
MARINE SCIENCE

9693/11

Paper 1 AS Structured Questions

May/June 2019

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.

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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.

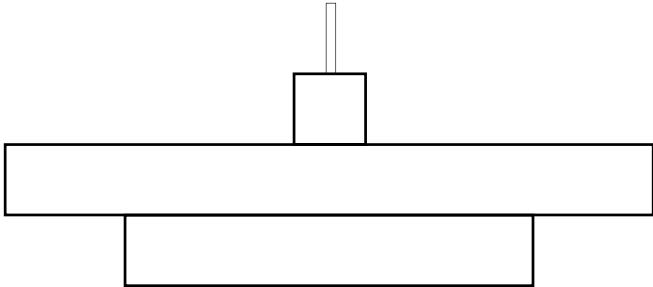
This mark scheme will use the following abbreviations:

| | |
|-------------------------|---|
| ; | 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) |
| OR | 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 | Guidance |
|----------|---|-------|--|
| 1(a)(i) | light (energy) ; | 1 | I heat |
| 1(a)(ii) | <u>photosynthesis</u> ; | 1 | A photosynthetic A phonetical spellings |
| 1(b)(i) | phytoplankton ; tuna ; | 2 | |
| 1(b)(ii) | (animal) that, hunts / captures / traps / kills ; <u>eats / consumes</u> other animals / prey / consumers / named animal ; | 2 | |
| 1 (c) | <u>reduces</u> (energy transfer efficiency) ; nematodes, use / utilise + energy / food / nutrients, from tuna ; | 2 | R idea of, taking <u>all</u> of the energy from the tuna |

| Question | Answer | Marks | Guidance |
|-----------|--|-------|---|
| 2(a) | (carbon) 14 / ¹⁴ C / carbon–14 | 1 | |
| 2(b)(i) | 8750 ±250 ; | 1 | |
| 2(b)(ii) | 0.38 cm (per year) / 3.8 mm (per year) / 0.0038 m (per year) ; ; ; | 3 | A ECF from bi) |
| 2(b)(iii) | reef erosion / any named cause of reef erosion ; OR ref. too few samples / specified error in method / insufficient data ; | 1 | I vague statements of human error / miscalculations |

| Question | Answer | Marks | Guidance |
|----------|--|-------|---|
| 3(a) | <u>thermocline</u> ; | 1 | I description A phonetical spellings |
| 3(b)(i) | <i>any 3 from:</i> (temperate) <u>starts</u> at a lower temperature ; (thermocline) is at a shallower depth ; steeper, slope / gradient (of thermocline) ; (but) change in temperature per m is less ; smaller temperature change ; covers smaller depth <u>range</u> ; I, reach the same (stated) temperature, below the thermocline ; | 3 | |
| 3(b)(ii) | <i>any 2 from:</i> surface is <u>cooled</u> more / heat is <u>lost</u> to the air ; more, turbulence / mixing / storms (in temperate region) ; (because) angle of the sun is lower / intensity of the sun is less ; | 2 | |
| 3(c) | <i>any 2 from:</i> little (sun)light / solar radiation (to warm water) ; idea of, light is reflected by the ice ; surface water (very) cold OR surface temp is similar to lower depths ; density of water the same throughout ; | 2 | A idea of, light is blocked by the ice |
| 4(a)(i) | <u>continuous</u> movement (of water) ; in a, definite / set / specific, direction ; | 2 | I causes of currents |
| 4(a)(i) | movement of cold water ; nutrient rich / ref. to carrying nutrients ; (water) from ocean, depths / bottom, + to the surface ; | 3 | |

| Question | Answer | Marks | Guidance |
|----------|--|-------|---|
| 4(b) |  <p>closed horizontal bars, approximately centered and touching ; labelled in correct order ; correct proportions (krill is widest, phytoplankton is wider than seals, killer whale is narrowest) ;</p> | 3 | <p>Note- if draw simple triangle, only MP2 can still be credited</p> <p>A line for killer whale</p> |
| 5(a)(i) | <p>P volcano/ volcanic island ; Q mid-ocean ridge ; R (ocean) trench ;</p> | 3 | <p>A seamount I hydrothermal vent A subduction zone</p> |
| 5(a)(ii) | convergent ; | 1 | <p>I description A destructive I subduction</p> |
| 5(b)(i) | <p><i>any 3 from:</i> divergent plates ; <u>magma</u> rises ; molten rock / magma / lava, cools and solidifies ; plates keep moving apart, so process repeats / continuous / keeps going ;</p> <p><i>idea of</i>, convection currents drive this process ; sediments accumulate ;</p> | 3 | <p>A description of e.g. seafloor spreading</p> <p>A ‘forms new crust’ for solidifies A <i>idea of</i>, subduction zone removing plate edges</p> <p>A named sediments</p> |
| 5(b)(ii) | <p><i>any 1 from:</i> younger rocks closer to the oceanic ridge / get older the further out ; seabed / sea floor / rocks, show <u>magnetic</u>, banding / striping ;</p> | 1 | |

| Question | Answer | Marks | Guidance |
|-----------|---|----------|----------|
| 5(b)(iii) | explanation / idea / hypothesis ; (consistently) supported by OWTTE , evidence / observable facts / experimental results ; | 2 | I proven |
| 5(c) | <i>any 3 from:</i> extreme / high, pressure ; extreme / high, temperature ; <u>no</u> light ; acidic / low pH ; | 3 | |

| Question | Answer | Marks | Guidance | | | | | | | | | | | | |
|----------------------------|--|-------------|----------|-------------|---------------------------------|---------------------|---------------|----------------------------|---|---------|------------------------------|---------------------|------------------------------------|----------|--|
| 6(a) | <p><i>Magnesium – use MUST match substance for 2 marks. If don't match, max 1 for magnesium</i></p> <table border="1" data-bbox="353 316 1299 845"> <thead> <tr> <th data-bbox="353 316 636 381">substance ;</th> <th data-bbox="636 316 1299 381">Use ;</th> </tr> </thead> <tbody> <tr> <td data-bbox="353 381 636 446">chlorophyll</td> <td data-bbox="636 381 1299 446">photosynthesis / description of</td> </tr> <tr> <td data-bbox="353 446 636 547">magnesium phosphate</td> <td data-bbox="636 446 1299 547">bones I shell</td> </tr> <tr> <td data-bbox="353 547 636 679">Mg ions / Mg²⁺</td> <td data-bbox="636 547 1299 679">bones / coral skeleton / corallite / shell / chlorophyll / creation of, DNA / RNA / ATP OR creation of enzymes</td> </tr> <tr> <td data-bbox="353 679 636 745">enzymes</td> <td data-bbox="636 679 1299 745">creation of, DNA / RNA / ATP</td> </tr> <tr> <td data-bbox="353 745 636 845">magnesium carbonate</td> <td data-bbox="636 745 1299 845">coral skeleton / corallite / shell</td> </tr> </tbody> </table> <p><i>calcium</i> coral skeleton / corallite / shell ; A bones / teeth</p> <p><i>nitrogen</i> protein / amino acid / enzymes / DNA / RNA / nucleic acids ;</p> | substance ; | Use ; | chlorophyll | photosynthesis / description of | magnesium phosphate | bones I shell | Mg ions / Mg ²⁺ | bones / coral skeleton / corallite / shell / chlorophyll / creation of, DNA / RNA / ATP OR creation of enzymes | enzymes | creation of, DNA / RNA / ATP | magnesium carbonate | coral skeleton / corallite / shell | 4 | |
| substance ; | Use ; | | | | | | | | | | | | | | |
| chlorophyll | photosynthesis / description of | | | | | | | | | | | | | | |
| magnesium phosphate | bones I shell | | | | | | | | | | | | | | |
| Mg ions / Mg ²⁺ | bones / coral skeleton / corallite / shell / chlorophyll / creation of, DNA / RNA / ATP OR creation of enzymes | | | | | | | | | | | | | | |
| enzymes | creation of, DNA / RNA / ATP | | | | | | | | | | | | | | |
| magnesium carbonate | coral skeleton / corallite / shell | | | | | | | | | | | | | | |

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| Question | Answer | Marks | Guidance |
|----------|---|----------|----------|
| 6(b) | <p><i>any 4 from :</i></p> <ol style="list-style-type: none"> 1. uptake / absorbed, by, (named) producers / plants / algae / phytoplankton / zooxanthellae ; 2. passage along a <u>food chain / web</u> ; 3. excretion / released as faeces ; 4. (organisms / bodies) sink to seabed after death / faeces sink to seabed ; 5. ref. to decomposition / decay ; 6. incorporated into reefs ; 7. returned by upwelling ; 8. ref. hydrogen carbonate ions / HCO_3^- / carbonic acid ; 9. ref. to <u>carbon dioxide</u> being, taken in / released ; 10. (carbon (dioxide) used in) photosynthesis ; 11. to create, glucose / other named organic nutrient e.g. carbonate ; 12. (carbon (dioxide) produced in) respiration ; | 4 | |
| 7(a) | <p><i>any 4 from :</i></p> <p>photosynthesis ; by, (named) producers / phytoplankton / algae / plants / zooxanthellae ; in photic zone / light (energy) available ; turbulence / surface mixing / wave action ; atmospheric dissolution / description of OR diffusion ;</p> | 4 | |
| 7(b)(i) | A ; | 1 | |
| 7(b)(ii) | 160±20 (m) ; | 1 | |

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| Question | Answer | Marks | Guidance |
|----------|--|----------|--------------------------------|
| 7(c) | <p><i>any 2 from:</i></p> <ol style="list-style-type: none"> 1. idea of, have to pass through zone of low oxygen / low oxygen may kill them ; 2. pressure difference too great / pressure is too low (at surface) ; 3. light (intensity) <u>too</u> high ; 4. (water) temperature <u>too</u> high ; 5. reduced food availability in low oxygen area ; 6. less predator avoidance (as not familiar with predators / more visible to predators, at that depth) ; 7. (behavioural / physical) adaptation for living at depths, which are unsuitable for shallower water ; 8. can't compete with the organisms at the surface ; 9. usual food source not available ; 10. idea of, higher oxygen levels <u>may by toxic</u> / oxygen levels <u>too</u> high ; | 2 | |
| 8(a)(i) | 8.4 ; ; | 2 | A 8.44 / 8.445 / 8.4449 |
| 8(a)(ii) | <p><i>any 2 from:</i></p> <p>named natural disaster (e.g. hurricane / cyclone / tsunami) ; tourism development ; deforestation qualified ; shrimp farming / aquaculture activities ; building houses / roads / infrastructure ; disease ; global warming / rise in sea level ; AVP ; ;</p> | 2 | |
| 8(b) | <u>parasitism</u> / <u>parasitic</u> ; | 1 | |

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| Question | Answer | Marks | Guidance |
|----------|---|----------|--|
| 9(a) | <p><i>any 3 from:</i> no longer gaining energy / heat ; from <u>warm waters</u> (of ocean) ; no, water / ocean, to evaporate (into the cyclone) ; buildings / trees / mountains, reduce / absorb, <u>energy</u> ; (due to) increased friction ; increased wind shear ;</p> | 3 | <p>A ref. to need for water temp at 26.5°C / 79.7°F</p> |
| 9(b) | <p><i>any 4 from:</i> high energy waves + (physically) break coral ; (inflow from land OR mixed from the ocean) sediment + causes, abrasion / erosion ; increased turbidity / sediment left on top of coral polyp + reduces light for photosynthesis / blocks mouth for feeding ; air exposure + kills coral polyp ; large inflow of fresh water + lowers salinity ; stress induced + disease ; AVP ;</p> | 4 | <p>e.g. inland flooding brings high nutrients to the sea + eutrophication / description of</p> |
| 9(c) | <p><i>any four from:</i></p> <ol style="list-style-type: none"> 1. tidal surge ; 2. flooding ; 3. coastal erosion ; 4. damage / destruction of, ecosystem ; 5. damage to, buildings / infrastructure / communications ; 6. disease / loss of life / injuries ; 7. economic cost of repair ; 8. reduction in fisheries ; 9. reduced tourism ; 10. reduced income / loss of jobs ; 11. human displacement ; 12. damage to agriculture ; 13. increased fertility of land ; 14. damage to boats / fishing equipment ; | 4 | |