CAMBRIDGE
International Education

Cambridge International AS & A Level

MARINE SCIENCE **9693/32**

Paper 3 A 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.

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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.

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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 ***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.

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6	<u>Calculation specific guidance</u> 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	<u>Guidance for chemical equations</u> 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.

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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
PAG	point already given

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Annotation	Meaning
POT	power of ten error
R	incorrect point or mark not awarded
RE	rounding error
SEEN	point has been noted, but no credit has been given or blank page seen
TV	response is too vague or there is insufficient detail in response
1, 1, a	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)	*any **2** of:* 1 continuous water flow / currents ; 2 (currents) supply food / nutrients / oxygen / remove waste products ; 3 shallow / calm(er) / slow moving, water ; 4 suitable salinity ; **AVP** ;	**2**	**I** ref. to transportation / harvesting of oysters / substrate / temperature / predation / breeding **A** tidal **e.g.** good supply of phytoplankton **e.g.** sheltered from (large) wave action **A** oysters are euryhaline / can tolerate a range of salinities **R** if oysters are osmoregulators / stenohaline **I** brackish water / osmoconformers **e.g.** nutrients include calcium for shell production
1(a)(ii)	*any **3** of:* 1 <u>run-off</u> from cities / towns / agriculture ; 2 contains, sewage / (excess) fertilisers / toxins / increased sediment ; 3 (sewage / fertilisers) cause overgrowth of algae / phytoplankton ; 4 (algae / phytoplankton) die and are decomposed by bacteria ; 5 which use up oxygen / oxygen concentration decreases ; 6 suitable example of why oysters will die ;	**3**	**I** ref to blocking light for photosynthesis **A** phosphates / nitrates, for fertilisers **I** nutrients **A** magnesium for sewage **R** phosphorus **A** cause eutrophication / algal blooms **A** decomposers for bacteria **e.g.** oysters suffocate / reduced respiration (starve) due to lack of food / phytoplankton are poisoned by toxins sediment covers oysters preventing respiration / feeding / reproduction ;
1(b)(i)	*any **2** of:* 1 easier to harvest ; 2 easier to monitor / check (from surface) ; 3 no need for a diver ; 4 (closer to light for photosynthesis), so more phytoplankton for oysters to consume ; 5 does not damage sea bed / benthic habitats ;	**2**	**I** less labour **I** easier to feed

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Question	Answer	Marks	Guidance
1(b)(ii)	*any **2** of:* 1 temperature more stable ; 2 less chance of predation by birds ; 3 less affected by adverse weather / storms ; 4 no need for flotation equipment ; 5 **AVP**	**2**	**I** ref to light intensity **/** oxygen availability / algal blooms / salinity **A** less affected by boats **e.g.** suitable advantage of stronger currents
1(b)(iii)	*light* – to ensure that there is enough for photosynthesis in phytoplankton (for oysters to consume / to supply oxygen) ; *sediment* – to ensure that levels are not too high to prevent blockage of gills / check for presence of pathogens or toxins / ensure clean water as oysters are filter feeders ;	**2**	**I** ref to algal blooms **A** disease-causing organisms for pathogens **A** heavy metals for toxins **A** idea that oysters filter sediment for feeding **I** to check for minerals required for growth
1(c)	*any **3** of:* 1 removes sediment / suspended particles ; 2 so increasing water clarity / reduces water turbidity ; 3 so providing more light for photosynthesis ; 4 which increases biomass / energy in ecosystem ; 5 (feeding current) circulates nutrients ; 6 toxin removal prevents bioaccumulation in other organisms ;	**3**	**A** toxins **A** increases productivity

Question	Answer	Marks	Guidance
2(a)(i)	*any **3** of:* 1 bycatch includes immature / juvenile, fish / prawns / non-target species ; 2 bycatch returned to the sea is often, injured / dead ; 3 idea of reduced recruitment (in future) ; 4 removes, important prey / keystone, species ; 5 idea of disrupts food chains / food webs ;	**3**	

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Question	Answer	Marks	Guidance
2(a)(ii)	*any **4** of:* 1 damages, sea bed / benthic habitat ; 2 uproots marine plants / macroalgae / attached marine animals ; 3 disturbs sediment / releases toxins (in sediment) ; 4 increases turbidity ; 5 less light (for producers) for photosynthesis ; 6 so less energy available for food chain ; 7 example of how sediment / toxins affect marine animals ; 8 **AVP** ;	**4**	**I** reduces biodiversity / disrupts food chains **A** coral reefs **A** example - sea anemones / tube worms **A** can injure marine organisms **e.g.** sediment smothers corals / eggs / larvae / plants or blocks gills toxins can bioaccumulate in organisms / biomagnify along food chains / poison top predators **e.g.** predators cannot see to catch prey / destroys nursery grounds
2(b)	*any **4** of:* 1 can catch only / increased catch of, target fish **or** non-target / undersized fish, are released (as gate can be opened) ; 2 so only catch fish of correct size ; 3 no new nets are required (as device fits into existing nets) ; 4 so saving money ; 5 no time required to sort fish by fishers ; 6 idea of future fish stocks maintained ; 7 less likely to be fined for catching, the wrong species / undersized fish ;	**4**	**I** ref. to employment / income / sustainability **I** reduces by-catch – needs reason **e.g.** small fish released to breed **e.g** less likely to be fined for exceeding quota
2(c)	*any **2** of:* 1 idea of juveniles left to grow and breed ; 2 no damage to, scallops / scallop habitat ; 3 undersea camera monitor scallop stocks ; 4 so can harvest to MSY ;	**2**	**I** ref to sustainability / catching only adults / no by-catch **e.g**. allows increased recruitment **I** damage to sea bed / habitat **e.g.** for damage / disease **A** eggs / larvae **A** prevents overharvesting

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Question	Answer	Marks	Guidance
3(a)	*type of life cycle* – simple ; *reason* – no metamorphosis / no larval stages ;	**2**	**I** juvenile and adult have same form
3(b)	less wastage (of gametes) / increased chance of fertilisation / less or no chance of predation (of sperm / eggs) ;	**1**	**I** increases the chance of forming offspring
3(c)	*any **2** of:* 1 idea of faster (embryo) development ; 2 so less chance of predation (during development as eggs protected) ; 3 increased, food source / prey, for young octopus after hatching ; 4 rocky substrate present for egg attachment ; 5 increased availability of mates ;	**2**	**e.g.** shorter incubation time / increased enzyme activity increases rate of development **A** sediment on abyssal plain unsuitable for egg attachment
3(d)	*any **3** of:* 1 produces a current ; 2 to provide oxygen / increase gas exchange ; 3 for aerobic respiration ; 4 (current) removes, waste products / CO_2 ; 5 helps prevent infections ;	**3**	**A** creates a diffusion gradient
3(e)	idea of, provides a source of food for scavengers (throughout the year) ;	**1**	**A** idea of constant food source (for scavengers)
3(f)	***Either*** eggs will develop more slowly ; as higher temperature will (start to) denature enzymes / reduce oxygen concentrations ; **OR** eggs will develop more rapidly ; as higher temp increases, enzyme activity / metabolic rates ;	**2**	**A** eggs no longer develop

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Question	Answer	Marks	Guidance
4(a)	*any **3** of:* 1 *idea of:* more sustainable / renewable ; 2 less / no, carbon dioxide released (into atmosphere) ; 3 reduces global warming ; 4 less carbon dioxide dissolves in sea water ; 5 less ocean acidification ; 6 no need to transport fossil fuels to site ; 7 does not use up space on land ;	**3**	**A ORA** **I** ref. to less labour required / toxins / cheaper **A** greenhouse gases for carbon dioxide **Note:** less global warming as less carbon dioxide released = 2 marks **I** climate change **A** SO_2 **A** less dissolution of carbon dioxide in sea water **A** no need to extract fossil fuels which is environmentally damaging
4(b)	*any **4** of:* 1 sea water now has a lower water potential than macroalgae ; 2 so water is lost (from macroalgae) ; 3 by osmosis ; 4 as water moves, from an area of HWP to an area of LWP / down a water potential gradient ; 5 causing (cell) dehydration ; 6 **AVP** ;	**4**	**I** hypertonic / hypotonic **A ORA** **R** water concentration for water potential **e.g.** vacuole shrinks / contents shrink from cell wall / reduces turgor pressure / cell plasmolysed **e.g.** macroalgae die due to increased concentration of toxins in brine

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Question	Answer	Marks	Guidance
5	*any **10** of:* 1 leaves are flexible ; 2 so (leaves) help to reduce water currents / reduce wave impacts ; 3 preventing / reducing, coastal erosion / flooding ; 4 (leaves / roots) trap sediment ; 5 ref. to a benefit of trapping sediment ; 6 carry out, photosynthesis / are primary producers ; 7 fix carbon to make, glucose / organic compounds ; 8 (glucose / organic compounds) are source of, energy / food, for consumers ; 9 (photosynthesis) provides oxygen for (aerobic) respiration ; 10 provides a, habitat / nursery areas, for (a variety of) marine species ; 11 as they provide shelter from predators ; 12 increase biodiversity ; 13 which increases, fish / invertebrate, stocks in surrounding areas ; 14 which, are a source of income / provide employment for (commercial) fishers ; 15 act as a carbon sink ; 16 so help to reduce ocean acidification (as they fix carbon dioxide) ; 17 **AVP** ;	**10**	must be linked to mp2 **e.g.** improves water clarity / reduces turbidity / allows more light penetration (for photosynthesis) / reduces chance of sediment clogging gills / stabilises substrate / seabed **e.g.** income from tourism **R** income from harvesting seagrass **e.g.** source of nutrients when they die and decompose / can be used as a fertiliser / are a source of medicines / pharmaceutical use

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Question	Answer	Marks	Guidance
6(a)	*any* ***7*** *of:* 1 occurs by diffusion ; 2 across body surface ; 3 (gases move) from a high concentration to a lower concentration / down a concentration gradient ; 4 diffusion is passive / does not require energy ; 5 oxygen (diffuses) in **and** carbon dioxide (diffuses) out (for respiration) ; 6 body has a large surface area (to volume ratio) present ; 7 so no specialised gaseous exchange surfaces required ; 8 thin-walled for easy diffusion / diffusion distance is short ; 9 tentacles present which increase surface area ; 10 idea of, tentacles move to create a current ; 11 so maintaining a, concentration / diffusion, gradient ;	**7**	**I** skin **R** active transport **A** no specialised transport system required **e.g.** tentacles are one cell thick
6(b)	*any* ***7*** *of:* 1 tuna is a, fast / active, swimmer ; 2 so has a high, oxygen / energy, demand ; 3 carries out ram ventilation (to obtain oxygen) ; 4 body has a small surface area (to volume ratio) ; 5 idea of gaseous exchange through, specialised organs / gills ; 6 (large numbers of), lamellae / filaments, increase surface area of gills / slow down water movement ; 7 lamellae are thin walled ; 8 capillaries / blood vessels, to transport gases ; 9 oxygen passes into blood **and** CO_2 removed (at gills) ; 10 by diffusion ; 11 correct ref. to counter-current exchanger ; 12 to maintain diffusion gradient / allows more time for, diffusion / gas exchange ;	**7**	**I** details of ram / pumped ventilation **A** pumped ventilation **e.g.** oxygen uptake in gills **e.g.** water and blood move in opposite directions **A** maintains a concentration gradient

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Question	Answer	Marks	Guidance
7	1 occurs in the chloroplast ; 2 in the stroma ; ***MAX 5** of:* 3 carbon dioxide is fixed ; 4 using the products of the light-dependent reaction ; 5 ATP **and** reduced NADP / NADPH ; 6 which are an energy source ; 7 and using (the enzyme) rubisco ; 8 to make, organic molecules / glucose ; 9 **AVP** ;	**6**	**A** starch / cellulose **A** extra detail beyond syllabus, e.g. formation of glycerate-3-phosphate / triose phosphate **Do not** award mp9 if any incorrect information

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