CAMBRIDGE
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Cambridge International AS & A Level

MARINE SCIENCE **9693/33**

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.

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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
	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)	*any **2** of:* carapace present / jointed legs / **two** pairs of antennae ;	**1**
1(b)	shows metamorphosis ; larval stages present **;**	**2**
1(c)(i)	*any **2** of:* they cause minimal damage to the mud substrate ; (most) stages in the life cycle are bottom dwelling ; catches more crabs than any other method ;	**2**
1(c)(ii)	$\frac{1.9 - 11.7}{11.7} \times 100$ (–) 83.8(%) ;	**2**
1(c)(iii)	*any **2** of:* 1 insufficient numbers (of males) to catch ; 2 *idea of* too few males available to breed ; 3 so, few offspring produced for future / low recruitment ; 4 allows time for population to recover / prevents extinction ;	**2**
1(c)(iv)	*any **4** of:* 1 kills / damages, eggs / larval stages / too few cold-water pools for juveniles to mature ; 2 correct ref. to phytoplankton blooms ; 3 introduction of new crab predators / invasive species / diseases ; 5 reduced oxygen concentration in seawater ; 6 less available for respiration / causes suffocation ; 7 so reducing growth / productivity ; 8 effect of increased temperature on salinity ; 9 so affecting water potential ; 10 **AVP** ;	**4**

Question	Answer	Marks
1(d)	*any **4** of:* 1 snow crab numbers will continue to decline ; 2 crabs / native species will be predated by cod / predatory fish ; 3 fewer cold-water pools for juveniles to mature ; 4 which could lead to overcrowding / increase in disease / starvation ; 5 could result in overfishing of other cold water species ; 6 less / no, income / employment, from commercial fishing for, snow crabs / cold water species ; 7 causing changes in food chains / webs ; 8 increased fishing for, cod / other warm water species, (could provide an alternative source of, income / employment) ;	**4**

Question	Answer	Marks
2(a)	*any **2** of:* 1 ban might be ignored by fishers / illegal fishing (for adults) continues ; 2 juveniles will be harvested instead ; 3 ban would be difficult to monitor / enforce ; 4 **AVP** ;	**2**
2(b)	*any **2** of:* 1 (optimum) abiotic conditions (required for spawning / larval survival / growth) ; 2 life-cycle / breeding ; 3 suitable feed for adults / larvae ; 4 **AVP** ;	**2**
2(c)	*any **2** of:* 1 provide, employment / income (for local community) ; 2 more likely to, look after / ensure success of, aquaculture project ; 3 *idea that* local people will look after the environment ; 4 **AVP** ;	**2**

Question	Answer	Marks
2(d)	*any **4** of:* 1 removes, organic waste / faeces, from sea floor ; 2 so recycling nutrients ; 3 decreases the chance of algal blooms ; 4 decreases the chance of, oxygen depletion / anoxic conditions ; 5 provides another source of income ; 6 no feed input required / no extra cost of feed ; 7 **AVP** ;	**4**

Question	Answer	Marks
3(a)	*idea that* in extensive ponds phytoplankton blooms are a food source on which the aquaculture organisms depend / **AW** ; in intensive ponds phytoplankton blooms supplement manufactured feed / **AW** ;	**2**
3(b)(i)	*any **2** of:* (increasing phytoplankton abundance) increases the, range / maximum and minimum, values of dissolved oxygen (in a pond) ; correct reference to figures for low and high phytoplankton abundance ;	**2**
3(b)(ii)	*any **4** of:* 1 highest oxygen concentration during the day and lowest at night ; 2 (during the day) phytoplankton photosynthesises using light (energy) ; 3 oxygen is produced (as a waste product), so concentration increases ; 4 the rate of photosynthesis is greater than the rate of respiration ; 5 at night photosynthesis stops as there is no light ; 6 oxygen is used for (aerobic) respiration, so the concentration falls ; 7 increasing phytoplankton numbers cause more oxygen to be used at night and more produced during the day ;	**4**

Question	Answer	Marks
3(c)	***any 4 of:*** 1 idea of: increasing winds would increase the diffusion rate of gases entering the pond (from the atmosphere) ; 2 more carbon dioxide available for photosynthesis (during the day) / more oxygen available for respiration at night ; 3 increased photosynthesis increases the concentration of oxygen (during the day) / increased respiration decreases the concentration of oxygen (at night) ; 4 *idea that* graph will be, higher / steeper in the day / lower at night ; 5 ref to effect of increased temperature on gas solubility **or** denaturing enzymes **or** increasing kinetic energy in molecules 6 effect of change in carbon dioxide **or** oxygen concentrations on photosynthesis / respiration ; 7 correct ref. to change in dissolved oxygen concentration due to photosynthesis / respiration ; 8 correct ref. to change in graph ;	

Question	Answer	Marks
4(a)	euryhaline can tolerate in a wide range of salinities **AND** stenohaline can only tolerate small changes in salinity / **AW** ;	**1**
4(b)	**A** – loss of water through skin ; **B** – (constantly) drinking (sea water) ; **D** – removal of, concentrated / low volume of, urine ;	**3**
4(c)	*any **2** of:* 1 there is a higher concentration of sodium and chloride ions in the sea water than in the fish ; 2 so ions move out against their concentration gradient ; 3 which requires energy from ATP ;	**2**

Question	Answer	Marks
5	*any **10** of:* 1 organisms must tolerate extreme conditions ; 2 any **two** of high pressure / extreme heat / no light / depth around 2000 m / toxins / acidic pH ; 3 vents release (dissolved) nutrients / minerals ; 4 no light for plants / photosynthesis ; 5 bacteria carry out chemosynthesis ; 6 using (chemical) energy from minerals ; 7 e.g. hydrogen sulphide / methane / hydrogen / iron ; 8 to fix, carbon / carbon dioxide ; 9 to make glucose / organic molecules / provide energy (for consumers) ; 10 example of bacterium e.g. *Endoriftia* ; 11 which has a symbiotic / mutualistic relationship with giant tubeworm / *Riftia* ; 12 suitable example of other marine organisms in hydrothermal vent community ; 13 ref. to low biodiversity ; 14 **AVP** ;	**10**

Question	Answer	Marks
6(a)	*any **6** of:* 1 they can inhabit a wide variety of habitats ; 2 they have few / no natural predators ; 3 they feed on a wide variety of prey species ; 4 outcompete native species for e.g. food / shelter ; 5 reduce biodiversity ; 6 ecological linkages / food chains / food webs, affected ; 7 (large) claws present to deter predators ; 8 tolerate a wide range of temperatures ; 9 tolerate a wide range of salinities / are euryhaline ; 10 high reproductive rate ; 11 larval forms easily transported to new areas by water currents ; 12 **AVP** ;	**6**

Question	Answer	Marks
6(b)	*any **8** of:* 1 (fishing gear / nets / ghost gear), cause entanglement ; 2 causing physical injuries e.g. to fins / flippers ; 3 so increasing the chance of, disease / infections / predation ; 4 correct ref. to suffocation ; 5 when ingested can cause, blockage / starvation ; 6 organism drowns if they cannot reach surface to breathe ; 7 can be used to transfer invasive species to new habitats ; 8 (larger) plastic broken down into (secondary) microplastic ; 9 taken up by zooplankton / filter feeders ; 10 can, bioaccumulate in marine organisms / biomagnify along food chains ; 11 can, contain toxins (which poison marine organisms) ; 12 can cover coral preventing photosynthesis ; 13 leading to coral bleaching ; 14 **AVP** ;	**8**

Question	Answer	Marks
7	*any **6** of:* 1 small in size / approx. 1 μm long ; 2 for easy diffusion of gases 3 has an outer and inner membrane ; 4 ref. to permeability of membranes ; 5 allow oxygen **+** glucose in and carbon dioxide **+** water out ; 6 inner membrane, folded / forms cristae ; 7 to increase surface area ; 8 matrix, fills centre / contains enzymes ; 9 function is aerobic respiration ; 10 releases energy (in the form of ATP) ; 11 **AVP** ;	**6**