
MARINE SCIENCE

9693/02

Paper 2 AS Data Handling and Free-Response

October/November 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.

PUBLISHED**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)	<p><i>Any 3 of:</i></p> <p>lack of sunlight ;</p> <p>cold temperature ;</p> <p>no zooxanthellae ;</p> <p>no / less, chlorophyll / pigment ;</p> <p>for photosynthesis ;</p>	3	<p>A idea of, less / decreasing light</p> <p>A idea of, cold / low / lowering temperature or stated low temp</p> <p>A few or no zooxanthellae</p> <p>A they cannot absorb (sun)light (energy)</p>
1(b)(i)	<p><i>Any 2 of:</i></p> <p>temperature ;</p> <p>salinity ;</p> <p>pH ;</p> <p>turbidity / (degree of) light <u>penetration</u> ;</p> <p>(dissolved) oxygen / carbon dioxide ;</p>	2	<p>A amount of, sodium and / or chloride, ions</p> <p>A acidity / alkalinity</p>
1(b)(ii)	<p>Axes – correctly labelled including units ;</p> <p>Scale – suitable linear scale for both axes to use at least $\frac{1}{2}$ the graph paper ;</p> <p>Plots – $\pm \frac{1}{2}$ small square ;</p> <p>Key – key or labels to identify two data sets ;</p>	4	<p>A line graph for 3 marks – MP 1, 2 and 3</p> <p>A either one y-axis (and a key) OR 2 y-axes (and a key)</p>

Question	Answer	Marks	Guidance
1(b)(iii)	any valid hypothesis that links flow rate with capture rate ; e.g. flow rate has a greater effect on the capture rate of phytoplankton than zooplankton	1	I conclusions / reference to figures
1(b)(iv)	medium + highest (total) capture rate ;	1	R highest rate for zooplankton / highest rate for both

Question	Answer	Marks	Guidance
2(a)	Any 4 of: idea of, transect up / down the shore ; use quadrat / description of ; <u>sensible</u> stated size ; repeat at least 2 more times and calculate mean / average ; count the number of barnacles (of each species) (in each quadrat) ; identify each species of barnacle (in each quadrat) ; relevant safety precaution ; AVP ; ;	4	other methods may be given which are acceptable e.g. point quadrat sampling e.g. ref. to further detail on counting such as photographing e.g. subdividing quadrat / random number generator to decide which parts to count e.g. checking tide tables / right part of tidal cycle
2(b)	2m OR 4m OR both ;	1	R 6m

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Question	Answer	Marks	Guidance
2(c)	<p>idea of, different species have different adaptations (for different environments / habitats) ;</p> <p>species 1 survives higher up the shore ;</p> <p>adapted to long exposure time / requires some exposure ;</p> <p>species 2 survives closest to the water line ;</p> <p>requires more immersion in water / unable to survive long exposure ;</p> <p>species 3 widest range of tolerance ;</p> <p>preference for mid-shore ;</p> <p>idea of, competition (with, algae / other species) ;</p> <p>presence of predators ;</p>	4	

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Question	Answer	Marks	Guidance
3(a)	<p><i>Any 6 of:</i></p> <p>undersea volcano – close to or above surface ;</p> <p>coral <u>polyps</u> settle OR growth of coral (reef) ;</p> <p>forms fringing reef ;</p> <p>no / shallow / narrow lagoon ;</p> <p>volcano starts to sink ;</p> <p>coral growth rate = rate of sinking ;</p> <p>barrier reef formed ;</p> <p>with a (wide, deep) lagoon ;</p> <p>volcano sinks completely ;</p>	6	credit <u>annotated</u> diagrams

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Question	Answer	Marks	Guidance
3(b)	<p><i>Any 6 of:</i></p> <p>predation ;</p> <p>named e.g. crown of thorns starfish ;</p> <p>storm <u>damage</u> ;</p> <p>abrasion from sediment ;</p> <p>smothering by, sediment / sand / algal blooms ;</p> <p>(erosion) physical breakage ;</p> <p>named human impact ;</p> <p>air exposure ;</p> <p>due to exceptional tides / tectonic movement / tsunami ;</p> <p>disease ;</p> <p>increase in temperature / global warming ;</p> <p>ocean acidity / reduced pH ;</p> <p>coral bleaching / description of ;</p>	6	erosion used in stem

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Question	Answer	Marks	Guidance
3(c)	<p><i>Any 3 of :</i></p> <p>absorbs / reduces wave <u>energy</u> ;</p> <p>acts as <u>breakwater</u> ;</p> <p>waves break before the beach ;</p> <p>slows speed of water ;</p> <p>reduces erosion ;</p> <p>reduces flooding ;</p>	3	

Question	Answer	Marks	Guidance
4(a)(i)	<p>all the different species living in a habitat ;</p> <p>at the same time ;</p>	2	A ecosystem / place / location / area
4(a)(ii)	<p><i>Any 5 of :</i></p> <p>at plate boundaries ;</p> <p>sea water seeps into cracks in the sea bed ;</p> <p>water (super)heated ;</p> <p>by magma ;</p> <p>minerals dissolve in hot water ;</p> <p>water forced back up ;</p> <p>idea of, so (water cools), <u>precipitating</u> minerals / AW ;</p>	5	<p>A at convergent or divergent</p> <p>A idea of, sediments deposit</p>

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Question	Answer	Marks	Guidance
4(b)	<p>Similarities:</p> <p>live in / on (host / other) organisms ;</p> <p>supply (host / other) with nutrients / food / energy ;</p> <p>both use CO₂ to synthesize nutrients / produce organic material ;</p> <p>form (basis of) food web / chain ;</p> <p>they are <u>producers</u> ;</p> <p>both derive a benefit from the relationship ;</p> <p>Differences:</p> <p>chemosynthetic vent bacteria ;</p> <p>photosynthetic zooxanthellae ;</p> <p>(C) utilises <u>energy</u> from chemicals ;</p> <p>(C) (chemical) released from vents / named (vent) mineral ;</p> <p>(P) utilises <u>energy</u> from light / sun ;</p> <p>(P) uses chlorophyll ;</p> <p>AVP ;</p>	8	<p>max 6 for similarities or differences.</p> <p>must include at least 2 similarities to gain full marks</p> <p>A other photosynthetic pigments</p> <p>e.g. ref. to (C) extreme environment vs (P) stable environment e.g. length of food chain (shorter at vent)</p>