



## Cambridge International AS & A Level

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**MARINE SCIENCE**

**9693/11**

Paper 1 AS Structured Questions

**May/June 2020**

MARK SCHEME

Maximum Mark: 75

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**Published**

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 **12** 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:

|                  |   |
|------------------|---|
| ;                | 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)                            |

| Question | Answer   | Marks |
|----------|--|-------|
| 1(a)(i)  | interactions + all living organisms ;<br>(with) the environment (where they live) ;  | 2     |
| 1(a)(ii) | captures <u>energy</u> from (sun light) ;<br>makes energy available to, rest of food chain / other organisms ;   | 2     |
| 1(b)(i)  | nitrogen – production of amino acids / proteins ;<br>magnesium – to make chlorophyll ;<br>phosphorous – to make DNA / ATP ;  | 3     |
| 1(b)(ii) | <i>any 2 from:</i><br>high nitrogen in river runoff ;<br>(algal bloom) blocks light to ;<br>reduces photosynthesis(in the seagrass) ;<br>reduces growth of seagrass / kills seagrass ;<br>dead algae / (sediment) settle on top of seagrass ;  | 2     |
| 1(c)(i)  | 0.2 / 10 = 2% ;  | 1     |
| 1(c)(ii) | <i>any 3 from:</i><br>upwelling (on Peruvian coast) ;<br>brings nutrients to the surface ;<br>allowing for more growth of phytoplankton / algae ;<br>(mid-North Atlantic) Is far from river / estuarine nutrient input / runoff ;<br>no upwelling occurs in mid-North Atlantic ;<br>(Peru is closer to the equator,) warmer temperatures ;<br>more, solar / sun, energy received ; | 4     |

| Question  | Answer   | Marks    |
|-----------|--|----------|
| 2(a)(i)   | = 11.3 (mm / year) ; ;<br><i>If incorrect look for evidence of correct workings</i><br>Correct conversion of 43 km to mm ;<br><b>OR</b><br>43 000 000 ÷ 3 800 000 / 43 ÷ 3.8 ;   | <b>2</b> |
| 2(a)(ii)  | 20 × 11.3 = 226 mm <b>ECF</b> ;  | <b>1</b> |
| 2(a)(iii) | bottom of the oceanic <u>trench</u> / description (e.g. where subduction occurs) ;   | <b>1</b> |
| 2(b)(i)   | convergent / destructive ;   | <b>1</b> |
| 2(b)(ii)  | <i>any 3 from:</i><br>oceanic (plate) subducting under continental (plate) ;<br>(because) oceanic crust is denser ;<br>may get caught / pressure build up <b>AW</b> ;<br>release causes <u>sudden</u> (large) plate movement / suddenly releases (large amounts of) energy <b>AW</b> ; | <b>3</b> |
| 2(b)(iii) | <i>any 2 from:</i><br>(earthquake causes) <u>sudden/rapid</u> release of / <u>sudden/rapid</u> slippage;<br><u>large</u> amounts of <u>energy</u> ;<br><u>vertical</u> displacement of seabed / <b>AW</b> ;<br><u>large volume</u> of water displaced (above plate) ;                  | <b>2</b> |

| Question | Answer   | Marks    |                |          |  |          |                                |          |  |          |  |          |
|----------|--|----------|----------------|----------|--|----------|--------------------------------|----------|--|----------|--|----------|
| 3(a)     | <table border="1"> <tr> <td></td> <td><b>process</b></td> </tr> <tr> <td><b>P</b></td> <td>feeding / grazing / passing along or uptake along food chain ;</td> </tr> <tr> <td><b>Q</b></td> <td>absorption / uptake / intake ;</td> </tr> <tr> <td><b>R</b></td> <td>excretion / defaecation / release of waste ;</td> </tr> <tr> <td><b>S</b></td> <td>upwelling / nutrients moving to the surface from ocean floor ;</td> </tr> </table> |          | <b>process</b> | <b>P</b> | feeding / grazing / passing along or uptake along food chain ; | <b>Q</b> | absorption / uptake / intake ; | <b>R</b> | excretion / defaecation / release of waste ; | <b>S</b> | upwelling / nutrients moving to the surface from ocean floor ; | <b>4</b> |
|          | <b>process</b>   |          |                |          |  |          |                                |          |  |          |  |          |
| <b>P</b> | feeding / grazing / passing along or uptake along food chain ;   |          |                |          |  |          |                                |          |  |          |  |          |
| <b>Q</b> | absorption / uptake / intake ;   |          |                |          |  |          |                                |          |  |          |  |          |
| <b>R</b> | excretion / defaecation / release of waste ;   |          |                |          |  |          |                                |          |  |          |  |          |
| <b>S</b> | upwelling / nutrients moving to the surface from ocean floor ;   |          |                |          |  |          |                                |          |  |          |  |          |
| 3(b)(i)  | <i>any 1 from:</i><br>as depth increases, percentage reaching the sediment decreases <b>ORA</b> ;<br>inverse relationship  | <b>1</b> |                |          |  |          |                                |          |  |          |  |          |
| 3(b)(ii) | <i>any 1 from:</i><br>the dead organisms get eaten on their way down ;<br>the further they have to travel the greater the chance they will be eaten ;  | <b>1</b> |                |          |  |          |                                |          |  |          |  |          |

| Question  | Answer  | Marks    |
|-----------|---|----------|
| 4(a)      | hurricane / typhoon   | <b>1</b> |
| 4(b)(i)   | <i>any 2 from:</i><br>provides energy ;<br>for evaporation ;<br>creates warm, damp / humid air ;<br>which rises ; | <b>2</b> |
| 4(b)(ii)  | causes (the system / it) to start spinning ;  | <b>1</b> |
| 4(b)(iii) | keeps the storm intact / doesn't disrupt the winds starting to circle / doesn't blow the system apart ;           | <b>1</b> |



| Question | Answer  | Marks    |
|----------|---|----------|
| 5(a)(i)  | <i>any 2 from:</i><br>Indian Ocean has higher <u>intensity</u> of solar radiation (sunlight) / is closer to the equator / greater solar energy input <b>ORA</b> ;<br>Arctic Ocean cold(er) / Indian ocean warm(er) ;<br>Arctic ocean less wind / Indian ocean more wind ;<br>Arctic Ocean is covered in sea ice for many months, (preventing evaporation) ;   | <b>2</b> |
| 5(a)(ii) | <i>any 4 from:</i><br>Pacific Ocean has a lower salinity <b>ORA</b> (Atlantic Ocean) ;<br>precipitation in Pacific is more <b>ORA</b> (Atlantic Ocean) ;<br>increasing amount of freshwater <b>ORA</b> (Atlantic Ocean) ;<br>reducing salinity <b>ORA</b> (Atlantic Ocean) ;<br>evaporation rate is similar in both ;<br>comparison of P-E values ;<br>idea of, Atlantic Ocean has more other freshwater inputs ;<br>(but) not enough to offset the higher precipitation in the Pacific <b>AW</b> ; | <b>4</b> |
| 5(b)     | (river) runoff ;<br>brings in, nutrients / toxins / pollutants / sediment / increases or decreases temperature / reduces density / increases turbidity or<br>reduces light penetration / causes algal blooms ; ;<br><br>icebergs / glacier meltwater / ice shelf melting ;<br>reduces temperature / creates new surface layer / reduces density / reduces salinity ;  | <b>4</b> |

| Question  | Answer  | Marks    |
|-----------|---|----------|
| 6(a)(i)   | Zooxanthellae / dinoflageellates ;  | <b>1</b> |
| 6(a)(ii)  | mutualistic / both benefit ;<br>(zooxanthellae or <b>ECF</b> from (i) provide food to the polyp ;<br>polyp provides protection to zooxanthellae ; | <b>3</b> |
| 6(a)(iii) | temperature too low ;<br>idea of, not enough light ;  | <b>2</b> |

| Question  | Answer  | Marks    |
|-----------|---|----------|
| 6(b)(i)   | <p><i>any 2 from:</i><br/> reduced salinity ;<br/> increased light intensity ;<br/> physical erosion by sediment ;<br/> sediment blocks light ;<br/> eutrophication ;<br/> acidification ;<br/> predation / named example e.g. COTS, parrot fish ;<br/> named human damage ;</p>  | <b>2</b> |
| 6(b)(ii)  | <p><i>any 2 from:</i><br/> sediment deposition ;<br/> means surface not suitable (for attachment) ;<br/> no corals in the area to reproduce ;<br/> depth may have changed ;</p>   | <b>2</b> |
| 6(b)(iii) | <p>advantage:<br/> species has survived, so better able to survive conditions there ;<br/> <b>PLUS</b><br/> <i>any 1 from :</i><br/> disadvantage:<br/> reduced biodiversity of the area ;<br/> if conditions change again, this species may not survive ;<br/> very narrow ecological niche for other organisms to occupy ;<br/> all may be susceptible to same disease / predator ;</p> | <b>2</b> |
| 6(c)      | <p><i>any 4 from:</i><br/> increased shore erosion ;<br/> due to increased wave energy ;<br/> due to increased wave height ;<br/> damages infrastructure / named ;<br/> damage to near shore ecosystems, such as mangroves ;<br/> increase in flooding / tidal inflow ;<br/> loss of fishing grounds ;<br/> loss of tourism ;</p>   | <b>4</b> |

| Question  | Answer   | Marks |
|-----------|--|-------|
| 7(a)(i)   | (from the top down)<br>tuna<br>blue damselfish<br>zooplankton<br>phytoplankton ;   | 1     |
| 7(a)(ii)  | <u>blue damselfish</u> ;   | 1     |
| 7(a)(iii) | both drawn above tuna ;<br>numbers bar for parasitic nematodes must be wider than tuna ;<br>energy bar for parasitic nematodes must be narrower than tunas ;   | 3     |
| 7(a)(iv)  | the nematode that lives in(side) + tuna ;<br>gaining benefit / named benefit + tuna is harmed / named harm to tuna ;   | 2     |
| 7(b)(i)   | <i>any 1 from:</i><br>reflected from the surface of the water ;<br>absorbed by water ;<br>reflected by particulates ;<br>phytoplankton are not able to absorb all wavelengths ;<br>not all light lands on phytoplankton / chloroplasts ;   | 1     |
| 7(b)(ii)  | <i>any 2 from:</i><br>a greater amount of previous trophic level captured / eaten <b>ORA</b> ;<br>(previous trophic level) idea of more digestible / less indigestible matter (e.g. shell / bone at higher) ;<br>relative energy expended in capturing / moving / idea that some organisms (zooplankton) may not actively swim ;<br>ref. to respiratory rate differences ; | 2     |

| Question | Answer  | Marks    |
|----------|---|----------|
| 7(c)     | <i>any 4 from :</i><br>easier to find food ;<br>many fish searching ;<br><br>easier to find a mate ;<br>increases reproductive success ;<br><br>hydrodynamic efficiency / reduced drag ;<br>reduces energy requirement for swimming ; | <b>4</b> |