



## Cambridge International AS & A Level

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**MARINE SCIENCE**

**9693/11**

Paper 1 AS Structured Questions

**May/June 2021**

MARK SCHEME

Maximum Mark: 75

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**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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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

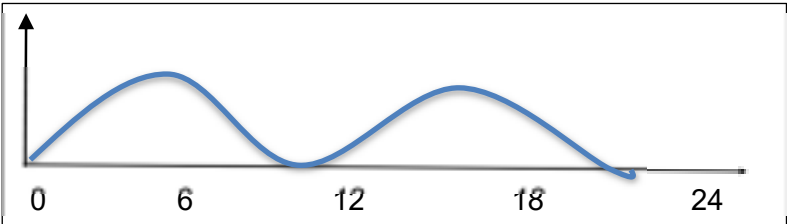
Multiples / fractions of coefficients used in chemical equations are acceptable unless stated otherwise in the mark scheme.

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:

- ;
  - /
  - ()
  - R
  - A
  - I
  - AW
  - AVP
  - ORA
  - underline
  - MAX
  - +
  - OR
  - ECF
- 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
- reject
- accept (answers that are correctly cued by the question or guidance you have received)
- ignore (mark as if this material was not present)
- alternative wording (where responses vary more than usual, accept other ways of expressing the same idea)
- alternative valid point (where a greater than usual variety of responses is expected)
- or reverse argument
- actual word underlined must be used by the candidate (grammatical variants excepted)
- indicates the maximum number of marks that can be awarded
- statements on both sides of the + are needed for that mark
- separates two different routes to a mark point and only one should be awarded
- error carried forward (credit an operation from a previous incorrect response)

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Question	Answer	Marks
1(a)(i)	<i>any 2 of:</i> low air pressure ; onshore wind ; hurricane / tropical cyclone / typhoon ;	<b>2</b>
1(a)(ii)	<i>any 2 of:</i> flooding / port flooded ; (coastal) erosion ; damage to, property / structures / infrastructure / water damage / agriculture / crops ;	<b>2</b>
1(b)(i)	2 peaks, approx. same height + correct alignment with the time ;  points plotted at midnight (1), midday (3) and midnight (5) at approx. the same height ;  tide height at X  	<b>2</b>
1(b)(ii)	range is smaller ;	<b>1</b>

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Question	Answer	Marks
2(a)(i)	<i>any 2 of:</i> respiration ; movement or named, e.g. swimming ; digestion / other ;	<b>2</b>
2(a)(ii)	<i>any 2 of:</i> (released) through decomposition ; by bacteria ; (may be) taken back into food chain / ref. to detritivores ; (return to the surface in nutrients in) upwelling ; incorporated (into chemical components) in the reef ;	<b>2</b>
2(a)(iii)	3300 – 720 – 2200 <b>OR</b> 2920 (lost) <b>OR</b> 380 ; $\frac{380}{3300} \times 100$ ; = 11.5(15)% ;  <b>OR</b>  720 + 2200 <b>OR</b> 2920 ; $\frac{2920}{3300} \times 100 = 88.48$ <b>OR</b> 88.5 ; 100 – 88.48 (or 88.5) = 11.5(2) ;	<b>3</b>
2(b)(i)	fourth ;	<b>1</b>
2(b)(ii)	<i>any 2 of:</i> large, numbers / population, of (small) producers / algae ; (supports) smaller number of larger, organisms / consumers (in next level up) ; large number of, parasites /nematodes, living in tuna <b>OR</b> parasites / nematodes are very small organisms <b>OR</b> parasites / nematodes live inside the tuna ;	<b>2</b>
2(b)(iii)	nematode bar will be narrower / smaller than the tuna bar ;	<b>1</b>

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Question	Answer	Marks
2(c)(i)	<i>any 2 of:</i> bones / skeleton ; DNA / RNA / nucleic acids ; ATP / ADP ; phospholipids ;	<b>2</b>
2(c)(ii)	absorbed by algae / phytoplankton / producer ; (idea of ) passed along the food chain to the sea bream ;	<b>2</b>
2(c)(iii)	not all of the sea bream is, eaten / consumed <b>OR</b> the bones are indigestible ;	<b>1</b>

Question	Answer	Marks
3(a)	decrease(s) ;	<b>1</b>
3(b)	7.8 ;	<b>1</b>
3(c)	<i>any 3 of:</i> increasing depth decreases temperature ; colder water holds more oxygen / allows a higher oxygen concentration ORA ;  increasing depth increases salinity ; increasing salinity reduces oxygen concentration ;	<b>3</b>

Question	Answer	Marks
4(a)(i)	no Coriolis forces / Coriolis forces too weak ;	<b>1</b>
4(a)(ii)	<i>any 1 of:</i> high wind shear ; water temperature not warm enough / water temperature below 26.5°C / 80°F / correct ref. to upwelling ;	<b>1</b>



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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
4(b)(i)	<i>any 4 of:</i> evaporation / formation of water vapour / high humidity / moist air ; transfers (heat) energy from ocean to atmosphere ; energy stored in water vapour ; rises / convection ; (water vapour) condenses ; releases latent, heat / energy ;	<b>4</b>
4(b)(ii)	absorb energy / reduces wave height / act as breakwater ;	<b>1</b>
4(c)	<i>any 2 of:</i> increases / causes, erosion ; removes sand from shore ; moves sand around the shore ; ref. to organisms being disrupted ;	<b>2</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
5(a)(i)	<i>any 2 of:</i> the number / amount of, species / types, of living organisms ; idea of, and (their) abundance ; idea of, genetic diversity ;	<b>2</b>
5(a)(ii)	<i>any 3 of:</i> unstable / shifting, sands / substrate ; few species adapted to live there / few species can live there ; have to eat anything available / few producers / less food available ; species burrow to survive / ref. to infauna ; few / no suitable substrate for attachment ; few niches ;	<b>3</b>

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Question	Answer	Marks
5(a)(iii)	<p>named predator-prey relationship + named parasitic relationship, e.g. nematodes and tuna ;</p> <p><i>plus any 3 of:</i>            predator, hunts / kills, and eats prey (quickly) ;            parasite does not always cause death of host / (idea of) can recover from / have parasites removed (e.g. by cleaner fish) ;            (idea of) parasite gains long-term advantage / nutrition ;            host harmed (or named harm) + parasite benefits (or named benefit) ;            predator will eat many prey + parasite infects 1 host (at each stage of its lifecycle) ;</p>	<b>4</b>
5(b)	<p>mutualism / mutualistic ;</p> <p><i>plus MAX 3 of:</i>            both species benefit ;            coral polyp receives, nutrients / food / sugars / carbohydrate ;            coral polyp receives oxygen (from zooxanthellae) ;            zooxanthellae receives, protection / a shelter ;            zooxanthellae receives carbon dioxide (from coral polyp) ;</p>	<b>4</b>

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Question	Answer	Marks
6(a)	(oceanic) trench ;	1
6(b)	<i>any 4 of:</i> correct ref. to relative plate densities OR oceanic plate under, land / continental plate ; crust subducted ; (crust) melts ; magma pressure increases ; weakness in crust / lithosphere ; lava erupts ; solidifies (to create cone) ; builds up (until reaches the surface) ;	4
6(c)	tsunami ;	1

Question	Answer	Marks
7(a)	<i>any 3 of:</i> warm waters (within stated range of 16–35°C / 60–95°F) ; shallow ; clear water / low turbidity / low nutrient ; high light penetration ; high light intensity ; rocky substrate (for attachment) ; pH 8.1–8.5 ;	3
7(b)	<i>any 3 of:</i> disease ; air exposure ; water pollution ; sedimentation / blocking coral polyps from feeding / blocking light / abrasion ; extreme weather example (hurricanes / severe storms) ; natural disaster (tsunami / earthquake) ; rising sea temperature ; acidification ; outbreak of, predators / COTS / crown of thorns starfish / coral eating fish / named coral eating fish ;	3

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
7(c)	<i>any 3 of:</i> core sampling / drilling ; coral banding ; geomorphological analysis ; carbon dating ;	<b>3</b>

<b>Question</b>	<b>Answer</b>	<b>Marks</b>
8(a)	<i>any 4 of:</i> (idea of,) ocean warmer than land ; air over the ocean is warmer ; warm air rises ; creating low pressure area over ocean ; leaving space for dry air to move from above the land ; (dry) offshore wind occurs ;	<b>4</b>
8(b)(i)	<i>any 4 of:</i> rainfall causes runoff ; reduces sea water density ; washes, nutrients / fertilizer / named toxin, into the ocean ; reduced pH / acidification (due to freshwater input) ; increases turbidity ; reduces salinity ; increased oxygen / dissolved gases ; temperature change ;	<b>4</b>
8(b)(ii)	increased nutrients / carbon dioxide / named nutrients ; more photosynthesis / greater population of producers ;	<b>2</b>