



Cambridge International AS & A Level

MARINE SCIENCE

9693/21

Paper 2 AS Data Handling and Free-Response

May/June 2020

MARK SCHEME

Maximum Mark: 50

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.

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)	<p><i>any 2 of:</i> use of measured area / use of quadrat ; idea of subdivisions within, area / quadrat ; to record coral coverage (in territory of each fish) ; use of photograph for subsequent analysis ; repeat process ;</p>	2
1(b)	<p><i>any suitable suggestion:</i> increased percentage cover of coral will decrease feeding rate AND / OR territory size ; percentage cover of coral affects feeding rate AND territory size ; there is a (positive) correlation between feeding rate and territory size ;</p>	1
1(c)	<p><i>any 3 of:</i></p> <p>(territory size will increase with decreased percentage cover) as fish will need to forage further / move around more to find sufficient food ORA ;</p> <p>(feeding rate may increase with decreased percentage cover) as fish will expend more energy seeking food ORA ;</p> <p>(feeding rate may increase with increased cover) as fish can take more bites in one place ; ref. to reasons for increased feeding rate in increased territory size ;</p> <p>AVP ;</p>	3

Question	Answer	Marks
1(d)	<p><i>any 3 of:</i></p> <p>(clear) correlation between the variables ;</p> <p>only one species of fish studied ;</p> <p>only one reef studied ;</p> <p>relatively small sample size ;</p> <p>spread of data is high ;</p> <p>credit suitable supporting examples from data ;</p> <p>territory size correlation is stronger ;</p> <p>errors in collection of data e.g. missing a bite ;</p>	3

Question	Answer	Marks
2(a)(i)	3828 ;	1
2(a)(ii)	<p>3828 correctly plotted for January ;</p> <p>lines correctly added joining Dec, Jan and Feb ;</p>	2
2(b)(i)	<p><i>any 2 of:</i></p> <p>zooplankton numbers low and phytoplankton numbers high ;</p> <p>plenty of food so zooplankton numbers increase ;</p> <p>phytoplankton consumed so numbers decreases ;</p>	2

Question	Answer	Marks
2(b)(ii)	<i>any 2 of:</i> low phytoplankton (numbers) and high zooplankton (numbers) ; so lack of food for zooplankton ; decrease in zooplankton allows phytoplankton numbers to recover ;	2
2(c)(i)	first trophic level / trophic level 1 / primary producer / producer ;	1
2(c)(ii)	<i>any 3 of:</i> increased water turbidity ; pollution ; decrease in light penetration and photosynthesis ; decrease in nutrient content of water ; increase in numbers of other consumers ;	3

Question	Answer	Marks
3(a)	<i>one of:</i> winds reverse ; winds change direction ; <i>any 3 from:</i> 1 in July / Aug Asian continent / landmass warmer than sea ; 2 air over continent becomes less dense and rises ; 3 so air drawn from ocean to replace it ; 4 south-west wind created ORA for winter months	4

Question	Answer	Marks
3(b)	<p><i>any 8 of :</i></p> <p>Temperature:</p> <ol style="list-style-type: none"> 1 decrease in temperature with depth ; 2 surface waters warmer due to heat from Sun / solar radiation ; 3 reference to thermocline ; 4 as region of <i>steep</i> decrease ; 5 density of warmer water ; <p>Salinity:</p> <ol style="list-style-type: none"> 6 highest at surface due to evaporation ; 7 reference to halocline ; 8 as steep decrease ; 9 then slow increase with depth due to density ; <p>Oxygen:</p> <ol style="list-style-type: none"> 10 surface waters have higher concentration ; 11 due to atmospheric dissolution / photosynthesis / wave action ; 12 oxygen minimum layer due to uptake by organisms ; 13 increase in oxygen again at greater depths ; 14 due to increased solubility in cooler temperature / at higher pressure ; 	8

Question	Answer	Marks
3(c)	<i>any 3 of:</i> effect of wind ; temperature ; Coriolis effect... ; ...explanation of ; influence of tides ; change in density ; topography of sea-bed ;	3

Question	Answer	Marks
4(a)	<i>any 4 from:</i> 1 unstable substrate (inability to attach) / sediments ; 2 prone to erosion / deposition ; 3 reference to burrowing organisms ; 4 limited food sources ; 5 prone to desiccation ; 6 ref. to need for specific adaptation e.g. burrowing ability ; ORA for rocky shores	4

Question	Answer	Marks
4(b)	<p><i>any 5 from:</i></p> <ul style="list-style-type: none"> 1 degree of exposure to wave action ; 2 sheltered shores likely to show higher biodiversity ORA ; 3 slope / relief / incline ; 4 greater incline likely to have lower biodiversity ORA ; 5 topography ; 6 presence of rock/tidepools likely to give higher biodiversity ; 7 nature of substrate / rock type ; 8 sedimentary rock more prone to erosion / less suitable for attachment ; 9 tidal range ; 10 will affect length of time exposed to desiccation ; 11 aspect ; 12 will affect, degree of wave exposure / fetch ; 	5

Question	Answer	Marks
4(c)	<p><i>Max 5 from:</i></p> <ol style="list-style-type: none">1 ecosystem contends with <u>extreme</u> conditions ;2 high water pressure ;3 lack of light / aphotic conditions ;4 high mineral content / toxicity ;5 high water temperature (superheated water) ;6 reliance on chemosynthesis to support ecosystem ;7 organisms must be <u>adapted</u> to extreme conditions (extremophiles) ; <p><i>Plus, at least one from:</i></p> <ol style="list-style-type: none">8 ref to transient nature of vents (providing new habitat) ;9 ref to succession ;10 <i>Tevnia</i> <u>replaced by</u> <i>Riftia</i> ;	6