



## Cambridge International AS & A Level

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**MARINE SCIENCE**

**9693/12**

Paper 1 AS Structured Questions

**May/June 2020**

**MARK SCHEME**

Maximum Mark: 75

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| <p><b>Published</b></p> |
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Students did not sit exam papers in the June 2020 series due to the Covid-19 global pandemic.

This mark scheme is published to support teachers and students and should be read together with the question paper. It shows the requirements of the exam. The answer column of the mark scheme shows the proposed basis on which Examiners would award marks for this exam. Where appropriate, this column also provides the most likely acceptable alternative responses expected from students. Examiners usually review the mark scheme after they have seen student responses and update the mark scheme if appropriate. In the June series, Examiners were unable to consider the acceptability of alternative responses, as there were no student responses to consider.

Mark schemes should usually be read together with the Principal Examiner Report for Teachers. However, because students did not sit exam papers, there is no Principal Examiner Report for Teachers for the June 2020 series.

Cambridge International will not enter into discussions about these mark schemes.

Cambridge International is publishing the mark schemes for the June 2020 series for most Cambridge IGCSE™ and Cambridge International A & AS Level components, and some Cambridge O Level components.

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This document consists of **11** printed pages.

**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 (see examples below)

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:

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

| Question  | Answer                                                                                                                                                                                                                                                             | Marks |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 1(a)(i)   | all the (living) organisms / populations ;<br>in one area + at one time ;                                                                                                                                                                                          | 2     |
| 1(a)(ii)  | 2 / second ;                                                                                                                                                                                                                                                       | 1     |
| 1(a)(iii) | <i>any 1 of (suggestion with matching explanation):</i><br>(snail population) decreases ;<br>(because) less food / (red) algae for snail <b>OR</b> more competition for food ;<br>or<br>(snail population) stays the same ;<br>(because) other food is available ; | 2     |
| 1(a)(iv)  | <i>any 3 of:</i><br>not all eaten ;<br>not all digested ;<br>respiration (of algae) ;<br>secrete chemicals (for defence against herbivores) ;                                                                                                                      | 3     |
| 1(b)      | (less eaten so) lower efficiency (of energy transfer) ;                                                                                                                                                                                                            | 1     |

| Question | Answer                                                                                                                                                                                                                                                            | Marks |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 2(a)     | <i>any 4 of:</i><br>rivers slow down (near sea / ocean) ;<br>(therefore) depositing sediment / silt ;<br>waves / tides do not remove sediment (as fast as it is deposited) ;<br>slow / no erosion ;<br>mouth of river gets wider / shallower ;<br>rivers branch ; | 4     |

| Question | Answer                                                                                                                                                                                                                                                                                                                  | Marks    |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 2(b)     | <i>any 4 of:</i><br>damage to infrastructure / farmland / buildings / power supply / transport / loss of life / spread of disease / lack of clean drinking water ;<br>flooding ;<br>over large area <b>or</b> far inland ;<br>more sediment in rivers ;<br>rivers changing course ;<br>reduction in local fish stocks ; | <b>4</b> |
| 2(c)     | more water ;<br>decreases / dilutes (salt) concentration ;                                                                                                                                                                                                                                                              | <b>2</b> |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                          | Marks    |
|-----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 3(a)(i)   | parasitism ;                                                                                                                                                                                                                                                                                                                                    | <b>1</b> |
| 3(a)(ii)  | damselfish + surgeonfish added to Fig. with lines to algae + grouper ;<br>damselfish and surgeonfish in separate boxes :<br>arrows in correct direction ;                                                                                                                                                                                       | <b>3</b> |
| 3(a)(iii) | both benefit (neither harmed) ;<br>cleaner fish gain food ;<br>grouper benefit from parasite removal ;                                                                                                                                                                                                                                          | <b>3</b> |
| 3(b)      | <i>any 3 of:</i><br>several / many parasites on each / one fish ;<br>so larger bar above smaller bar ;<br>a large organism / whale fall may provide food for many individuals ;<br>difficult to assign only one trophic level to some species ;<br>(such as) cleaner fish that feed on more than one level ;<br>marks on an annotated diagram ; | <b>3</b> |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                               | Marks    |
|-----------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 4(a)(i)   | <i>any 3 of:</i><br>dissipate / reduce / decrease energy of waves (before they reach the shore) ;<br>reduce wave height ;<br>reduce wave speed ;<br>reduce distance wave travels inland (reduce flooding) ;<br>reduce erosion of shore ;                                                                                                                                                                                                             | <b>3</b> |
| 4(a)(ii)  | (advantage)<br><i>any 1 of:</i><br>reuses a waste product ;<br>cheaper (specialised concrete structures may be more expensive) ;<br>(open structure) may be less prone to damage by waves ;<br>(disadvantage)<br><i>any 1 of:</i><br>may corrode / rust ;<br>may release toxins / heavy metals / oil ;<br>(not as heavy therefore) may move ;<br>open structure may not reduce storm damage as much ;                                                | <b>2</b> |
| 4(a)(iii) | <i>any 1 of:</i><br>reefs with a mixture of types have higher / lower biodiversity ;<br>reefs made of bicycles / concrete have higher / lower biodiversity ;<br>reefs made of bicycles / concrete have no effect on biodiversity ;                                                                                                                                                                                                                   | <b>1</b> |
| 4(b)      | <i>any 3 of:</i><br>(sedimentation) smothering (blocking light) ;<br>(sedimentation) abrasion (caused by crown-of-thorns starfish) ;<br>(coral) predation ;<br>direct human damage <b>OR</b> example such as from divers / anchors / blast fishing / collecting coral ;<br>sea level change ;<br>pesticide / oil / pollutant damage ;<br>salinity change ;<br>bleaching ;<br>pH change / acidification ;<br>temperature change ;<br>eutrophication ; | <b>3</b> |

| Question  | Answer                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                       | Marks    |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 5(a)      | <p><i>any 1 of :</i><br/> photosynthesis requires energy from (sun)light (whereas) chemosynthesis requires chemical energy / dissolved minerals ;<br/> photosynthesis requires chlorophyll (whereas chemosynthesis does not) <b>ORA</b> ;<br/> photosynthesis occurs in plants / algae / phytoplankton / zooxanthellae (whereas) chemosynthesis occurs only in bacteria ;<br/> <i>plus any 1 of :</i><br/> both processes make energy available to, the rest of the food chain or web / other organisms ;<br/> transfers energy into organic compounds ;</p> | <b>2</b> |
| 5(b)      | <p><i>any 3 of:</i><br/> formed at plate boundaries (divergent boundaries) ;<br/> (cold) water seeps into cracks / fissures ;<br/> (underlying) magma heats water ;<br/> causing minerals to dissolve (water becomes saturated) ;<br/> hot water is <u>forced</u> back / spews out / pushed out to the surface (pressure builds) ;<br/> (dissolved) minerals precipitate as water cools ;</p>                                                                                                                                                                | <b>3</b> |
| 5(c)(i)   | <p><i>any 2 of :</i><br/> high temperature ;<br/> high pressure ;<br/> depth ;<br/> extreme / low pH ;<br/> detail mark as qualification of other marks ;</p>                                                                                                                                                                                                                                                                                                                                                                                                | <b>2</b> |
| 5(c)(ii)  | (hydrothermal vents are) rich in minerals ;                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                  | <b>1</b> |
| 5(c)(iii) | <p><i>any 3 of :</i><br/> decreased productivity ;<br/> decreased mineral availability for producers / chemosynthetic bacteria ;<br/> (therefore) less minerals / nutrients available to rest of the food web ;<br/> physical damage or loss of substrate ;<br/> tubeworms cannot attach ;<br/> sedimentation / smothering / increased turbidity ;</p>                                                                                                                                                                                                       | <b>3</b> |

| Question  | Answer                                                                                                                                                                               | Marks |
|-----------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|
| 6(a)      | (produce / make / synthesise / part of) protein(s) / DNA (amino acids) ;                                                                                                             | 1     |
| 6(b)(i)   | <i>any 1 of:</i><br>as a control ;<br>for comparison ;<br>as a standard or reference point ;                                                                                         | 1     |
| 6(b)(ii)  | <i>any 1 of:</i><br>temperature ;<br>volume of each sample ;                                                                                                                         | 1     |
| 6(b)(iii) | 0.16 ;                                                                                                                                                                               | 1     |
| 6(b)(iv)  | 57 (any significant figures is acceptable) ;<br><b>ECF</b> from 6(b)(iii)                                                                                                            | 1     |
| 6(b)(v)   | magnesium needed to produce chlorophyll ;<br>increased chlorophyll ;<br>(increased) phytoplankton (growth) ;                                                                         | 3     |
| 6(c)      | <i>any 2 of:</i><br>run-off ;<br>dissolving ;<br>precipitation ;<br>idea of, ash in sky blown over sea, falls in ;                                                                   | 2     |
| 6(d)      | <i>any 4 of:</i><br>uptake (by marine organisms / phytoplankton) ;<br>eaten / passes up food chain ;<br>to make, bones / coral / shells / teeth ;<br>death ;<br>decay ;<br>sinking ; | 4     |

| Question | Answer                                                                                                                                                                                                                                                                                                                  | Marks    |
|----------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------|
| 7(a)(i)  | <i>any 4 of:</i><br>land warmer than ocean ;<br>air above land heats (more than over ocean) ;<br>therefore air rises ;<br>causing low(er) pressure ;<br>(so) air moves inland from over ocean ;<br>winds from south west / south ;                                                                                      | <b>4</b> |
| 7(a)(ii) | <i>any 2 of:</i><br>lower land temperature ;<br>higher ocean / sea temperature ;<br>less difference between land and ocean temperature ;<br>land cooler than ocean ;                                                                                                                                                    | <b>2</b> |
| 7(b)     | <i>any 2 of:</i><br>more / less mixing ;<br>upwelling / downwelling ;<br>currents ;<br>(in summer) more surface water is warm, so less dense ;                                                                                                                                                                          | <b>2</b> |
| 7(c)     | <i>any 4 of:</i><br>water vapour evaporates (from ocean surface) ;<br>which condenses ;<br>releasing latent heat (transfer of energy from (evaporated) water to air ;<br>latent heat warms surrounding air ;<br>which rises ;<br>decreasing pressure ;<br>causes spiral wind ;<br>which further increases evaporation ; | <b>4</b> |