



Cambridge International AS & A Level

MARINE SCIENCE

9693/01

Paper 1 AS Structured Questions

October/November 2021

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.

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 **12** 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)	phytoplankton → krill → baleen whale ;	1
1(a)(ii)	4 ;	1
1(b)(i)	calcium is required for shell formation / shell not (fully) formed / weak shell ;	1
1(b)(ii)	nitrogen required for, protein synthesis / amino acids ; lack of growth / stunted growth ;	2
1(c)(i)	$(7980 \div 31\,080) \times 100$; = 25.7% ;	2
1(c)(ii)	<i>any 3 from:</i> trophic level 2 may be larger than 1 / idea that proportions may be different ; <u>biomass</u> of, phytoplankton / trophic level 1, may be low (at this point) ; (doesn't take into account) rapid reproduction rates of phytoplankton ; ref to high rate of productivity of phytoplankton ; <i>idea that</i> it is an estimate / only taken at a singular point in time ;	3

Question	Answer	Marks
2(a)(i)	<i>any 2 from:</i> <i>P. volitans</i> , is the <u>predator</u> / hunts, kills and eats (<i>S. leucostictus</i>) ; <i>S. leucostictus</i> is the <u>prey</u> ; <i>P. volitans</i> eats <i>S. leucostictus</i> to get its energy ;	2
2(a)(ii)	<i>any 3 from:</i> both occupy different niches ; <i>P. volitans</i> occupies a wider niche (than <i>L. apodus</i>) / ORA ; <i>P. volitans</i> eats a larger proportion of fish species (than <i>L. apodus</i>) / <i>L. apodus</i> eats a larger proportion of crustacean species (than <i>P. volitans</i>) / ORA ; ref to manipulated data to show comparison from the table ;	3
2(b)	decrease (in efficiency of energy transfer) ; some, energy / nutrients, used by the parasite ;	2

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Question	Answer	Marks
3(a)(i)	<p><i>any 2 from:</i> high temperature ; high pressure ; dark / no, light ; rich in (named) minerals ; acidic / low pH ;</p>	2
3(a)(ii)	<p>extreme conditions ; few species have the necessary (named) adaptations ;</p>	2
3(b)	<p><i>any 3 from:</i> <i>idea of</i> change in community structure (over time) ; first organisms / pioneer species, are chemosynthetic bacteria ; <i>Tevnia</i> (tube worms) colonise the hydrothermal vent followed by <i>Riftia</i> (tube worms) ; tube worms produce nutrients allowing other organisms to colonise ;</p>	3
3(c)(i)	<p>(reactions of inorganic) chemicals / (named) (dissolved) minerals ;</p>	1
3(c)(ii)	<p>rate of production ; of biomass ;</p>	2
3(c)(iii)	<p>increase in hydrogen sulfide / chemicals (from volcanic action) ; increased rate of chemosynthesis ; more, carbohydrates / biomass produced ;</p>	3

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Question	Answer	Marks
4(a)	<p><i>any 4 from:</i> ref to weathering / breaking down of rocks / (constant) wave action (elsewhere) ; ref to, erosion / transport of (eroded) sediment (to the beach) ; sedimentation is greater than erosion ; ref to low energy waves / slower water movement ; <u>deposition</u> (of loose sand) ; ref to small particle size ; particle size decreases towards sea ; ref to necessity of gradual slope (to the sea) ; AVP ;</p>	4
4(b)	<p>constantly shifting / unstable, substrate ; difficult for attachment ; or covered with sediments ; preventing photosynthesis ; or lack of nutrients ; reducing photosynthesis ;</p>	2

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Question	Answer	Marks
4(c)	<p><i>any 2 adaptations linked to the explanation:</i></p> <p>ability to burrow ; protection from, predators / wave action / high temperatures / desiccation ;</p> <p>hard shell ; protection from, predators / wave action / desiccation ;</p> <p>ability to move with the tide ; protection from, predators / wave action / high temperatures / desiccation / allows access to food source ;</p> <p>ability to filter feed ; as few species to feed on ;</p> <p>wide ecological niche ; as there are few species to feed on ;</p> <p>AVP ;;</p>	4

Question	Answer	Marks
5(a)	33.06% ;	1
5(b)	<p><i>any 3 from:</i></p> <p><i>location B has:</i></p> <p>reference to temperature difference ; (higher temperature leads to) increased evaporation ; (lower temperature leads to) freezing of pure water (leaving salts behind) ; decreased runoff ; <i>idea of</i> input of dissolved substances from human activity ; increased volcanic activity ; lack of precipitation ;</p> <p>AVP ;</p>	3

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Question	Answer	Marks
5(c)	<i>any 3 from:</i> <i>location B has:</i> increased ocean acidification ; increased (atmospheric dissolution of) carbon dioxide ; increased volcanic activity ; ref to presence of hydrothermal vents ; ref to carbonate rock ; AVP ;;	3

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Question	Answer	Marks
6(a)(i)	arrow drawn showing movement of plates away from each other ;	1
6(a)(ii)	X drawn at the top in between the two plates ;	1
6(a)(iii)	divergent ;	1
6(a)(iv)	<i>any 3 from:</i> plates float on the mantle ; ref to convection currents ; density changes of molten rock ; caused by temperature differences (in the mantle) ; magma rises and solidifies ;	3
6(a)(v)	<i>any 2 from:</i> ref to magnetic field / magnetite / basalt / magnetic stripes ; alternate normal and reverse polarity ; symmetrical patterns either side of divergent boundaries / mid-ocean ridges ; oldest rocks are found further away from the boundary ;	2
6(b)(i)	<i>any 4 from:</i> ref to subduction / subduction described ; ref to different densities of the plates ; plates get stuck ; build-up of pressure ; sudden slippage of plates ; causing a, large / sudden, release of energy ;	4
6(b)(ii)	trench ;	1

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Question	Answer	Marks
7(a)	7 ;	1
7(b)	largest band labelled with an X ;	1
7(c)	<i>any 3 from:</i> suitable / optimum, temperature ; increased light ; increased photosynthesis ; increased productivity of zooxanthellae ; increased, food / nutrient / carbon dioxide, availability ; decrease in (named) predator ; less predation ; suitable / optimum, pH ; AVP ;	3
7(d)	<i>any 2 from:</i> extremes in temperature ; storm action / increased sediments / AW ; pollution / eutrophication / algal bloom ; damage by humans ; (ocean) acidification / decrease in pH ; exposure to air / desiccation ; AVP ;	2
7(e)	carbon dating / geomorphological analysis ;	1

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Question	Answer	Marks
8(a)	<i>any 4 from:</i> currents in the northern hemisphere rotate clockwise ; currents in the southern hemisphere rotate anti-clockwise ; ref to Coriolis effect ; caused by the Earth's rotation ; deflecting water ;	4
8(b)	<i>any 2 from:</i> (differences in) temperature ; (differences in) density ; (differences in) salinity ; wind ;	2
8(c)	upwelling ;	1