Cambridge International AS & A Level

Cambridge Assessment International Education
Cambridge International Advanced Subsidiary and Advanced Level

MARINE SCIENCE **9693/02**

Paper 2 AS Data-Handling and Free-Response **October/November 2019**

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.

Cambridge International is publishing the mark schemes for the October/November 2019 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

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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.

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 reasonable choice ; e.g. more larvae will settle on rough granite / rough surfaces **OR** larvae will not settle on sand	**1**	must include statement about larvae **and** surface. **I** larvae, survival / growth
1(b)	*any one of:* barnacle species ; stage / age of barnacle larvae ; length of time (in sea water) ; temperature ; pH ; salinity ; amount / type, of food / phytoplankton ; size / surface area, of substrate ;	**1**	

Question	Answer	Marks	Guidance
1(c)	*any 3 of:* sample size too small ; few of the total found settled ; no replicates completed (to compare for anomalous results) ; larvae may have fallen off / been killed when removed from water each day ; settlement seen could be due to chance / random chance ; ref. to an uncontrolled variable affecting the results ; **AVP** ;	**3**	 **A** number of larvae that settle is very small **I** if that variable was stated as controlled in 1(b)

Question	Answer	Marks	Guidance
1(d)	*any 4 of:* repeat experiment – have 3 sets of tanks set up ; of same tank size / shape ; same volume of water ; any named environmental condition the same (e.g. temp., light, salinity, pH etc) ; ; all substrates should be of similar surface area / size ; same number of / more, barnacle larvae added to each tank ; same volume / amount of phytoplankton / food, added each day to each tank ; examine each substrate only at the end of the experiment ; extend to other, species / types, of barnacle ; extend to more, surfaces / substrates ;	**4**	

Question	Answer	Marks	Guidance
2(a)(i)	700 ;	**1**	
2(a)(ii)	the result does not fit with the others **AW** ;	**1**	**A** it is an anomalous result / outlier **A** low compared to the others

Question	Answer	Marks	Guidance
2(b)	appropriate linear **scale** for both axes ; both **axes** labelled, including units ; all points **plotted** correctly (± ½ small square) ; (points joined with) a suitable smooth **curve** ;	**4**	plots to cover at least half the grid
2(c)(i)	day 8 ; maximum population available ;	**2**	**A ECF** from graph
2(c)(ii)	population will decrease ; death rate exceeds reproduction rate ; nutrients all utilised ; **AVP** ;	**2**	**A** for 1 mark – the cell density stays the same, they are just dead cells. e.g. toxins build-up, disease spread more likely
2(d)	photosynthesis ;	**1**	

Question	Answer	Marks	Guidance
3(a)(i)	*any 4 of:* sheltered ; little slope / flat ; low water flow rate ; high sediment levels ; fine sediment ; mixture of fresh and salt water ; tidal ; low wave action / low energy environment ;	**4**	
3(a)(ii)	*any 4 of:* as tide rises / falls ; twice a day ; *rises* brings salt water / saline water / 35 ppt water ; *idea of,* mixes with fresh water (entering from river) ; increases salinity ; *falls* less salt water / only fresh water (entering from river) **ORA** ; decreases salinity ;	**4**	

Question	Answer	Marks	Guidance
3(a)(iii)	*any 2 of:* loss of, fish nursery areas / habitat ; loss of, biodiversity / endangered species ; increased sediment output to ocean ; loss of (named) products useful to man ; (increased) erosion ; (increased) storm damage ;	**2**	 e.g. timber, fish,

Question	Answer	Marks	Guidance
3(b)	*any 5 of:* too much sediment ; smother coral polyps / blocks mouth / prevents feeding ; causes abrasion ; blocks sunlight ; (which) reduces / stops, photosynthesis ; temperature more variable ; salinity too low ; runoff can bring pollutants / insecticides ; (which can be) toxic / kill corals ; *idea of,* runoff can bring, excess / extra, nutrients ; causes eutrophication **AW** ; named human intervention ; lack of substrate for attachment (of polyps) ;	**5**	

Question	Answer	Marks	Guidance
4(a)(i)	*any 4 of:* **1** divergent plate boundary / mid-ocean ridge / subduction zones ; **2** cracks in the ocean floor ; **3** (sea) water seeps down into the cracks ; **4** (water) heated by underlying magma ; **5** minerals dissolve in the hot water ; **6** water forced back out ; **7** *idea of*, (minerals) precipitate when reach cold water ;	**4**	
4(a)(ii)	change in a community ; over time ; *PLUS any 4 of:* pioneer species ; chemosynthetic bacteria ; *Tevnia* tubeworm ; replaced by *Riftia* tube worms ; fast(er) growing ; outcompete *Tevnia* ; *idea of*, other species now able to inhabit ; appropriate ref. to climax / final stage (of succession) ;	**6**	**I** change in, habitat / environment **I** *Tevnia* turns into *Riftia*

Question	Answer	Marks	Guidance
4(b)	carbon dioxide; *PLUS max 3 of causes:* from volcanic activity ; named anthropogenic activity ; dissolves in sea water / atmospheric dissolution ; forms carbonic acid ; sea water is slightly alkaline ; lowers pH of seawater ; *max 3 of effects:* coral skeletons / shells, dissolve / cannot form ; more carbon dioxide for plants to utilise ; phytoplankton population may increase ; (leads to) increase productivity in the food chain ;	**5**	**A** photosynthesis may increase