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MARINE SCIENCE **9693/01**

Paper 1 AS Structured Questions **October/November 2017**

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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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
R	reject
A	accept (answers that are correctly cued by the question or guidance you have received)
I	ignore (mark as if this material was not present)
AW	alternative wording (where responses vary more than usual, accept other ways of expressing the same idea)
AVP	alternative valid point (where a greater than usual variety of responses is expected)
ORA	or reverse argument
underline	actual word underlined must be used by the candidate (grammatical variants excepted)
MAX	indicates the maximum number of marks that can be awarded
+	statements on both sides of the **+** are needed for that mark
OR	separates two different routes to a mark point and only one should be awarded
ECF	error carried forward (credit an operation from a previous incorrect response)

Question	Answer	Marks	Guidance
1(a)(i)	March **AND** April ;	**1**	
1(a)(ii)	*any 3 of:* Jan to Aug – non-landfall higher each month / **ORA** ; Sep to Dec – landfall higher each month / **ORA** ; smallest difference in March ; greatest difference in August ; **AVP** ;	**3**	any valid comparison
1(a)(iii)	(seas) warm enough in July and Aug / **ORA** ; **OR** convergence of trade winds in July (in Philippine Sea) ;	**1**	'hot air' unqualified is insufficient
1(b)(i)	*any 2 of:* destroy crops ; cause floods ; physical damage to buildings / infrastructure / example of ; deaths ; (coastal) erosion ; disruption of economic activity ;	**2**	

Question	Answer	Marks	Guidance
1(b)(ii)	*any 2 of:* reduce drought ; reduce temperatures ; refill reservoirs / lakes / rivers ; idea of, increased land suitable for crops ; rebuilding storm resistant infrastructure ;	**2**	**A** idea of, (fresh) water replenishment
1(c)	*any 2 of:* idea of, meets resistance (from trees or buildings) ; idea of, less energy ; (due to) no evaporation (over land) ; less water to sustain cyclone ;	**2**	

Question	Answer	Marks	Guidance
2(a)	rate ; at which, organic material / biomass, is produced ; by phytoplankton / producers ;	**3**	idea of 'time' must be present for MP1 **A** autotroph or chemosynthetic organism
2(b)(i)	decreases then increases ;	**1**	
2(b)(ii)	as (sun)light increases, phytoplankton increases ; **+** *any 2 of:* phytoplankton, use / need / absorb, (sun)light ; for photosynthesis ; increased photosynthesis allows growth / faster reproduction ; becoming limited by available nutrients ;	**3**	idea of, more growth / reproduction is needed
2(b)(iii)	nutrient level falls ; **+** *any 2 of:* more nutrients absorbed / used (by phytoplankton) ; increase in phytoplankton ; (nutrients used by) phytoplankton for (rapid) growth / reproduction ; no mixing of water at that time of year ;	**3**	**A** 'producer' for 'phytoplankton **A** increased productivity of phytoplankton
2(b)(iv)	line increases (from Jan) then decreases (to June) ; with peak between mid-March and May ;	**2**	

Question	Answer	Marks	Guidance
2(b)(v)	*any 3 of:* zooplankton rises as, phytoplankton / food, does ; zooplankton (almost) always below phytoplankton level / **ORA** ; zooplankton falls as phytoplankton falls ; ref. to lag / phytoplankton peaks before zooplankton ;	**3**	

Question	Answer	Marks	Guidance
3(a)(i)	volcanic island / volcano / cone ;	**1**	
3(a)(ii)	*any 4 of:* (stage 2) the island / volcano / cone, collapses / erodes / subsides ; ref. to coral growth ; enabled by suitable substrate / conditions for coral growth ; fringing reef formed ; ref. to lagoon ; (stage 3) (fringing reef) becomes a barrier reef ; (stage 4) island collapses ; barrier reef becomes an atoll ;	**4**	description can start from any stage BUT if not in correct sequence, MAX 3

Question	Answer	Marks	Guidance
3(b)	*any 2 of:* wave action / storms ; abrasion (by sediments) ; breakage by parrot fish ; named human activity that breaks coral skeleton ; acidity of sea water / description of ;	**2**	 e.g. anchoring, trampling from divers, dredging, dynamite fishing **A** increased CO_2 in sea water
3(c)(i)	as age increase, % ^{14}C decreases / **ORA** ;	**1**	
3(c)(ii)	10 000 (±100) ; construction lines leaving the *x* **and** *y* axes ;	**2**	**ECF** construction line mark can be awarded if it correctly matches incorrect MP1
3(c)(iii)	5700 to 6000 (years) ;	**1**	
3(c)(iv)	idea of, too little ^{14}C for (accurate measurement) ;	**1**	**I** idea of, none left

Question	Answer	Marks	Guidance
4(a)(i)	<table><tr><th>organism</th><th>predator</th><th>primary consumer</th><th>secondary consumer</th><th>prey organism</th></tr><tr><td>tuna</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr><tr><td>zooplankton</td><td></td><td>✓</td><td></td><td>✓</td></tr><tr><td>squid</td><td>✓</td><td></td><td>✓</td><td>✓</td></tr><tr><td>sardines</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td></tr></table> ; ; ; ;	**4**	Ignore primary and secondary columns 1 mark per correct row
4(a)(ii)	*any 2 of:* anchovies ; sardines ; squid ; herring ; tuna ;	**1**	
4(b)	*any 3 of:* easy access to / find, mates for reproduction ; easier for fish to find food ; hydrodynamic efficiency / less energy used when swimming ; provides protection from predators ; easier to see predators / **AW** ;	**3**	**A** safety in numbers

Question	Answer	Marks	Guidance
4(c)(i)	parasite benefits / **AW** ; organism which lives in / on another, **OR** has a host ; which is harmed / **AW** ;	**3**	
4(c)(ii)	23.5 ;	**1**	**A** 23.25–23.75
4(c)(iii)	older the fish, the longer the larvae / **ORA** ;	**1**	**A** positive (linear) relationship / correlation **OR** directly proportional

Question	Answer	Marks	Guidance
5(a)	<table><tr><th>biological use</th><th>nutrient</th></tr><tr><td>to make proteins amino acids / DNA</td><td>nitrogen ;</td></tr><tr><td>to make chlorophyll</td><td>magnesium ;</td></tr><tr><td>to make shells / bones / teeth</td><td>calcium ;</td></tr></table>	**3**	**A** other valid nutrients **A** carbon once only
5(b)	*any 4 of:* named, ion / nutrient / pollutant ; affects acidity / pH ; affects salinity / salt concentration ; decreases oxygen concentration (from eutrophication) ; affects surface water (more than deep water) ; effects occur close to land ;	**4**	

Question	Answer	Marks	Guidance
5(c)	decrease in temperature of water at surface ; **+** *any 3 of:* increase in density ; cold water sinks ; replaced by water moving up from below / **AW** ; decrease in density ; ref. to convection ;	**4**	**A** water is cooled at surface **A** idea of, water moving up from depth

Question	Answer	Marks	Guidance
6(a)	*any 3 of:* fit between continental coastlines ; magnetic ‘stripes’ on sea floor ; distribution of fossils / living organisms ; plate boundaries moving can be measured ; seismic / volcanic / geothermal activity greatest along plate boundaries ; formation of ridges or mountain ranges as evidence of moving plates ; **OR** idea of, age of rock at ridges and ranges correlates with hypothesised formation ;	**3**	 **A** idea of, jigsaw pieces

Question	Answer	Marks	Guidance
6(b)(i)	*any 4 of:* ref. to mid-ocean ridges ; ref. to divergent plate boundaries ; sea water enters cracks in sea bed ; heated by magma ; picks up minerals / **AW** ; (hot) water forced / pushed (out of sea bed) ; meets cold water ; minerals precipitate out / **AW** ; solidify to form deposits / chimney ;	**4**	**A** heated by mantle
6(b)(ii)	no light for photosynthesis ; **+** *any 2 of:* idea of, extreme environment and plants do not have correct adaptations ; hydrogen sulphide / low pH, (toxic to plants) ; high pressure (would crush plants) ; high temperature (would denature enzymes) ;	**3**	**I** low light

Question	Answer	Marks	Guidance
6(b)(iii)	chemosynthesis ; **+** *any 2 of:* ref. to chemical (potential) energy ; from dissolved minerals / named minerals ; (bacteria) make carbohydrate / named carbohydrate available ;	**3**	 e.g. hydrogen sulphide **A** sugar / food **I** sucrose