



Cambridge International AS & A Level

MARINE SCIENCE

9693/02

Paper 2 AS Data-Handling and Free-Response

October/November 2021

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 2021 series for most Cambridge IGCSE™, Cambridge International A and AS Level components and some Cambridge O Level components.

This document consists of **8** 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.

Science-Specific Marking Principles

1 Examiners should consider the context and scientific use of any keywords when awarding marks. Although keywords may be present, marks should not be awarded if the keywords are used incorrectly.

2 The examiner should not choose between contradictory statements given in the same question part, and credit should not be awarded for any correct statement that is contradicted within the same question part. Wrong science that is irrelevant to the question should be ignored.

3 Although spellings do not have to be correct, spellings of syllabus terms must allow for clear and unambiguous separation from other syllabus terms with which they may be confused (e.g. ethane / ethene, glucagon / glycogen, refraction / reflection).

4 The error carried forward (ecf) principle should be applied, where appropriate. If an incorrect answer is subsequently used in a scientifically correct way, the candidate should be awarded these subsequent marking points. Further guidance will be included in the mark scheme where necessary and any exceptions to this general principle will be noted.

5 'List rule' guidance

For questions that require *n* responses (e.g. State **two** reasons ...):

- The response should be read as continuous prose, even when numbered answer spaces are provided.
- Any response marked *ignore* in the mark scheme should not count towards *n*.
- Incorrect responses should not be awarded credit but will still count towards *n*.
- Read the entire response to check for any responses that contradict those that would otherwise be credited. Credit should **not** be awarded for any responses that are contradicted within the rest of the response. Where two responses contradict one another, this should be treated as a single incorrect response.
- Non-contradictory responses after the first *n* responses may be ignored even if they include incorrect science.

6 Calculation specific guidance

Correct answers to calculations should be given full credit even if there is no working or incorrect working, **unless** the question states 'show your working'.

For questions in which the number of significant figures required is not stated, credit should be awarded for correct answers when rounded by the examiner to the number of significant figures given in the mark scheme. This may not apply to measured values.

For answers given in standard form (e.g. $a \times 10^n$) in which the convention of restricting the value of the coefficient (a) to a value between 1 and 10 is not followed, credit may still be awarded if the answer can be converted to the answer given in the mark scheme.

Unless a separate mark is given for a unit, a missing or incorrect unit will normally mean that the final calculation mark is not awarded. Exceptions to this general principle will be noted in the mark scheme.

7 Guidance for chemical equations

Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

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
<u>underline</u>	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)

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Question	Answer	Marks
1(a)(i)	C ; (because) it is most evenly distributed throughout the different estuary locations / salinities ;	2
1(a)(ii)	B ; (because) it has a high intertidal position / is present in the high (and medium) zone	2
1(a)(iii)	G ; (because) it has low tolerance to freshwater / requires full sea water, and medium exposure ;	2
1(b)(i)	<i>any 2 from:</i> a single estuary may be exceptional / have atypical results / reduce random error ; improves reliability ; to find a mean ;	2
1(b)(ii)	(water or air) temperature / wave action / current speed / sediment type ;	1

Question	Answer	Marks
2(a)(i)	0.67 / 0.7 1.69 / 1.7 ;	1
2(a)(ii)	bars both correct height and width, placed correctly $\pm \frac{1}{2}$ small square ; bars touching and identified ;	2
2(b)	(correct identification of numbers) 2.2. and 0.9 ; (calculation of a difference) 1.3 / ECF from MP1 ; (division of answer from MP2 by number of parasites with no cleaning station + multiply by 100 + correct answer) (1.3 \div 2.2) \times 100 = 59.09 / 59.1 / 59 ;	3

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Question	Answer	Marks
2(c)	<p><i>any 3 from:</i> <i>supports</i> (for most islands) there are more parasites on damselfish in territories without cleaning stations than with cleaning stations ;</p> <p><i>does not support</i> island I is an exception ; other factors (named) may cause this difference ; small, sample size / number, / small number of (external) parasites per damselfish found ; only for a single (damsel)fish species ; idea of, islands H, I, J are less supporting than islands (K), L and M ;</p>	3
2(d)	<p><i>any 2 from:</i> salinity ; water temperature ; pH ; fish health / disease ; fish age ;</p>	2

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Question	Answer	Marks
3(a)	<p><i>any 7 from:</i> <i>surface currents</i> wind (direction) ; Coriolis forces (for either current depth) ; push surface waters ; creates upwelling ;</p> <p><i>deep water currents</i> (correct ref. to) convection current ; water temperature differences ; salinity differences ; cause density changes (in water) ; colder water (is denser) and sinks ; more saline water (is denser) and sinks ; shape of the sea bed ; forces water into different directions ; tsunami / underwater earthquake / (massive) volcanic eruption / cyclone ;</p>	7
3(b)	<p><i>any 8 from:</i> weathering / erosion of rocks ;</p> <p>runoff ; (creates) reservoir in surface waters ; reference to calcium hydrogencarbonate ; uptake by plants / algae / phytoplankton ; passed along food chain ; incorporated into reefs / shells / bones / teeth ; (mostly) indigestible parts ; death / faecal matter ; sinking to the sea bed ; decomposition / decay / dissolving ; upwelling (to surface) ; removed by harvesting ;</p>	8

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Question	Answer	Marks
4(a)	mutualism ; <i>any 3 from:</i> both species benefit ; zooxanthellae protected ; (zooxanthellae) provided with carbon dioxide ; (coral) provided with carbohydrates / organic nutrients ; (coral) provided with oxygen (by zooxanthellae) ;	4
4(b)	<i>any 5 from:</i> clear water / low turbidity ; (so) high light <u>intensity</u> ; rapid nutrient cycling (between organisms) ; warm water / range 16–35 °C ; shallow water / up to 20 m depth ; (so) high light availability ; high rate of photosynthesis / maximum photosynthesis ; AVP ; e.g. lots of energy to pass up food chain	5
4(c)	<i>any 6 from:</i> fish come / stay / interact / hunt, together ; (feeding advantage) more eyes to find food ; easier to find mates ; idea of, safety in numbers / lower chance of being the prey / <u>confuses</u> predators ; many eyes looking for predators ; hydrodynamic efficiency ; reduces energy use / swim faster ;	6