CAMBRIDGE
International Education

Cambridge International AS & A Level

MARINE SCIENCE **9693/31**

Paper 3 A 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.

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 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

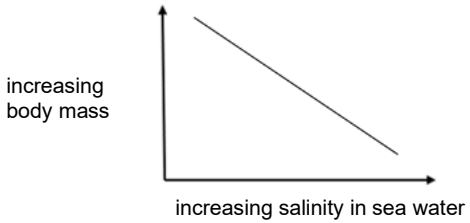
Annotation	Meaning
PAG	point already given
POT	power of ten error
R	incorrect point or mark not awarded
RE	rounding error
SEEN	point has been noted, but no credit has been given or blank page seen
TV	response is too vague or there is insufficient detail in response
1, 1, a	marking point 1 or marking 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

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)	the difference in height between high tide and low tide ;	**1**
1(a)(ii)	*any **2** of:* 1 shallow / only 7 m deep / calmer / smaller body of water, so heats up easily / faster / **ORA** ; 2 no rivers to bring cold(er) water to lagoon ; 3 water calmer / little interchange of water with the Mediterranean Sea / small tidal range, so little mixing of water (of different temperatures) ; 4 **AVP** ;	**2**
1(a)(iii)	*any **3** of:* 1 (run-off) of (excess), fertiliser / sewage (from farm animals) ; 2 named nutrient in fertiliser / sewage ; 3 nitrates used to make proteins / amino acids **OR** magnesium used for chlorophyll **OR** phosphates used for DNA ; 4 so increasing, photosynthesis / growth / biomass / productivity ; 5 so increasing (rate of) reproduction (in phytoplankton) ;	**3**
1(a)(iv)	*any **3** of:* 1 phytoplankton covered the surface (of the lagoon) ; 2 preventing light from reaching, macroalgae / seagrass / (benthic) plants ; 3 phytoplankton use up, minerals / nitrates / carbon dioxide ; 4 so, preventing / decreasing, photosynthesis (in plants) ; 5 less / no growth, (so plant dies) ; 6 correct reference to decomposition (by bacteria / decomposers) ; 7 (decomposers) use up oxygen for respiration / which cause a decrease in oxygen for (plant) respiration ; 8 (decomposition) releases toxins ;	**3**
1(b)(i)	*idea of* water becomes more saline ;	**1**

Question	Answer	Marks
1(b)(ii)	*any **4** of:* 1 (increased) silt blocks gills (of, fish / crustaceans) ; 2 so they suffocate / are unable to respire ; 3 prevents feeding in filter feeders ; 4 unable to find prey / smothers prey (causing starvation) ; 5 silt blocks light, less food / less oxygen, produced from, photosynthesis / plants ; 6 silt makes it harder to, see / avoid, predators ; 7 toxins / pollutants, (in silt) ; 8 **AVP** ;	**4**
1(c)	(higher temperatures) hold less oxygen ; so fish suffocate / unable to respire ; **OR** (increased temperature) causes an increase in salinity ; so fish dehydrates (as water is lost due to difference in water potential) ; **OR** can denature enzymes ; so preventing respiration / chemical reactions ;	**2**

Question	Answer	Marks
2(a)(i)	as the salinity increases, so does the concentration of body fluids ; oysters are osmoconformers / have the same salinity as their surroundings ;	**2**
2(a)(ii)		**1**

Question	Answer	Marks
2(a)(iii)	*any **3** of:* 1 (as the salinity increases) the body mass decreases ; 2 as water is lost from the body ; 3 by osmosis ; 4 because the water potential outside is, lower / more negative, than the water potential in the body ;	**3**

Question	Answer	Marks
3(a)(i)	In 1990 the percentage fishmeal, was 50% **AND** in 2030 it decreased to 4% **OR** percentage fishmeal decreased by 46%; In 1990 the percentage fish oil was 24% **AND** in 2030 it decreased to 4% **OR** percentage fish oil decreased by 20% ;	**2**
3(a)(ii)	*any **2** of:* 1 fishmeal and fish oil are obtained from small fish (such as anchovies) ; 2 (small) fish stocks are overfished / demand exceeds supply (as they are food fish for humans) ; 3 stocks are unsustainable / other / new sources are more sustainable ; 4 idea that, alternative / new sources of food, might have improved, nutrient balance / are easier to obtain / are cheaper / to allow fish stocks to recover ;	**2**
3(a)(iii)	*any **1** of:* 1 land will be used to grow agricultural crops for humans instead ; 2 land, might not be available / used for industry / building ; 3 better / alternative / new sources, become available (replacing plants) ; 4 *idea of* difficult to extract / cost of extraction from plants too high ;	**1**
3(a)(iv)	*idea of*, optimum amount / percentage, of each already in feed ;	**1**
3(b)(i)	glucose ;	**1**
3(b)(ii)	*any **2** of:* 1 can be grown in a smaller space / do not take up agricultural land ; 2 grow / reproduce, at a fast rate / products produced at a fast rate ; 3 use waste products (as food) ; 4 are therefore more sustainable ; 5 **AVP** ;	**2**

Question	Answer	Marks
4(a)(i)	*any **2** of:* notochord dorsal neural tube pharyngeal slits post-anal tail ;	**1**
4(a)(ii)	*any **1** of:* fins / named fin ; gills / gill cover / operculum ;	**1**
4(a)(iii)	*any **1** of:* no caudal / pelvic fin ; no scales / skin covers body ; **AVP** ;	**1**
4(b)	*any **4** of:* 1 example of how, boats / tourists, cause, disturbance / damage, (to seahorses) ; 2 pollutants / toxins, **OR** example, oil / fuel, (from boats) / sunscreens ; 3 caught as by-catch (in fishing nets) / overfishing has depleted their food supply (shrimp) ; 4 habitat destruction (by boats / dredging / tourism) ; 5 idea of trapped, on land / in tidal pools, after high tide / flooding **OR** so desiccate ; 6 poor swimmers so cannot avoid danger ; 7 **AVP** ;	**4**
4(c)	*any **3** of:* 1 actual numbers present ; 2 life cycle / breeding habits ; 3 feeding / prey / predators ; 4 habitat / location ; 5 effect of, boats / fishing / tourism / pollutants ; 6 optimum conditions for survival ;	**3**

Question	Answer	Marks
4(d)	*any **4** of:* 1 create a marine protected area (MPA) ; 2 restrict / reduce / ban, all fishing / (motorised) boats / tourism / plastic (from where seahorses are located) ; 3 carry out captive breeding (to increases numbers) ; 4 education programmes / raising awareness ; 5 legislation / laws, to protect seahorses ; 6 *idea of* highlighting species in, marine aquaria / marine zoos ; 7 create more suitable habitat ; 8 **AVP** ;	**4**

Question	Answer	Marks
5	*any **10** of:* 1 small in size / approx. 5 μm ; 2 chloroplast has a large surface area to volume ratio ; 3 membranes are thin ; 4 for easy diffusion of gases ; 5 carbon dioxide enters chloroplast **AND** oxygen removed ; 6 ref. to permeability (of inner / outer membranes) ; 7 allow water to enter by osmosis ; 8 grana / thylakoid (membrane), contain chlorophyll ; 9 light is, absorbed / trapped ; 10 (absorb) red **AND** blue light / (around) 750 nm **AND** 450 nm wavelengths; 11 ref. to accessory pigments ; 12 e.g. xanthophyl / phycobilins / phycocyanin / phycoerythrin / fucoxanthin / chlorophyll b ; 13 absorb, 'other / different', wavelengths / green / yellow ; 14 grana / thylakoids, have a large surface area ; 15 light-dependent reaction occurs in, grana / thylakoid (membrane) ; 16 light-independent reaction occurs in stroma; 17 ref to, enzymes / rubisco ; 18 required to fix carbon (dioxide) ; 19 **AVP** ;;;	**10**

Question	Answer	Marks
6(a)	*any **6** of:* 1 combustion of fossil fuels releases carbon dioxide (into the atmosphere) ; 2 which, diffuses / dissolves, into sea water ; 3 weathering of rocks (containing carbonate) ; 4 enters ocean via run-off (from land) ; 5 respiration (by marine organisms / decomposers) ; 6 death / decomposition, (of marine organisms) ; 7 ref. to upwelling / dredging / undersea mining ; 8 releases (stored) carbon compounds from seabed to surface waters ; 9 dissolving / erosion of, shells / coral ; 10 released from, underwater volcanoes / hydrothermal vents ; 11 **AVP** ;	**6**
6(b)	*any **6** of:* 1 act as carbon sinks ; 2 (water) absorbs carbon dioxide form the atmosphere / carbon dioxide dissolves in sea water ; 3 stored in, e.g. phytoplankton / seagrass / algae / mangroves ; 4 as they photosynthesise ; 5 (fix dissolved carbon dioxide to make), glucose / carbohydrate ; 6 which pass along food chain ; 7 can be used to form, fossil fuels / shells / corals / exoskeleton ; 8 shells of dead organisms can form, rocks / limestone ; 9 death and decay / decomposition, (of marine organisms) forms marine snow ; 10 which sinks to ocean floor ; 11 can be stored, on seabed / trapped in sediment (for years) ; 12 found in ice sheets ; 13 deep slow-moving ocean currents / conveyor belt, (retain carbon compound for hundreds of years) ; 14 **AVP** ;	**6**

Question	Answer	Marks
7	*advantages – MAX **5** of:* 1 increases salmon numbers (if very low) ; 2 *idea of* can increase (salmon) catch ; 3 so providing more, employment / income ; 4 keeps the price of (wild) salmon lower (for consumer) ; 5 used when rivers are, polluted / dry / blocked by dams (for salmon to return to the sea) ; 6 used if the salmon species is of conservation concern ; 7 salmon could provide an increase in, food supply / prey for predators, e.g. whales ; 8 survival rates of, eggs / larvae / adults, greater in a hatchery ; 9 **AVP** ; *disadvantages- MAX **5** of:* 1 correct ref. to spread of, disease / parasites ; 2 may not adapt to new environment **or** ref. to suitable example ; 3 *idea of* competition (with, wild salmon / other predators) for, e.g. prey / mates ; 4 may not be able to tolerate fluctuations in, temperature / salinity / pH ; 5 (*idea of* large numbers) could disrupt (other) food, chains / web ; 6 (if breeding with wild salmon), correct reference to genetics ; 7 not a long-term solution for saving wild salmon population ; 8 high cost of raising salmon in a hatchery ; 9 **AVP** ;	**8**