



Cambridge International AS & A Level

MARINE SCIENCE

9693/13

Paper 1 AS Level Theory

May/June 2022

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.

Cambridge International is publishing the mark schemes for the May/June 2022 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

This document consists of **14** 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.

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	<p><u>'List rule' guidance</u></p> <p>For questions that require <i>n</i> responses (e.g. State two reasons ...):</p> <ul style="list-style-type: none">• The response should be read as continuous prose, even when numbered answer spaces are provided.• Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>.• Incorrect responses should not be awarded credit but will still count towards <i>n</i>.• 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 <i>n</i> 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.

Key Points

- Refer to the *Instructions for Examiners (marking scripts on-screen) 2021* booklet for details of all procedures.
- As soon as you are able (usually about two days after the paper set date), please access the question paper and provisional mark scheme from the **RM support portal**. In conjunction with the provisional mark scheme, browse scripts in **RM Assessor (scoris)** and feed any issues or comments to your **Team Leader**.
- The decisions of the **Principal Examiner** are final, and the final agreed mark scheme must be applied as intended by the Principal Examiner. If you are in any doubt about applying this mark scheme, consult your **Team Leader** by telephone or by email.
- Please report any serious problems during marking to your **Team Leader / Principal Examiner** (details in the confidential package).
- If you require technical support, please contact the **RM Helpdesk**. If you require administrative support relating to the examination process, please contact the **CIE Examiner Helpdesk**. For all queries relating to payment, please contact **Cambridge Assessment Finance Division**. Up-to-date contact details for each of these can be found in the *Instructions for Examiners (marking scripts on-screen) 2021* booklet.
- The schedule of dates is very important. It is **essential** that you meet the **Batch 1** and **Batch 2** deadlines. If you experience problems, you must contact your Team Leader without delay.
- Mark strictly to the mark scheme. All marks awarded must relate directly to the mark scheme. However, always credit correct, relevant, science, even if it lies outside of the syllabus content. For answers not provided for in the mark scheme, give as far as possible equivalent marks for equivalent work. If in doubt, consult your Team Leader.
- Never transfer marks allocated for one question item to another.
- Where work has been crossed out, mark it when nothing else has been written.
- Do not penalise grammatical constructions / spelling of words that are not in the syllabus, so long as the meaning is clear.
- Credit should be given to all the candidate's correct responses, wherever they have been written (including blank pages, around diagrams, etc.).
- Additional materials may be attached and must be checked for candidates' responses. Show that you have checked blank pages for answers by placing an annotation on each blank page. Do not use crosses or ticks for this purpose, unless the points are credited as part of a response to a specific question. In this instance, please use the On Page Comment tool to clearly annotate which question part the marks relate to.
- If the candidate has left an answer blank, or has left a mark / comment that does not in any way relate to the question (for example 'my dog is black' or '----' or 'can't do' or '?') use the **NR** (No Response, #) option.
- Award 0 marks for any attempt which does not earn credit. This includes copying out all / part of the question or any working that does not earn any marks (whether crossed out or not).

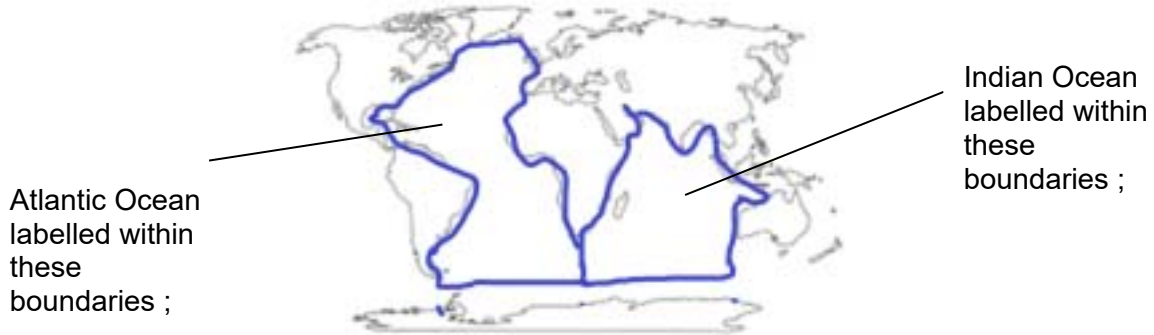
This mark scheme will use the following abbreviations:

;	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)

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Question	Answer	Marks								
1(a)(i)	<table border="1" style="width: 100%; text-align: center;"> <thead> <tr> <th data-bbox="459 213 1137 277">ionic bonds</th> <th data-bbox="1137 213 1816 277">covalent bonds</th> </tr> </thead> <tbody> <tr> <td data-bbox="459 277 1137 341">calcium carbonate</td> <td data-bbox="1137 277 1816 341">carbon dioxide</td> </tr> <tr> <td data-bbox="459 341 1137 405">sodium chloride</td> <td data-bbox="1137 341 1816 405">oxygen</td> </tr> <tr> <td data-bbox="459 405 1137 469"></td> <td data-bbox="1137 405 1816 469">glucose</td> </tr> </tbody> </table>	ionic bonds	covalent bonds	calcium carbonate	carbon dioxide	sodium chloride	oxygen		glucose	2
ionic bonds	covalent bonds									
calcium carbonate	carbon dioxide									
sodium chloride	oxygen									
	glucose									
1(a)(ii)	<p><i>any 4 from:</i> (idea of) oxygen draws electrons closer to itself ; oxygen atom becomes (slightly), negatively charged / negative dipole ; hydrogen atom becomes (slightly), positively charged / positive dipole ; positive and negative charges attract ; bonds are weak / weaker than covalent bonds ; electrostatic forces (develop) ;</p>	4								
1(a)(iii)	<p><i>any 3 from:</i> C^{+} / Cl is negative OR Na^{+} / Na is positive ; (because it) gains an electron from the sodium ion OR because it loses an electron to the chloride ions ; (so C^{+} is) attracted to the hydrogen (atom) OR Na^{+} is attracted to the oxygen (atom) ; separates from the lattice ;</p>	3								
1(b)(i)	<p><i>any 2 from:</i> carbon / hydrogen / oxygen ;</p>	1								

Question	Answer	Marks
<p>1(b)(ii)</p>	<div style="display: flex; justify-content: space-around;"> <div style="text-align: center;"> <p>large molecule</p> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">cellulose</div> <div style="border: 1px solid black; padding: 2px 5px;">lipids</div> <div style="border: 1px solid black; padding: 2px 5px;">protein</div> <div style="border: 1px solid black; padding: 2px 5px;">starch</div> </div> </div> <div style="text-align: center;"> <p>smaller molecule</p> <div style="display: flex; flex-direction: column; gap: 10px;"> <div style="border: 1px solid black; padding: 2px 5px;">amino acids</div> <div style="border: 1px solid black; padding: 2px 5px;">glucose</div> <div style="border: 1px solid black; padding: 2px 5px;">glycerol</div> <div style="border: 1px solid black; padding: 2px 5px;">fatty acids</div> </div> </div> </div>	<p>4</p>
<p>1(b)(iii)</p>	<p><i>any 3 from:</i> photosynthesis ; using light energy ; to convert carbon dioxide + water ; into, glucose / carbohydrate, + oxygen ;</p>	<p>3</p>

Question	Answer	Marks
2(a)	 <p data-bbox="577 421 779 552">Atlantic Ocean labelled within these boundaries ;</p> <p data-bbox="1532 300 1727 427">Indian Ocean labelled within these boundaries ;</p>	1
2(b)(i)	<p data-bbox="338 628 824 831"><i>any 4 from:</i> (spring tide has) largest tidal range ; Moon, Sun and Earth in straight line ; gravity / gravitational force ; additive (effect of Sun and Moon) ; highest force on the water body ;</p>	4
2(b)(ii)	<p data-bbox="338 863 1272 930">(actual low tide) will be lower than predicted ; (because) higher atmospheric pressure pushes the water down further ;</p>	2

Question	Answer	Marks
3(a)(i)	mutualism ;	1
3(a)(ii)	<i>any 4 from:</i> both organisms benefit / increases chance of survival (of both) ; toxin provides protection for the <u>alga</u> / alga is eaten less ; so increases population of alga ; alga receives CO ₂ from bacterium ; (alga) provides a safe environment / protection (for the bacterium) ; <u>bacterium</u> receives nutrients / energy (from alga) ; <u>bacterium</u> receives O ₂ (from alga) ; so increases growth / respiration of bacterium ;	4
3(b)	haemocyanin / KLH / fish skin for burns treatment / skin graft ;	1

Question	Answer	Marks
4(a)	(higher shore) exposed to atmosphere / sunlight / radiation ; for a longer time (periods) / longer exposure ;	2
4(b)	<i>any 3 from:</i> higher shore (rockpools) will contain less oxygen ORA ; (because) temperature is higher so less oxygen dissolves / oxygen less soluble ORA ; less water exchange with ocean OWTTE ORA ; (higher rockpools) have more evaporation ; so salinity is higher (than on lower rockpools) + more saline water holds less oxygen ;	3
4(c)	<i>any 2 from:</i> food availability ; predation ; disease ;	2

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Question	Answer	Marks
4(d)	<p><i>any 2 from:</i> strong / thick shells ; strong attachment / muscular foot / holdfast ; returning to home scar ; hide in crevices / ledges / under rocks ; can trap water under shells (to avoid desiccation) ; hydrodynamic shapes of, fronds / shells ; flexible fronds of seaweed to avoid damage) ;</p>	2

Question	Answer	Marks
5(a)(i)	DNA / RNA / nucleic acid ;	1
5(a)(ii)	amino acids / proteins ; calcium ;	2
5(b)	<p><i>any 3 from:</i> increased nutrients would allow more algal growth ; lowest bar / algae bar would become longer / wider ; the extra, nutrients / food, would be passed along the food chain / populations of all species would increase ; (so) other bars would gradually become longer / wider ;</p>	3

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Question	Answer	Marks
6(a)	<p><i>any 10 from:</i> tentacle ; nematocyst ; thread-like stinging cells / contain toxic substances ; used to capture prey ; mouth ; prey items pass into the body (by the mouth) ; waste also released (from mouth) ; stomach / gastrovascular cavity ; breaks down food ; calyx ; stony cup they sit in ; theca ; walls of the cup ; basal plate ; bottom of the cup ; anchors polyp to the substrate ;</p>	10
6(b)	<p><i>any 6 from:</i> (large number of species) attract tourists ; harvesting on coral reefs to provide food sources (for restaurants and local people) ; increased employment for locals ; increased, income / foreign currency / taxes ; improves infrastructure for local people ; producers absorb CO₂ reducing global warming / maintains stable ecosystems ; (idea of) living coral reef reduces wave impacts / reduces shore erosion ; sea walls or artificial reefs are not required ; may be source of medicines ; genetic diversity / variation in the genes of a species ; species diversity / number of species and their relative abundance ; ecological diversity / variation in ecosystems regionally or globally ;</p>	6

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Question	Answer	Marks
7	<p><i>any 7 from:</i> weathering is the breakdown of rocks ; by, chemical / physical / organic means ; erosion is the removal / movement of particles away (from where they weathered) ; (particles from land) carried by wind / water / ice to the ocean ; to areas of very low water velocity / very low wave action standing water at high tide ; (sedimentation occurs) in flat areas ; allow very fine particles to sediment / settle / deposit ; sedimentation rate is higher than erosional rate ; particles are smaller than on sandy shores ;</p>	7

Question	Answer	Marks
8	<p><i>at least 1 from:</i> mixing due to surface winds / currents ; cooling of surface temperature ; upwelling ;</p> <p><i>and any 6 from:</i> epipelagic / surface layer heated more by energy / light / heat from the sun ; warm water is less dense so floats on deep colder water ORA ; correct ref. to thermocline ; ref. to temp. difference e.g. 20 °C above thermocline, dropping to around 4 °C below the thermocline ; very deep ocean at around 1 °C ; energy doesn't penetrate below around a particular depth ; more, saline / saltier water is more dense + sinks ORA ; correct ref. to halocline ;</p>	7