



Cambridge International AS & A Level

MARINE SCIENCE

9693/04

Paper 4 A2 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 **9** 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)	0.55 (%) ;	1
1(a)(ii)	<i>any 1 of:</i> difficult to control where the gene goes in DNA ; gene may not be taken up by the nucleus ; gene may insert into inactive DNA ;	1
1(b)(i)	Axes – correctly labelled including units ; Scale – suitable linear scale for both axes to use at least ½ grid ; Plots – ± ½ small square ; Line – straight lines joining points ; Key – key or lines labelled ;	5
1(b)(ii)	<i>any 2 of:</i> both increase in mass throughout the time period ; genetically engineered fish grow faster ORA ; growth of genetically engineered fish levels off after nine weeks ORA ; growth rate between 4 and 6 weeks is similar ORA ; correct relevant data manipulation ;	2
1(c)(i)	500 (kg) ;	1
1(c)(ii)	<i>any 3 of:</i> less wild fish is used ; less overfishing of wild fish ; reduced effects on food chains ; less waste from food and faeces ; reduced eutrophication / reduced oxygen depletion ;	3

Question	Answer	Marks
2(a)(i)	(as body mass increases), gill surface area: body mass ratio decreases sharply then levels off ;	1
2(a)(ii)	220 (mm ² g ⁻¹) ; 110 000 mm ² ; ±½ small square	2
2(b)	<i>any 4 of:</i> increased sea temperature leads to reduced oxygen concentration ; larger fish have lower gill area proportion ; reduced diffusion of oxygen into blood ; insufficient oxygen available for respiration ; less energy for growth ;	4

Question	Answer	Marks
3(a)	<i>any 4 of:</i> intensive uses <u>more</u> technology ; intensive is <u>less likely</u> to be in the natural environment ; intensive requires <u>more</u> artificial feeding ; intensive has <u>more</u> supplements of substances ; extensive uses natural water currents ; intensive requires <u>more</u> water filtration ; AVP ;	4
3(b)	<i>any 5 of:</i> adult shrimp kept in indoor tanks ; eggs collected and placed into brood tanks ; eggs are washed / sterilised ; larvae fed with algae ; postlarval shrimps placed into nursery ponds ; shrimps grown out in outdoor shallow ponds ; antibiotics used to reduce bacterial infections ; filtering of water carried out ; fungicides added to water ;	5

Question	Answer	Marks
3(c)	<p><i>any 6 of:</i> lobsters (and other organisms) feed on waste foods so require no food of their own ; less decomposition of wastes ; so less oxygen loss ; seaweeds prevent algal blooms ; photosynthesis of seaweeds produces oxygen for fish respiration ; all waste types are removed ; natural water currents supplies more oxygen ; produces multiple products for market / (idea of) demand for different products may fluctuate ;</p>	6

Question	Answer	Marks
4(a)(i)	<p><i>any 3 of:</i> provide a habitat ; act as a nursery ground ; fix carbon / energy for food chains ; provide oxygen for respiration ; chemosynthesis ;</p>	3
4(a)(ii)	<p><i>any 6 of:</i> producers have adaptations suitable for their habitat / where they are found ;</p> <p>(open ocean) has diatoms / dinoflagellates / cyanobacteria / Sargassum ; no anchorage / float on surface ; require floatation devices ; light penetration is only through upper layer of water ;</p> <p>(intertidal zones) green / red / brown algae ; require anchorage on substrate ; due to tidal movements ; very shallow areas have green algae ; deeper areas have red and brown algae ; possession of accessory pigments as less red light in deeper water ;</p>	6

Question	Answer	Marks
4(b)	<p><i>any 6 of:</i> sustainable fishing means that harvests must not deplete stocks ;</p> <p>air / sea patrols ; are effective at spotting boats ; but are expensive ; and can only patrol at certain times / over certain areas ;</p> <p>catch inspection ; enables quota enforcement / stops illegal catches ; but requires manpower / no warning to fishers / fishers may dump catch ;</p> <p>catch per unit effort ; takes into account the fishing intensity and state of fish stocks ; may not account for high catch per unit effort of depleted stocks when using sophisticated technology ;</p> <p>satellite monitoring ; effective at spotting all vessels and monitoring time in fishing grounds ; expensive / requires all vessels to carry satellite recognition equipment ;</p>	6