Cambridge Assessment International Education

Cambridge International AS & A Level

MARINE SCIENCE **9693/21**

Paper 2 AS Data Handling and Free-Response **May/June 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 May/June 2021 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.

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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.

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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.

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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)

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Question	Answer	Marks
1(a)	both, (species / organisms) benefit ;	**1**
1(b)	*any **3** of:* (idea of) overall increase (from 2010 to 2016 / 2017) ; slight decrease from 2012–2013 ; (idea of) (sudden) decrease in 2017 / from 2016 **AW** ; (idea of) greatest increase between 2015–2016 ; correct manipulation of data ;	**3**
1(c)(i)	31.(1688) correct rounding ;;;	**3**
1(c)(ii)	bar correctly plotted for answer from 1(c)(i), both height and width drawn on Fig. 1.1 ;	**1**
1(d)(i)	*any **2** of:* (idea of) no apparent / negative, correlation ; correct, description / explanation, of why it is rejected ; correct use of data to support answer ;	**2**
1(d)(ii)	*any **2** of:* sharknose goby / the cleaner fish, may have species preferences ; other cleaner fish may have relationship with new species appearing ; population (density) of cleaner fish may vary ; so more than enough clients **AW** ; not all species visit cleaning stations ; the (visiting) number of fish species may have changed ; disease/ decrease, in the number of parasites ;	**2**

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Question	Answer	Marks
2(a)	line correctly drawn ;	**1**
2(b)	if (sea) temperature (variation) increases, penguin population (change) decreases **ORA** ; ***plus** any **1** of:* majority of data clustered, above population change of –20% / below temperature variation of +0.5°C ; use of data to illustrate relationship ;	**2**
2(c)	value commensurate with plotted line ;	**1**
2(d)	*any **4** of;* upwelling reduced / ceases ; nutrients / minerals, (in surface waters) not replaced / depleted ; reduced productivity / reduced producer populations ; disruption of food chain / reduced number of primary consumers ; fewer fish / less food available for penguins to eat ; penguins migrate elsewhere ; (idea of) unsuccessful breeding ;	**4**

Question	Answer	Marks
3(a)(i)	*any **3** of:* (few) organisms, adapted / able, to tolerate / survive conditions ; high / intense pressure (at great depth) ; high temperature (of water leaving vents)… ; causing lack of oxygen ; water with, low pH / highly acidic / high salinity / high mineral content, around vent ; named mineral ion / toxic gas ;	**3**
3(a)(ii)	two examples of an organism from hydrothermal vents ; ***plus** any **4** of:* (idea of) change in community structure ; over time ; one species replaces another ; (initial colonisation by) pioneer species ; climax community ; (idea of) one species helping create conditions for subsequent species ;	**5**

Question	Answer	Marks
3(b)	*any **7** of:* Theory: **1** Earth's crust / lithosphere made up of plates ; **2** (plates float) on mantle / asthenosphere ; **3** (plates) moving / colliding / sliding **AW** ; **4** convection currents in magma / mantle below plate is moving ; **5** driven by heat / density ; Evidence: **6** fit (like jigsaw puzzles) between coastlines of continents ; **7** ref. to distribution of fossils / palaeontology; **8** distribution of similar terrestrial living creatures, e.g. marsupials in Australia and S. America **9** ref. similarities in rock, types / ages ; **10** magnetic stripes (in rocks) on the ocean floor / sea bed ; **11** stated activity near plate boundaries ;	**7**

Question	Answer	Marks
4(a)	*any **4** of:* extensive / prop roots / large / many / system of, roots of mangroves ; (roots / mangrove) help reduce water speed / current ; (roots / mangrove) allow for (increased) sedimentation / deposition ; (roots / mangrove) ref. to accumulation of, silt / sand / fine particles ; (roots / mangrove) ref. to reduction of erosion ;	**4**
4(b)(i)	*any **5** of:* **1** increased erosion / movement of sediments ; **2** causing changes in morphology of delta ; **3** increased turbidity ; **4** (idea of) reduction in light (for photosynthesis) ; **5** increased nutrient availability / influx of nutrients ; **6** may increase productivity ; **7** decreased salinity ; **8** due to greater influx of freshwater ; **9** increased, depth / height of water / flooding ; **10** reduced opportunity for feeding by littoral organisms ; **11** increased current flow ; **12** so reduced ability of organisms to attach / organisms washed away ; **13** water temperature, increase / decrease ; **14** correct change to oxygen content of water ; **15** **AVP** ;	**5**

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Question	Answer	Marks
4(b)(ii)	*any **6** of:* **1** increased (volume) of nutrients / fertilisers in water ; **2** may cause algal bloom / eutrophication ; **3** increased turbidity of water ; **4** decreased, penetration of light (intensity) ; **5** temperature will change ; **6** dissolved carbon dioxide content of water is changed ; **7** will affect (the rate of) photosynthesis ; **8** (temperature / eutrophication) correct effect on dissolved oxygen ; **9** reduced production of organic, material / nutrients ; **10** (by) zooxanthellae ; **11** sediments in water ; **12** sediments, block mouths of coral polyps / prevent coral attachment / cause abrasion ; **13** ref. uses to negative impact of pesticides on corals **14** decreased salinity ;	**6**

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