



## **Cambridge International AS & A Level**

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**MARINE SCIENCE**

**9693/23**

Paper 2 AS Data Handling and Free-Response

**May/June 2020**

MARK SCHEME

Maximum Mark: 50

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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 **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:

;	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
<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)	Maximum 36.0 and minimum 25.5 ;	1
1(a)(ii)	<p><i>any 3 from:</i>  salinity rises and falls twice per 24hr period ;</p> <p>overall salinity levels rising over the seven day period ;</p> <p>(significant) peak on 7th Nov ;</p> <p>(significant) trough on 1st Nov ;</p> <p>peaks/troughs gradually becoming later each day ;  idea of, daily range changes ;</p>	3
1(a)(iii)	<p><i>any 3 from:</i>  tide rises and falls twice per 24hr period ;</p> <p>tidal cycle causes change in height of tide ;</p> <p>higher tide causes higher salinity ORA ;</p> <p>variations in run-off will affect dilution ;</p> <p>impact of varying precipitation on run-off ;</p> <p>tidal cycle is just over 12 hours so peaks / troughs shift slightly to right ;</p> <p>credit named example of factor affecting tidal height e.g. wind / air pressure ;</p>	3
1(b)	<p><i>any 3 from ;</i>  idea of, must have adaptation / features allowing them to survive in this environment ;  (difficulty of surviving in) changing salinity ;  (difficulty of surviving in) changing oxygen levels ;  temperature fluctuations ;  potential for dessication due to salt / water fluctuations ;</p>	3

Question	Answer	Marks
2(a)(i)	59.1 (59)	1
2(a)(ii)	<p><i>any 3 from:</i></p> <p>elkhorn has higher % survival after 6 months ;</p> <p>staghorn has higher initial survival ;</p> <p>greater drop in staghorn number surviving between 3–6 months ;</p> <p>only slight drop in elkhorn coral numbers between 3–6 months ;</p> <p>credit manipulation of numbers ;</p>	3
2(b)	<p><i>any 6 from:</i></p> <p>1 <i>(how vary independent)</i> reference to (a) container(s) of (sea) water ;</p> <p>2 <i>(range independent)</i> each at a stated temperature / suitable temperature range suggested ;</p> <p>3 <i>(control variables)</i> <u>at least two</u> stated variables controlled, e.g. species of coral, salinity of sea water, light intensity, dissolved oxygen concentration, pH, nutrient/food content of water ;</p> <p>4 <i>(how dependent)</i> <u>known</u> original mass or area or branch length of coral ;</p> <p>5 <i>(how dependent)</i> leave for suitable stated time ;</p> <p>6 <i>(how dependent)</i> measure <u>change</u> in mass / area / length of coral (at each temperature) ;</p> <p>7 <i>(how dependent)</i> reference to calculation of rate of growth ;</p> <p>8 <i>(repeats and means)</i> reference to replicates (at each temperature) + calculation of means / average ;</p> <p>9 <i>(ethical / safety)</i> e.g. care handling coral as living organism / not extreme values of independent variable that could kill coral ;</p>	6

Question	Answer	Marks
3(a)	<p><i>any 3 from:</i>  upwelling brings nutrient rich water nearer to surface ;  increase in primary productivity in surface waters ;  increase in animal populations in food chains ;  more food for tuna and sardines ;</p> <p><b>AND / OR:</b>  degree of upwelling varies year on year ;  reference to impact of El Niño / La Niña ;</p>	<b>4</b>
3(b)	<p><i>any 4 from:</i>  1 both may benefit from increased chance of reproductive success ;  2 idea of, both may benefit from increased hydrodynamic efficiency ;  3 sardines (are prey to various predators so benefit from) safety in numbers ;  4 due to lower probability of predation / ability to respond to each other's movements ;  5 Tuna may benefit from increased predation efficiency ;  6 due to scattering of prey / increased chance of isolating prey ;</p>	<b>4</b>
3(c)	<p>when one organism lives on or in another ;  for its non-mutual benefit / benefiting at the expense of the other ;  such as nematode worms in tuna ;</p>	<b>3</b>



Question	Answer	Marks
3(d)	<p><i>any 4 from :</i></p> <p>1 tuna live in more than one habitat / described ;</p> <p>2 tuna feed on a wide range of prey ;</p> <p>3 butterfly fish have a specialised niche ;</p> <p>4 eat only, coral / one type of food ;</p> <p>5 live only on coral reefs ;</p> <p>6 niche is an organism's role in an ecosystem ;</p>	4

Question	Answer	Marks
4(a)	<p><i>any 4 from:</i></p> <p>volcano will have formed at plate boundary ;</p> <p>named plate boundary, convergent or divergent ;</p> <p>magma / lava / molten rock, released from below Earth's crust / from mantle ;</p> <p>(lava) cools <b>AND</b> solidifies ;</p> <p>forms new igneous rock ;</p> <p>ref. to formation in subduction zone ;</p>	4

Question	Answer	Marks
4(b)	<p><i>any 4 from:</i></p> <ol style="list-style-type: none"><li>1 colonised / settling, by, reef-building / hermatypic, coral <b>OR</b> colonised / settling, by coral polyps / coral larvae ;</li><li>2 so, <u>fringing reef</u> develops ;</li><li>3 volcano becomes dormant / extinct ;</li><li>4 volcano / island, begins to sink / subside ;</li><li>5 so, <u>barrier reef</u> develops ;</li><li>6 lagoon / description of, forms between reef and island ;</li><li>7 volcano / island, eventually sinks below sea level / disappears ;</li></ol>	<b>4</b>

Question	Answer	Marks
4(c)	<p><i>any 7 from:</i></p> <ol style="list-style-type: none"> <li>1 gases from volcanic action <u>dissolve</u> ;</li> <li>2 named volcanic gas ;</li> <li>3 change in temperature ;</li> <li>4 higher temperature decreases solubility / <b>ORA</b> ;</li> <li>5 suggested cause for change e.g. vent / volcano / glacial melt / global warming ;</li> <li>6 wave action ;</li> <li>7 (increased turbulence) increases <u>dissolution</u> ;</li> <li>8 salinity ;</li> <li>9 increased salinity decreases solubility / <b>ORA</b> ;</li> <li>10 pressure ;</li> <li>11 increased pressure increases solubility / <b>ORA</b> ;</li> <li>12 ref to photosynthesis, increasing O<sub>2</sub> / decreasing CO<sub>2</sub> ;</li> <li>13 ref to respiration, decreasing O<sub>2</sub> / increasing CO<sub>2</sub> ;</li> </ol>	<b>7</b>