Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

MARINE SCIENCE **9693/03**

Paper 3 Structured Questions **October/November 2018**

MARK SCHEME

Maximum Mark: 75

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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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.

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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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Question	Answer	Marks	Guidance
1(a)(i)	*any **3** of*: light energy trapped by chlorophyll / pigments ; (energy) used to convert / combine carbon dioxide and water ; to sugar / glucose / carbohydrate ; ref. to enzymes ;	**3**	
1(a)(ii)	phosphorus / phosphates ;	**1**	**A** nitrogen / nitrates
1(b)(i)	*any **2** of:* more light is absorbed (in the upper layers) ; part **A** had more sediment / turbidity ; part **A** more phytoplankton / primary producers ; part **A** rougher water ;	**2**	**I** light intensity
1(b)(ii)	*any **4** of:* ref. to light (intensity) as main limiting factor ; there is not enough / less light for photosynthesis / **ora** ; less photosynthesis can occur / **ora** ; population growth (of phytoplankton / producers) slower / **ora** ; (less phytoplankton) so less zooplankton / less fish in area / **ora** ; temp is not likely to be a limiting factor (because data taken at same time of year) ;	**4**	**I** ref.to wavelength **A** ref. to less biomass

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Question	Answer	Marks	Guidance
2(a)(i)	glucose + oxygen ; carbon dioxide + water ;	**2**	
2(a)(ii)	to release energy in glucose / food ;	**1**	**A** provide / supplies energy **R** energy production
2(b)	*any **2** of:* thin ; (so) less distance for gases to travel ; have a large surface area to volume ratio ; wavy edges increase surface area ; any ref. to diffusion ;	**2**	
2(c)	*any **3** of:* oxygen concentration in water in burrow is very low / lower ; (little wave action) to mix oxygen from air and sea water ; external gills increase the surface area for gaseous exchange / oxygen absorption ; lugworms have a small(er) surface area to volume ratio (compared to flatworms) ;	**3**	**I** anoxic

Question	Answer	Marks	Guidance
3(a)(i)	external ;	**1**	

Question	Answer	Marks	Guidance
3(a)(ii)	*any **2** of:* uses a lot of energy to produce a lot of gametes ; many gametes, lost / wasted / predated upon ; chance of fertilisation limited ;	**2**	**A** ***ecf*** if internal fertilization stated in **(i)**
3(a)(iii)	1 **B** ; 2 **D** ; 3 **A** and 4 **C** ;	**3**	
3(a)(iv)	*advantage: any **1** of:* carried to new habitats ; good food supply ; *disadvantage: any **1** of:* idea of increased risk of predation ; lost / carried to unsuitable locations ;	**2**	**I** to escape predators
3(b)(i)	most larvae settle where there are reef sounds **or** least larvae settle where there are no sounds ; (but) not much difference between no sound (**Z**) and off-reef sounds (**Y**) / almost the same number settle in **Z** and **Y** ; manipulated data quote ;	**3**	e.g. 0.10 difference between **X** and **Y** / 0.12 difference between **X** and **Z**
3(b)(ii)	more likely to find a suitable, area / habitat ; detail of why this area might be more suitable ;	**2**	e.g. suitable substrate for attachment / more food available in reef areas / other oysters present for breeding

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Question	Answer	Marks	Guidance
4(a)	to be able to identify / find each (individual) FAD ; idea of, frequency is only known to the owner of the buoy ;	**2**	 **A** to avoid use by other fishing fleets ;
4(b)	*any **2** of:* concrete blocks make FADs very heavy so less likely to be swept away ; type **A** is below the surface so less wave action ; type **B** has curved rope / extra rope to allow for movement of buoy over waves ;	**2**	 aggregator flexible so less resistance to waves
4(c)	palm frond are cheap / free / biodegradable / do not pollute the environment / do not pose a hazard to marine animals ;	**1**	**ora** re. ropes causing entanglement **AW**
4(d)(i)	*any **2** of:* will provide, year round / regular, supply of fish ; less fishing pressure on reefs and seagrass beds ; so more fry / juveniles survive to adulthood ; offers a sustainable fishery ;	**2**	
4(d)(ii)	*any **2** of:* local community will monitor / repair / prevent theft of their FAD ; local community in charge of fishing rules and regulations ; offers more opportunities for employment ; AVP ;	**2**	 e.g. no / reduces conflict with other fishermen from neighbouring communities ;

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Question	Answer	Marks	Guidance
5(a)	*any **2** of:* overfishing of wild fish stocks / aquaculture more sustainable ; increase in human population / more demand ; easier / cheaper to rear fish ; reliable food source / constant supply ; less dangerous ; people are better trained / more training available ;	**2**	allows wild stocks to recover
5(b)(i)	*any **2** of:* habitat destruction ; loss of coastal defences / increased coastal erosion ; pollution from wastes / toxins / fertiliser / antibiotics / drugs ; over-exploitation of food resources ; escape of fish **and** an effect ;	**2**	**I** clearing mangroves **I** eutrophication unqualified e.g. spread disease / parasites

Question	Answer	Marks	Guidance
5(b)(ii)	*any **3** of:* *economy improved:* by low cost of production (of some seafood) ; export of (high value) seafood ; *poverty increased:* ***MAX 2*** government policy / overseas buyers taking land for aquaculture ; loss of income / food sources from reduced fishing / other uses of coastal resources ; low wages for workers as owners keep profits ;	**3**	
5(c)	*any **3** of:* waste food / fish faeces will be eaten by sea urchins ; (as a result) less decomposition by bacteria ; less likely to reduce oxygen content ; waste / decomposition produce, nitrate and phosphate, taken up by kelp ; (as a result) less likely to encourage algae growth / algal blooms / eutrophication ;	**3**	**A** references to less pollution from wastes
5(d)	*any **3** of:* more carbon dioxide dissolves in sea water ; forming carbonic acid ; water becomes more acidic (pH falls) ; calcium carbonate in shells dissolves in the water ; prevents the formation of shells ;	**3**	**I** damages shells

Question	Answer	Marks	Guidance
6(a)	*any **3** of:* marine herbivores eat the excess algae ; so less chance of overgrowth of algae ; more space for coral growth ; less algae to block out light ; required for photosynthesis in zooxanthellae / required for coral growth ;	**3**	 **I** ref. to eutrophication unqualified
6(b)	increasing volume of nitrogen (in sewage) used to make protein (for growth) ;	**1**	**A** used to make DNA / amino acids **A** phosphate used for DNA
6(c)(i)	1994 ;	**1**	
6(c)(ii)	*any **3** of:* not very effective as increases before it decreases / increases until 1977 and then (steep) decrease to 1978 ; as waste water / sewage is treated and stored in well ; less effective as nitrogen discharge increases from 1978 to 1995 / after 1978 ; well is too small / leaks ; so nitrogen-rich water escapes into groundwater / into the sea around the coral reef ; correct data quote ;	**3**	
6(d)	$\frac{382.78}{922.76} \times 100$; = 41.48 (%) ;	**2**	**A** both marks for correct answer with no working

Question	Answer	Marks	Guidance
6(e)	*any **2** of:* less fresh water used, so less cost to hotel ; lower fertiliser costs as waste water is used on golf courses and gardens ; increased income from tourism, as reef recovers / gardens / golf courses greener / hotel marketed as eco-friendly ;	**2**	more recycled water used which is cheaper

Question	Answer	Marks	Guidance
7(a)	*gene:* a length of DNA (deoxyribonucleic acid) that codes for a specific protein product ;	**1**	
7(b)(i)	growth (promoting gene) / gene for growth hormone ; promoter (gene) ;	**2**	
7(b)(ii)	increased growth (rate) ;	**1**	**A** increased size of salmon
7(c)	idea of, a strategy to cope with the possible dangers of GMOs to human health and to the environment ; *any **2** of:* salmon bred and grown in land-based facilities ; GM salmon separated from wild population ; GM salmon are sterile ;	**3**	
7(d)	*any **1** of:* GM grows faster as more fish produced in less time / higher yield (so more income) ; (idea of grows faster) so less money spent on feed ;	**1**	reach market size faster / can be sold sooner

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Question	Answer	Marks	Guidance
7(e)	*any* **2** *of:* can be produced to meet demand ; idea of, less wild salmon caught so, no decrease in numbers / more survive to breed ; allows wild population to recover ;	**2**	