrient availability / salinity ; reduction in light <u>energy</u> ;	5	