CAMBRIDGE
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MARINE SCIENCE **9693/13**

Paper 1 AS Level Theory **May/June 2025**

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 2025 series for most Cambridge IGCSE, Cambridge International A and AS Level components, and some Cambridge O Level components.

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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 descriptions 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 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.

Annotations guidance for centres

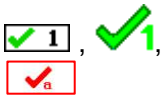
Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the 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
A	allow or accept
I	incorrect or insufficient point ignored while marking the rest of the response
CON	contradiction in response, mark not awarded
BOD	benefit of the doubt given
ECF	error carried forward applied
MR	maximum mark reached
NBOD	benefit of doubt was considered, but the response was decided to not be sufficiently close for benefit of doubt to be applied

Annotation	Meaning
	Point already given
	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

This mark scheme will use the following abbreviations:

;	separates marking points
/	alternative responses for the same marking point
R	reject the response
A	accept the response
I	ignore the response
ECF	error carried forward
AVP	any valid point / alternative valid point
ORA	or reverse argument
AW	alternative wording
underline	actual word given must be used by candidate (grammatical variants excepted)
( )	the word / phrase in brackets is not required but sets the context
MAX	indicates the maximum number of marks that can be given
+ **AND**	statements on both sides of the **+** or **AND** are needed for that mark
OR	separates two different routes to a mark point and only one should be awarded

Question	Answer	Marks
1(a)(i)	viviparous ;	**1**
1(a)(ii)	*any **2** from:* propagules are (germinated) seeds that grow attached to the parent plant ; (therefore) grow faster (than seeds) once settled away / separated, from the parent plant ; (therefore propagules are) more likely to survive than seed (stated reason) ;	**2**
1(b)	*any **3** from:* (prop roots) trap / collect, sediment ; decreases turbidity ; *idea of* decreased turbidity increases light (penetration) in (other / nearby areas) ; allowing seagrass to photosynthesise ;	**3**
1(c)(i)	*any **2** from:* temperature / climate, change ; over-harvesting ; storm (damage) ; named change in coastal land use e.g. development of hotels ; **AVP** ;;	**2**

Question	Answer	Marks
1(c)(ii)	*any **2** from:* fisheries ; conservation ; tourism / kayaking / tours ; timber harvesting ; **AVP** ;	**2**

Question	Answer	Marks
2(a)(i)	<table><tr><td>subatomic particle</td><td>charge</td><td>number present in a sodium atom</td></tr><tr><td>electron</td><td>–1</td><td>11</td></tr><tr><td>neutron</td><td>neutral / 0</td><td>12</td></tr><tr><td>proton</td><td>+1</td><td>11</td></tr></table>;;	**2**
2(a)(ii)	ion ;	**1**
2(b)(i)	$CaCO_3$;	**1**

Question	Answer	Marks
2(b)(ii)	*any **3** from:* (calcium carbonate) forms part of, shell / teeth / bone / skeleton ; animal, dies / sinks / decays / becomes part of marine snow ; *idea of* compaction ; **AVP** ;	**3**
2(c)	*any **4** from:* (magnesium is) used to make chlorophyll ; chlorophyll is needed for photosynthesis ; photosynthesis is used to produce glucose ; glucose is used to form, starch / cellulose ; which increases biomass ;	**4**

Question	Answer	Marks
3(a)	benthic (zone) ;	**1**
3(b)	*any **2** from:* (geological) matching of rock formations on different continents ; distribution of similar fossils on different continents ; paleomagnetic stripes on the, ocean floor / sea bed ; **AVP** ;;	**2**

Question	Answer	Marks
3(c)(i)	**A** – convergent ; **B** – divergent ; **C** – transform ;	**3**
3(c)(ii)	**B** ;	**1**
3(d)(i)	*any **2** from:* sea water seeps into cracks in crust and is heated ; solubility of, salts / minerals, increases at higher temperatures ; higher temperature water is less dense, therefore rises, mixing with colder water above ; **PLUS** salts precipitate (forming chimney) ;	**3**
3(d)(ii)	*any **2** from:* high temperature ; lack of light / no light ; high pressure ; **AVP** ;	**2**

Question	Answer	Marks
4(a)(i)	the (intertidal) region (on a shoreline) between the highest and lowest spring tide marks ;	**1**
4(a)(ii)	weathering is the breakdown of rock ; erosion is the transport of rock (by the eroding agent) ;	**2**
4(a)(iii)	*any **1** from:* helps withstand desiccation ; helps withstand wave action ; (shells) protect from (land) predators (when exposed to air) ;	**1**
4(a)(iv)	(frame) quadrat ;	**1**
4(b)	(keyhole limpet) can feed on consumers and producers ;	**1**
4(c)(i)	carbon **+** hydrogen **+** oxygen **+** nitrogen ;	**1**
4(c)(ii)	1.2 (g) × 1000 = 1200 mg 1200 / 0.8 = 1500 (doses per limpet) (90 000 000 / 1500 =) 60 000 ;;;	**3**
4(c)(iii)	*any **2** from:* the population of (keyhole limpet) predators may decrease ; the population of (keyhole limpet) prey may increase ; predators compete for other food sources ; **AVP** ;	**2**

Question	Answer	Marks
5	*any **8** from:* **1** nematocyst ; **2** on tentacles ; **3** (nematocyst) fire out barb (into prey) ; **4** (barb) contains toxin ; **5** (toxin) which paralyses prey ; **6** (prey) passed through the mouth / into stomach for digestion ; **7** *ref to* zooxanthellae ; **8** symbiotic / (zooxanthellae) live in the coral tissues ; **9** (zooxanthellae) are photosynthetic ; **10** produce glucose (and oxygen) ; **11** excess glucose used by, coral / polyp ;	**8**

Question	Answer	Marks
6(a)	*any **5** from:* **1** (**X** is a) hydrogen bond ; **2** to lone pair of electrons on oxygen ; **3** hydrogen atoms (in water molecule) are slightly positive(ly charged) ; **4** oxygen atoms (in water molecule) are slightly negative(ly charged) ; **5** oxygen attracts electrons more strongly than hydrogen (causing differences in charge) ; **6** oxygen (from one water molecule) is attracted to hydrogen in another water molecule ; **7** reference to dipole ;	**5**
6(b)	*any **8** from:* *different densities* **1** water has hydrogen bonds that break and reform often **OR** ice has, more permanent / fixed, hydrogen bonds ; **2** water molecules can be closer **OR** ice molecules can be further apart ; **3** more water molecules per unit volume **OR** fewer ice molecules per unit volume ; **4** ice floats ; *importance* **5** (thermal) insulator ; **6** so whole water column doesn't freeze / maintains warmer temperature in sea below / organisms don't freeze in the water ; **7** habitat, for (named) organism(s) / algae **OR** algae / bacteria / protists, live / grow, in the ice / attached to bottom / sides of ice / on the underside of the ice ; **8** platform / place / surface, for / organisms, to rest / hide from predators **OR** a platform to hunt from / organisms hide below the ice / protection from predators ; **9** water at different temperatures has different densities ; **10** ref to idea of thermal stratification ; **11** ref to nutrient cycling (between the layers) ; **12** **AVP** ;	**8**

Question	Answer	Marks
6(c)	*any **9** from:* (solvent action) **1** water is a polar molecule ; **2** therefore able to dissolve many substances ; **3** named example of substance that dissolves ; **4** oxygen required for respiration ; **5** carbon dioxide required for photosynthesis ; **6** example of name nutrient use in organisms ; **7** transport of nutrients / nutrient cycling / upwelling ; **8** **AVP** ; (specific heat capacity) **9** specific heat capacity of water is (relatively) high ; **10** it takes more energy to increase the temperature of water (compared to other substances) ; **11** as lots of energy is required to break hydrogen bonds (between water molecules) ; **12** temperature buffer ; **13** importance in climate control ; **14** **AVP** ;	**9**