

Cambridge International AS & A Level

MARINE SCIENCE**9693/13**

Paper 1 AS Level Theory

May/June 2026**MARK SCHEME**Maximum Mark: 75

Published

This mark scheme contains the instructions and marking guidance that our examiners used to mark candidate responses for this component.

Before they start marking, examiners complete a standardisation process. They review a range of candidate responses and discuss the mark scheme in detail to agree which answers can and cannot be accepted. Examiners award marks where it is clear that candidate responses have met the requirements of the mark scheme. These requirements may vary between different components or different versions of the same component, depending on the exact requirements of the question and the candidate responses seen during the standardisation process.

Sometimes, our mark schemes may allow marks to be awarded to responses which contain elements that are factually incorrect or for content not covered by the syllabus. We do this in response to the demands of a specific question to support candidates and make sure that our assessments are fair. However, these allowances should not be used as a guide for teaching and learning.

We cannot discuss the mark scheme with schools, and we recommend that schools read the mark scheme together with the assessment material and the Principal Examiner Report for Teachers.

This document consists of **14** printed pages.

General marking principles

All examiners must apply these marking principles when marking candidate responses.

1	Examiners must award marks for each response in line with: - the specific content defined in the mark scheme - the specific skills defined in the mark scheme or in the level descriptions - the standard of response required as exemplified by the standardisation scripts.
2	Examiners must award whole marks (not half marks, or other fractions).
3	Examiners must award marks positively . This means that: - marks are not deducted for errors or omissions - marks are awarded for correct/valid answers as defined in the mark scheme and also for other valid answers which go beyond the scope of the syllabus and mark scheme referring to your team leader as appropriate - the quality of spelling, punctuation and grammar are judged only when the mark scheme indicates that these features are specifically assessed in the question. However, the meaning of all responses must be unambiguous.
4	Examiners must consistently apply the requirements of the mark scheme and any rules for what to do when candidates have not followed instructions correctly.
5	Examiners must use the full range of marks defined in the mark scheme, unless limited by the quality of the candidate responses seen.
6	Examiners must award marks according to the mark scheme and must not award marks with grade thresholds or grade descriptions 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	<u>'List rule' guidance</u> For questions that require <i>n</i> responses (e.g. State two reasons ...): • 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.

Annotations guidance for centres

Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the supervising examiners when they are checking the work of examiners within their team. The meaning of annotations and how they are used is specific to each component and is understood by all examiners who mark the component.

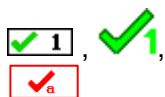
We publish annotations in our mark schemes to help centres understand the annotations they may see on copies of scripts. Note that there may not be a direct correlation between the number of annotations on a script and the mark awarded. Similarly, the use of an annotation may not be an indication of the quality of the response.

The annotations listed below were available to examiners marking this component in this series.

Annotations

Annotation	Meaning
	correct point or mark awarded
	incorrect point or mark not awarded
	information missing or insufficient for credit
	allow or accept
	incorrect or insufficient point ignored while marking the rest of the response
	contradiction in response, mark not awarded
	benefit of the doubt given
	error carried forward applied
	maximum mark reached
	point already given

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Annotation	Meaning
	power of ten error
	incorrect point or mark not awarded
	rounding error
	point has been noted, but no credit has been given or blank page seen
	response is too vague or there is insufficient detail in response
	marking point 1 or marking point a is awarded. Used to mark against a particular marking point from an extended answer MS
	used to highlight parts of an answer / incorrect idea / irrelevant to question
	used to highlight parts of an extended response / incorrect idea / irrelevant to question
	key point attempted / working towards marking point / incomplete answer / response seen but not credited / blank page seen
ruler	allows lengths to be measured
multi-line overlay	overlays graphs

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Question	Answer	Marks	Guidance																				
1(a)(i)	2 ;	1																					
1(a)(ii)	<table border="1"> <thead> <tr> <th>organism</th><th>prey</th><th>secondary consumer</th><th>quaternary consumer</th></tr> </thead> <tbody> <tr> <td>orca</td><td></td><td>✓</td><td>✓</td></tr> <tr> <td>salmon</td><td>✓</td><td>✓</td><td></td></tr> <tr> <td>sardine</td><td>✓</td><td></td><td></td></tr> <tr> <td>squid</td><td>✓</td><td>✓</td><td></td></tr> </tbody> </table>	organism	prey	secondary consumer	quaternary consumer	orca		✓	✓	salmon	✓	✓		sardine	✓			squid	✓	✓		4	1 mark for each correct row
organism	prey	secondary consumer	quaternary consumer																				
orca		✓	✓																				
salmon	✓	✓																					
sardine	✓																						
squid	✓	✓																					
1(b)	<i>any 3 of:</i> the higher the glucose production the greater the productivity ; glucose is produced during photosynthesis ; (glucose) used to produce biomass ; productivity is the rate of production of biomass per, unit area / volume ;	3	A proteins / carbohydrates / biological molecules for biomass																				
1(c)	ref. to covalent / sharing of electrons ; (electron) <u>pairs</u> are shared between atoms ;	2																					
1(d)	<i>any 2 of:</i> starch ; cellulose ; AVP ;	2	A any correct polymer of glucose e.g. glycogen, amylopectin, amylose																				

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Question	Answer	Marks	Guidance
2(a)	<i>any 3 of :</i> heavy / increased, rainfall ; high winds ; low atmospheric pressure ; more, cyclones / hurricanes / typhoons ; lower temperature (during the day) ;	3	I wet weather A trade winds strengthen A storms A decreased risk of frost (due to wetter weather and higher overnight temp.)
2(b)	<i>any 4 of:</i> stronger east to west winds ; (warm surface) water pushed to the west ; causes increased upwelling ; (brings) colder / decreased temperatures, (to surface waters) ; ; (causing an) increase in nutrients (in surface waters) ;	4	A stronger westerly (winds) A water pushed offshore
3(a)	(a group of) <u>organisms</u> that breed together ; to produce fertile offspring ;	2	A organisms that can reproduce / mate A organisms that can produce fertile offspring = MP1 and MP2
3(b)	hard ;	1	A staghorn A hermatypic
3(c)	<i>Cnidaria</i> ;	1	I capitalisation or italics
3(d)	mutualism / both species benefit ; polyp receives, oxygen / glucose / energy ; zooxanthellae receives, carbon dioxide / shelter ;	3	A coral for polyp A nutrients A habitat I home / protection from predators

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Question	Answer	Marks	Guidance
3(e)	<i>any 2 of:</i> increased / decreased, water temperature or water temperature change ; decrease in pH / ocean acidification ; sediment causing abrasion ; sediment blocking mouth of coral ; (named) predation / bioerosion ; AVP ;	2	I climate change / pollution A hurricanes / storms A named human factors e.g. named fishing practices
3(f)	<i>any 4 of:</i> a) increase biodiversity ; b) restore natural habitats / provides substrate for attachment ; c) provide coastal protection ; d) encourage ecotourism ; e) improve fishing opportunities ; f) acts as a nursery for juvenile fish ; g) provides shelter / hiding places ; h) provide research / education opportunities ; i) AVP ;	4	A maintains biodiversity A provides habitat A reduce wave action A breeding ground e.g. provide platforms for sustainable energy generation
4(a)	proton labelled + neutron labelled + nucleus labelled ;	1	
4(b)	8 electrons for sodium ion ; 8 electrons for chloride ion ; correct charges on both ions ;	3	A +1, 1+, -1, 1- for charges on ions
4(c)	CaCO ₃	1	R 3 as a superscript
4(d)	<i>any 2 of:</i> increased salinity (in B) increases density ; (because B) has more ions / particles / more mass, per unit volume ;	2	A more ions occupy the space between the water molecules

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Question	Answer	Marks	Guidance
5(a)	62.5 ;;	2	MP1 15 / 24 × 100 MP2 = 62.5 A ecf from minor incorrect readings correct answer = 2 marks regardless of working A 63 / 62.5
5(b)	<i>any 2 of:</i> upwelling ; runoff / fertilisers / sewage ; decomposition ; excretion ; AVP ;	2	A industrial spills I pollution unqualified e.g. atmospheric dissolution
5(c)	<i>any 1 of:</i> decomposition ; marine snow ; (named) tectonic activity ;	1	A description of marine snow A hydrothermal vents / volcano
5(d)	for the production of <u>chlorophyll</u> ;	1	A ATP or reduced NADP or NADP A for proteins <u>involved in photosynthesis</u>

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Question	Answer	Marks	Guidance
6	<i>any 9 of:</i> a) named <u>abiotic</u> factor ; b) named <u>biotic</u> factor ; c) higher, wind / wave action, increases atmospheric dissolution ; d) ref. to photic zone / epipelagic zone / surface layer, has highest light intensity ; e) oxygen concentration highest in the surface layers ; f) greater number of producers / higher rate of photosynthesis ; g) photosynthesis, produces / releases oxygen ; h) lack of light / less photosynthesis, with increasing depth / below 200 m ; i) higher rates of respiration compared to photosynthesis ; j) respiration uses oxygen ; k) ref. to decomposers (respiring) / decomposition. (due to marine snow) ; 1) oxygen concentration increases as you go further down the water column / below the mesopelagic layer ; 2) temperature decreases with depth ; 3) pressure increases with depth ; 4) <u>solubility</u> of oxygen increases with decreasing temperature / ORA ; 5) <u>solubility</u> of oxygen increases with increasing pressure / ORA ; 6) salinity increases (with depth) causing a (small) decrease in (dissolved) oxygen concentration ;	9	e.g. dissolving from air / wave action / wind / atmospheric pressure / light / temperature / salinity e.g. photosynthesis / respiration I ref to predation / disease / food availability / parasites A sunlight zone A compensation depth A ref. to oxygen minimum layer oxygen R atmospheric pressure A more oxygen <u>dissolved</u> at low temperature A more oxygen dissolved at high pressure

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Question	Answer	Marks	Guidance
7	<i>rocky shores:</i> a) substrate is large rock ; b) exposed to high wave action / high erosive forces ; c) resistant to weathering ; d) (so) few or small particles are eroded / rocks too big to be eroded ; e) ref. to gradient / steepness, of shore ; f) larger rocks at the high water mark / smaller rocks at the low water mark ; g) little sedimentation (due to speed of water) / more erosion than sedimentation ; <i>muddy shores</i> 1) consists of silt / very small particle size ; 2) low wave action / little water movement ; 3) little weathering (on the muddy shore) ; 4) transport of weathered particles to the muddy shore ; 5) shallow / no, slope ; 6) high rates of deposition / sedimentation ; 7) constant erosion / higher sedimentation than erosion ;	8	MAX 5 from one section

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Question	Answer	Marks	Guidance
8(a)	<i>any 5 of:</i> a) bony fish has a (calcified / ossified) <u>skeleton</u> made of bone + cartilaginous fish have a <u>skeleton</u> made of cartilage ; b) bony fish are covered in scales + cartilaginous fish have denticles ; c) bony fish have operculum + cartilaginous fish have gill slits ; d) bony fish (usually) have a swim bladder + cartilaginous fish no swim bladder ; e) bony fish have an <u>external or visible</u> lateral line + cartilaginous fish have an internal lateral line ; f) AVP ;;	5	A calcified skeleton A cartilaginous fish have fatty liver cartilaginous fish heterocercal tail / bony have homocercal tail. cycloid or ctenoid scales for bony and placoid scales for cartilaginous.

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Question	Answer	Marks	Guidance
8(b)	<i>ecological role:</i> 1) often occupy higher trophic levels / apex predator ; 2) ref. to interspecific competition ; 3) maintain balance of prey species ; 4) maintain biodiversity ; 5) control invasive species ; 6) act as indicators of ecosystem health ; 7) feed on dead organisms so recycle nutrients ; 8) feed on weak / diseased / old individuals (so maintain health of population) ; <i>economic role:</i> a) caught by fishing industry ; b) caught for recreational fishing ; c) harvested for meat / fins / liver oil ; d) used in medicinal industry / source of vitamin A ; e) ref. to ecotourism / diving with sharks ; f) named example of economic role of cartilaginous fish	8	MAX 5 from one area e.g. sharks predation of lionfish on coral reef. A transfer nutrients (to new areas) through excretion A for cosmetic industry e.g. income from photography of whale sharks / used in the preservation of leather