Cambridge International AS & A Level

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**MARINE SCIENCE** **9693/03**

Paper 3 A2 Structured Questions **May/June 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.

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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) | fix the algae to the substratum / **AW** / stops alga being washed away by current ; | **1** | |
| 1(a)(ii) | idea of, holding up the algae / gives buoyancy (to the thallus) **ORA** ;<br><br>idea of, more / enough light (for photosynthesis) ; | **2** | |
| 1(a)(iiii) | 7 ± 0.1 cm (length of line A to B cm) ×10 (scale line) ;<br><br>= 70 ± 1 cm ; | **2** | |
| 1(a)(iv) | idea that: light penetration decreases with depth / different wave lengths go to different depths ;<br><br>(so any deeper) not all of the thallus would get enough light for photosynthesis / light highest / more light in photic zone ; | **2** | |
| 1(b) | *any **3** of:*<br><br>(primary) producers (in the marine food web / chain / ecosystem) ;<br><br>fix carbon / introduce energy into the ecosystem ;<br><br>provide food for (a wide range of) organisms / species / named species ;<br><br>provides a habitat / shelter / home / for marine organisms / number of species / named species ;<br><br>nursery area for a number of species / named species ;<br><br>decomposition provides source of nutrient / mineral salts in the ocean ;<br><br>provide oxygen for marine organisms to respire ;<br><br>reduce water movement so prevent small organisms from being washed away by current ; | **3** | e.g. turtles, fish<br><br>e.g. small fish, sea urchins<br><br>e.g. eels and turtles |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 1(c) | *any **2** of:*<br>spread diseases ;<br>idea of **out**competes local species (of Sargassum) / **AW** ;<br>grows very fast / uses more resources (than local species of algae) ; | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(a) | *any **3** of:*<br>mouth open **and** operculum closed / moves in ;<br>floor drops increases volume (in buccal cavity / mouth) ;<br>low pressure in mouth causes water to move in ;<br>mouth closes and floor lifts ;<br>(this) decreases volume / increases pressure forcing water back over gills ;<br>operculum opens / moves out to let water out ; | **3** | |
| 2(b)(i) | oxygen **+** water ; | **1** | |
| 2(b)(ii) | idea of, operculum movement shows the ventilation rate ;<br>respiration uses the oxygen (taken in at the gills) ;<br>idea of, more respiration **OR** more oxygen so faster ventilation / operculum movement needed ; | **3** | |
| 2(b)(iii) | 141 **+** 155 ; | **1** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 2(b)(iv) | as the temperature increases (the rate of) operculum movement increases ;<br>; | **1** | |
| 2(b)(v) | *any **3** of:*<br><br>oxygen content of water decreases as the temperature increases / **ORA** ;<br><br>need to increase ventilation to get same oxygen from the water at higher temperature ;<br><br>increasd temperature also increases respiration rate ;<br><br>need to increase ventilation even more to meet oxygen demand ; | **3** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(a) | adult – benthic / ocean / sea floor ;<br><br>egg – plankton(ic) / ocean surface ;<br><br>larval stages – plankton(ic) / ocean surface ; | **3** | |
| 3(b) | *any **1** of:*<br><br>large (abdomen) to carry / hold eggs ;<br><br>grows large(r) as it uses more resources / energy to produce eggs ; | **1** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 3(c) | *advantage: any **1** of:*<br>idea of, more cross fertilisation / genetic diversity;<br>idea of, some will escape predation ;<br>*disadvantage*: *any **1** of:*<br>idea of, higher energy demand to produce eggs ;<br>idea of, more wastage / high(er) risk of predation ; | **2** | |
| 3(d)(i) | *any **1** of:*<br>idea of, avoiding the two types of shrimp eating each other ;<br>idea of, different food supply / avoiding competition for food ; | **1** | |
| 3(d)(ii) | *any **2** of:*<br>(provides a) food source / variety of food available ;<br>(provides) shelter / to hide from predators ;<br>(provides) oxygen for respiration ;<br>(provides) shelter from / protection from waves / ocean current ; | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(a)(i) | *any **2** of:*<br><br>(large number of) juveniles suggests reduced number of / too few adults in the population ;<br><br>ban coincides with spawning season ;<br><br>(large numbers of) juveniles would be caught (by pelagic trawlers) ;<br><br>less juveniles surviving to become breeding adults / reach fertility so less adults to spawn in future years ;<br><br>stocks might not be sustainable ; | **2** | |
| 4(a)(ii) | *any **2** of:*<br><br>restriction by season ;<br><br>restriction on fish size ;<br><br>restriction on numbers that can be retained ;<br><br>restriction of fishing intensity e.g. number of fishermen per boat / number of boats / require fishermen to have a permit ;<br><br>restriction by location ; | **2** | |
| 4(b)(i) | trend shows an (overall) increase / **AW** ; | **1** | |
| 4(b)(ii) | $\frac{35-3}{35}\times 100$ **or** $\frac{32}{35}\times 100$ / 91 / 91.4 / 91.43 (%);<br><br>decreases ; | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 4(b)(iii) | *any **2** of:*<br><br>ref. to sustainability ;<br><br>catch much higher in 2013 / lower catch in 1992 ;<br><br>ref.to high recruitment in 1989 (enable stock recovery after 1992) ;<br><br>**OR**<br><br>high recruitment in 1989 ;<br><br>(so) 5 years later enough mature fish in stocks for high catch (so no need for ban) ;<br><br>very low recruitment in 2010 ;<br><br>(so) by 2015 not enough mature fish to support a catch / to be sustainable ; | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(a)(i) | to remove particles / sand / silt / microbes / example of microbe / pathogen / parasites ; | **1** | **R** rocks / anything large |
| 5(a)(ii) | *any **2** of:*<br><br>provides (only) <u>oxygen</u> ;<br><br>for respiration ;<br><br>helps circulate contents of tank / **AW** ; | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 5(a)(iii) | *Answer needs to give a reason why hatchery is intensive and sea cages extensive*<br><br>(intensive because) hatchery uses land based tanks / air supply / pumping water / food supplied / environment controlled ;<br><br>(extensive in) sea cages as using water currents to supply oxygen / little control of environment ; | **2** | |
| 5(b)(i) | *any **2** of:*<br><br>light / moon phases ;<br><br>temperature ;<br><br>(correct) diet ;<br><br>addition of hormones ;<br><br>water quality / pH ;<br><br>ratio of males to females ; | **1** | ***Note:** 2 factors needed for 1 mark* |
| 5(b)(ii) | hatching tank ;<br><br>food supply (for larvae) / **AW** ; | **2** | <br><br>**ECF** if tank incorrect, but reason correct |
| 5(b)(iii) | use fish trimmings / fish processing waste / feed made from soya / plant sources ; | **1** | |
| 5(c)(i) | mutualism ; | **1** | |
| 5(c)(ii) | spread disease / introduce parasites / introduce harmful microbes ; | **1** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(a)(i) | *any **3** of:*<br>idea of, tuna / fish move away (from blasting) ;<br>can kill tuna outright ;<br>can kill tuna prey fish ;<br>increases sediment in water / turbidity preventing tuna finding food ;<br>kills eggs / larvae / fry ; | **3** | |
| 6(a)(ii) | ban any seismic surveys between October and April / between February and March / during main fishing season ;<br>avoid seismic surveys on migration routes / fishing hotspots / spawning areas ; | **2** | |
| 6(b) | *any **1** of:*<br>location of tuna / fish / spawning or feeding areas ;<br>numbers of tuna ;<br>(exact) migration route ;<br>timing of migration / when not to blast ; | **1** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 6(c)(i) | *any **4** of:*<br>sticks to their feathers and inhibits flight ;<br>coats feathers limiting temperature regulation ;<br>coats feathers so decreases / reduces buoyancy (so bird sinks / drowns) ;<br>kills seabirds as it is toxic / poisonous / carcinogenic ;<br>swallowed by sea birds (blocking the intestines) / gets into beak (and blocks breathing system) ;<br>damages internal) organs as corrosive ;<br>washes onto shores and covers eggs / kills chicks / nest abandoned ;<br>hormonal changes in some birds (and disrupts breeding) ;<br>fish killed by oil, so less food for birds ;<br>ref. to bioaccumulation of chemicals / pollutants from oil ; | **4** | |
| 6(c)(ii) | using microorganisms / bacteria ;<br>that digest the oil ; | **2** | |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(a)(i) | *support: any **2** of:*<br><br>using local people to provide hotel service ;<br><br>small hotel so less impact on the environment ;<br><br>more money into local economy ;<br><br>helps conservation / protects environment by clearing rubbish / mapping reefs ;<br><br>raising awareness / showing appreciation of the natural environment, by educational classes ;<br><br>*undermine*:<br><br>ref. to car travel causing (air) pollution / adds carbon dioxide to the air ; | **3** | *answers must relate to an **aim of** ecotourism: involving local people, raising awareness, conservation, minimising ecological impact* |
| 7(a)(ii) | *support: any **2** of:*<br><br>small cruise ships carry fewer people, so less impact on the environment ;<br><br>using local people as guides ;<br><br>raising awareness / showing appreciation by using an expert on the area ;<br><br>small groups for trips have less impact ;<br><br>*undermine: any **2** of:*<br><br>cruise ships cause pollution / litter in water (damaging the environment) ;<br><br>cruise ships also cause physical damage to reefs / seagrass ;<br><br>idea that a small cruise ship will still have a lot of small groups that could damage the ecosystem / environment ; | **3** | *answers must relate to an **aim of** ecotourism: involving local people, raising awareness, conservation, minimising ecological impact* |

| Question | Answer | Marks | Guidance |
|---|---|---|---|
| 7(b) | ***1 × 2** for energy of:*<br><br>1 use solar panels / wind turbine (for electricity / energy) ;<br><br>using renewable resource / reducing use of fossil fuels ;<br><br>2 ref. to any method of reducing electricity consumption ;<br><br>using less energy from the (mains) supply ;<br><br>***1 × 2** for water of:*<br><br>1 collect water from showers / baths / to use for watering grass / plants ;<br><br>re-using water / recycling water reduces clean water demand (from mains) ;<br><br>2 replace grass with less water-demanding / drought tolerant plants ;<br>**OR**<br>collect rain water for watering grass / plants ;<br>**OR**<br>collect rain water for water in showers / baths / laundry / cleaning ;<br><br>(because) it reduces the use of clean water from the mains ;<br><br>3 replace the water in the swimming pool with sea water ;<br><br>reducing use of fresh water / using local resources ;<br><br>4 install eco-friendly showers and toilets ;<br><br>reduce water consumption ; | **4** | **A** water power<br><br>**A** grey water<br><br>**A** replacing with artificial grass / paving<br><br>**I** filling in swimming pool<br><br>**A** re-using towels and bed linen |