

# Cambridge International AS & A Level

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**MARINE SCIENCE****9693/11**

Paper 1 AS Level Theory

**May/June 2025**

MARK SCHEME

Maximum Mark: 75

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Published

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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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This document consists of **16** printed pages.

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
	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
	benefit of doubt was considered, but the response was decided to not be sufficiently close for benefit of doubt to be applied

Annotation	Meaning
<b>PAG</b>	point already given
<b>POT</b>	power of ten error
<b>R</b>	incorrect point or mark not awarded
<b>RE</b>	rounding error
<b>SEEN</b>	point has been noted, but no credit has been given or blank page seen
<b>TV</b>	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

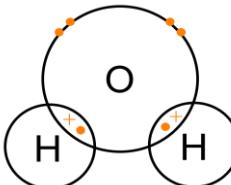
This mark scheme will use the following abbreviations:

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

Question	Answer		Marks
1(a)	substance	<b>components</b>	3
	chlorophyll	magnesium <b>OR</b> nitrogen;	
	DNA	phosphorous <b>OR</b> nitrogen	
	skeletons and shells	calcium <b>OR</b> phosphorus	
1(b)	fatty acids ; glycerol ;		2

Question	Answer	Marks
2(a)(i)	holdfast ; <i>any 1 from:</i> (idea of) attach / secure/AW the kelp / macroalgae <b>to</b> the, seabed / seafloor/ rock / substrate ; <b>OR</b> withstand, current / wave action ; absorbing minerals / nutrients ;	2
2(a)(ii)	<i>any 3 from:</i>  absorb carbon (dioxide) during photosynthesis ;  providing, food / carbon / glucose / organic matter / energy, passed along, food chains / through food webs ;  releasing carbon (dioxide) from, respiration / decomposition <b>OR</b> carbon in faeces / carbon lost in egestion ;  acts as carbon sink / stores carbon in tissues ;	3
2(b)(i)	crabs ;	1
2(b)(ii)	different, food sources / supplies available <b>OR</b> different/ wider range, of nutrients available ;	1

Question	Answer	Marks
2(b)(iii)	26 – 325 / 325 × 100 ; (–) 92 (%) ;	2
2(b)(iv)	<p>5 closed rectangular bars approx. centrally positioned on top of each other in correctly named order ; bars for prawns, starfish and sea otter decreasing in width ; parasites bar (5th bar) is wider than sea otters and directly above sea otters bar ;</p>	3
2(c)	<p><b>any 3 from:</b></p> <p>alginates / in food industry / food source / edible ; cosmetics / pharmaceuticals / medicines ; used as fertiliser ; (beds attract) tourism / named tourism ; food / nursery area for, <u>economically important</u> / harvested, fish / invertebrate species / (land) farm animals ; heavy metals extraction ;</p>	3

Question	Answer	Marks
3(a)(i)	 <p>Ignore any other concentric circles around H and O</p> <p>correct <u>sharing</u> of electron pairs shown in oxygen and hydrogen atoms (must be within the overlapping area / on the overlapping lines) ;</p> <p>(only) 4 remaining outer electrons shown in oxygen <b>AND</b> no additional electrons in hydrogen ;</p>	2
3(a)(ii)	<p>positive <u>ions</u> / <math>\text{Na}^+</math> / positive sodium <u>ion</u>, are <u>attracted</u> to, <math>\delta-</math> oxygen / oxygen dipole ;</p> <p>negative <u>ions</u> / <math>\text{Cl}^-</math> / negative chloride (ion), are <u>attracted</u> to, <math>\delta+</math> hydrogen / hydrogen dipoles ;</p> <p>separates ions from the lattice / breaks the <u>ionic</u>, bond/ structure (in <math>\text{NaCl}</math>) / <math>\text{NaCl}</math> dissociates ;</p>	3
3(a)(iii)	<p>concentration of (dissolved) salt in (sea) water <b>OR</b> concentration / mass, of <u>dissolved</u> salt ;</p>	1
3(b)	17 (g)	1
3(c)	<p>(thermal) insulator ;</p> <p>so whole water column doesn't freeze / maintains <u>warmer</u> temperature in sea below / organisms don't freeze <u>in the water</u> ;</p> <p><u>habitat</u>, for (named) organism(s) / algae <b>OR</b> algae / bacteria / protists, live /grow, in the ice / attached to bottom/ sides of ice / on the <u>underside</u> of the ice ;</p> <p>platform / place / surface, for / organisms, to rest / hide from predators <b>OR</b> a platform to hunt from / organisms hide below the ice / protection from predators ;</p> <p>releases minerals / nutrients ;</p>	2

Question	Answer	Marks
4(a)(i)	10.5 (ppt) ;	1
4(a)(ii)	<p><i>any 3 from:</i>  due to rising <b>AND</b> falling tides ;</p> <p>salinity rises, as sea water enters the estuary / as sea water enters at high tide <b>OR</b> salinity drops as sea water leaves the estuary / sea water leaves at low tide ;</p> <p>as sea water leaves the estuary / at low tide, fresh water is, still <u>entering</u> / <u>brought down</u> the river, which dilutes the sea water / reduces salinity ;</p> <p>(heavy) rain (adds fresh water to the estuary so) reduces salinity / (high) evaporation increases salinity ;</p>	3
4(b)(i)	<p><i>any 3 from:</i>  (mangroves) <u>tolerant</u> to salt water ;</p> <p>shallow ;</p> <p>(idea of) slow current / low or decreased wave action ;</p> <p>suitable substrate / muddy / sedimentation occurs (due to low current) ;</p> <p>located in a tropical / sub-tropical region <b>OR</b> it is a warm <u>climate</u> ;</p>	3
4(b)(ii)	<p><i>any pair from:</i>  prop roots ;  for stability / anchorage / prevent being washed away ;</p> <p>salt exclusion by <u>roots</u> ;  to prevent (high level of) salt passing into the, mangrove / plant ;</p> <p>viviparous reproduction ;  for young plant to survive in high salinity / seeds are buoyant to float / roots start to form, before detachment from parent / so they embed quickly (into new area or substrate) ;</p> <p>lenticels (on the roots) / (idea of ) aerial roots ;  to, absorb / release, carbon dioxide / oxygen <b>OR</b> for gas exchange ;</p>	2

Question	Answer	Marks
5(a)(i)	rate of production of biomass (per unit, area / volume) ;	1
5(a)(ii)	<p><b>any 2 from:</b></p> <p>1 polar only has one peak <b>AND</b> temperate has two peaks ;      2 polar (productivity), peaks / is high, in Nov / Dec <b>AND</b> temperate (productivity), peaks / is high, in Aug / Sept <b>OR</b> Feb / March ;      3 polar region reaches, a <u>higher</u> / the <u>highest</u> productivity, than temperate region / <b>ORA</b> ;      4 polar productivity drops <u>lower</u> than the temperate / <b>ORA</b> ;      5 temperate has <u>more</u> productivity overall <b>ORA</b> <b>OR</b> temperate has productivity throughout the year <b>AND</b> polar productivity stops between Feb to Oct <b>ORA</b> ;      6 polar rate of productivity, increases / decreases, more rapidly than temperate ;      7 Oct–Jan polar has higher productivity than temperate ;</p>	2
5(a)(iii)	<p><b>any 2 from:</b></p> <p>low / cold (water) / decrease in temperature / very high / hot temperature ;      low, mineral/nutrient availability / concentration of named mineral ;      low carbon dioxide <u>concentration</u> /lack of carbon dioxide ;  <b>AVP</b> ;</p>	2
5(b)	range would be <u>higher</u> / <u>greater</u> <b>OR</b> <u>higher</u> high tide <b>AND</b> <u>lower</u> low tide ;	1

Question	Answer	Marks
6	<p><b>any 8 from:</b></p> <p>1 <u>tides</u> ;</p> <p>2 (tides) create <u>different physical / environmental / abiotic</u> conditions (at different heights on the shore) ;</p> <p>3 species have an, upper / lower, limit they can survive in ;</p> <p>4 (idea of) organisms adapted to survive in a zone / organisms require different conditions to survive / organisms are adapted to a given or named condition ;</p> <p>5 (more time in air, more chance of / adapted to) drying out / desiccation ;</p> <p>6 changes in, exposure time in air / time submerged ;</p> <p>7 changes / differences in light <u>intensity</u> ;</p> <p>8 changes / differences in wave action ;</p> <p>9 changes / differences in temperature ;</p> <p>10 changes / differences in (water) depth / <u>water</u> pressure (at high / low tide) ;</p> <p>11 predators control level of prey / organisms more susceptible to predation in some zones / predators are found more in some zones than others ;</p> <p>12 <u>difference</u> in nutrient / food / prey, availability (in different zones) ;</p> <p>a <u>interspecific competition / competition between species</u> ;</p> <p>b <u>intraspecific competition / competition within a species</u> ;</p> <p>c <u>competition for (named) resources</u> ;</p>	8

Question	Answer	Marks
7	<p><b>any 5 from:</b></p> <p>1 (denser) plate subducts / subduction zone ;</p> <p>2 (idea of plate) comes into contact with the <u>mantle</u> ;</p> <p>3 plate, is heated / melts ;</p> <p>4 increases the magma (chamber) pressure ;</p> <p>5 magma, forced out / ejected / erupts (at high pressure) ;</p> <p>6 hot magma / molten rock is less dense rises ;</p> <p>7 (hot magma / molten rock) <u>solidifies</u> when it meets the (cold) water ;</p>	5

Question	Answer	Marks
8(a)	<p><b>MAX. 4</b> from structure names in <b>bold</b> (spelling must be correct or clear) plus any correct functions for named structures :</p> <p>1 <b>tentacles</b> ;      2 to move food towards mouth ;      3 clear debris / sediment from near mouth ;      4 (tentacles contain) <b>nematocyst</b> ;      5 stinging cells / nematocysts, capture food / capture zooplankton / prey;      6 (stinging cells) as protection from predators ;      7 <b>mouth / anus</b> ;      8 ingests food <b>OR</b> removal of waste ;      9 stomach digests food ;      10 <b>calyx / calcium carbonate, cup</b> ;      11 (hard structure / skeleton / basal / base plate) to attach polyp (to reef / substrate) ;      a (polyp retracts into calyx / theca) for support / protection ;      b <b>theca</b> ;      c walls of the calyx ;      d <b>basal / base (of calyx), plate</b> ;      e <b>AVP</b> ;;</p>	8

Question	Answer	Marks
8(b)	<p><b>any 9 from:</b></p> <p>1 water temperature rise ;</p> <p>2 acidification / reduced pH ;</p> <p>3 prevents / reduces, formation of (calcium carbonate) skeleton OR dissolves the calcium carbonate skeleton ;</p> <p>4 (water temperature rise/ acidification/ named pollution can lead to) coral bleaching / zooxanthellae leave ;</p> <p>5 storms / hurricanes ;</p> <p>6 (storms / hurricanes) breaks pieces of coral off ;</p> <p>7 sediments cause abrasion ;</p> <p>8 (sediments) blocks mouth of polyp ;</p> <p>9 (blocked mouth) reduces feeding ;</p> <p>10 increased turbidity ;</p> <p>11 sewage / oil / plastic / organic / toxins, pollution ;</p> <p>12 reduced light availability ;</p> <p>a (increased turbidity / reduced light availability / less polyps) reduces, photosynthesis / productivity ;</p> <p>b stated, tourist / human, activities / divers touching or standing on corals / boat hitting them /anchors dropped on them / dynamite fishing / fishing nets / building materials / building infrastructure ;</p> <p>c bioerosion / described example ;</p> <p>d disease ;</p> <p>e coral / polyp death (leads to erosion) ;</p> <p>f reduces biodiversity / loss of food source (for non human organisms) / affects nursery or breeding grounds / ref. to disrupted food chains / habitat loss ;</p> <p>g reduction, in diving / tourism / affects fisheries / (potential) source of medicines ;</p> <p>h (more) erosion of land / less shore protection / loss of breakwater ;</p> <p>i <b>AVP</b> ;</p>	9