



Cambridge International AS & A Level

MARINE SCIENCE

9693/12

Paper 1 AS Level Theory

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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.

This document consists of **15** printed pages.

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.

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 <i>n</i> responses (e.g. State two reasons ...): • The response should be read as continuous prose, even when numbered answer spaces are provided. • Any response marked <i>ignore</i> in the mark scheme should not count towards <i>n</i>. • Incorrect responses should not be awarded credit but will still count towards <i>n</i>. • 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 <i>n</i> 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

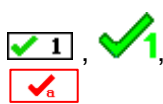
Examiners use a system of annotations as a shorthand for communicating their marking decisions to one another. Examiners are trained during the standardisation process on how and when to use annotations. The purpose of annotations is to inform the standardisation and monitoring processes and guide the 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.

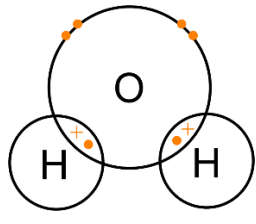
The annotations listed below were available to examiners marking this component in this series.

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
	point already given

Annotation	Meaning
	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

Question	Answer	Marks	Guidance
1(a)	domain ;	1	
1(b)(i)	<i>Ophiothrix</i> ;	1	I capitalisation and italics
1(b)(ii)	any 2 of: pentaradial symmetry ; tube feet ; AVP ;	2	I mouth, legs A water vascular system
1(b)(iii)	<i>ecological effects (max 3)</i> food for other marine organisms or transfer, energy / biomass, up food chains or webs ; regulate, algal / producer / lower trophic level organism, populations ; maintain biodiversity ; AVP ; <i>economic effects</i> source of food for humans / ref to fishing industry ; source of, medicines ; (maintains biodiversity) for tourism / ecotourism ;	4	for max marks must have ecological and economic effects A control fast growing coral species allowing slow growing coral to grow e.g. role as detritivores / nutrient cycling / burrowing and releasing oxygen / (endo)skeletons used to neutralise soil (in agriculture) ; A named examples e.g. KLH / cosmetics
1(c)(i)	(a relationship between two species) where one species benefits and the other species is neither benefited nor harmed ;	1	I organisms in place of species A other species is unaffected A ref to host
1(c)(ii)	parasitic ; mutualism ;	2	A in either order

Question	Answer	Marks	Guidance															
2(a)	<table><thead><tr><th>compound</th><th>name of compound</th><th>ionic or covalent bonding</th></tr></thead><tbody><tr><td>A</td><td>calcium carbonate</td><td>ionic</td></tr><tr><td>B</td><td>sodium chloride</td><td>ionic</td></tr><tr><td>C</td><td>glucose</td><td>covalent</td></tr><tr><td>D</td><td>carbon dioxide</td><td>covalent</td></tr></tbody></table>	compound	name of compound	ionic or covalent bonding	A	calcium carbonate	ionic	B	sodium chloride	ionic	C	glucose	covalent	D	carbon dioxide	covalent	4	1 mark for each correct row 1 mark if all names or all bonding correct if no other marks awarded 1 covalent for calcium carbonate
compound	name of compound	ionic or covalent bonding																
A	calcium carbonate	ionic																
B	sodium chloride	ionic																
C	glucose	covalent																
D	carbon dioxide	covalent																
2(b)		1	1 any additional inner shells drawn for oxygen A if dots (or crosses or e's) used throughout diagram															
2(c)	any 4 of: ref. to hydrogen bonds ; water is a polar molecule / hydrogen atoms (in water) are partially positive / oxygen atoms (in water) are partially negative ; caused by unequal sharing of electrons ; water's charges allow it to interact with other substances ; allowing substances to dissolve (in water) ;	4	A diagram A slightly / δ for partially A dipole for polar A waters charges attract oppositely charges particles / ions A ions dissociate / molecules separate / ionic bonds broken															

Question	Answer	Marks	Guidance
3(a)	Indian Ocean labelled with an X ;	1	 A if no X labelled but Indian Ocean written in correct place
3(b)	in the Northern hemisphere currents (spiral) clockwise / AW ; in the Southern hemisphere currents (spiral) anticlockwise / AW ; plus any 2 of: ref. to Coriolis effect ; ref. to Earth's rotation ; causes a deflection of currents (at a 45° angle) ;	2+2	I to the right / left
3(c)	any 2 of: cycles water, across the globe / between Arctic and Antarctica ; transfer of nutrients ; animal migration ; (idea of) temperature regulation / effects on the climate ; AVP ;	2	A upwelling A idea of distribution of heat e.g. effects on the global transport / shipping
4(a)	bathypelagic (zone) ;	1	I midnight zone

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Question	Answer	Marks	Guidance
4(b)	chemosynthetic ;	1	A chemotrophs / chemoautotrophs
4(c)	<i>any 4 of:</i> zone C has a greater pressure ; zone C has a lower temperature ; solubility of oxygen increases with increased pressure ; solubility of oxygen increases with decreased temperature ; fewer organisms in zone C ; less food available / less marine snow, in zone C ; so there is less respiration in zone C ;	4	A ORA if specified throughout A more oxygen can dissolve A detritus for marine snow A less decomposition in zone C
4(d)	(the benthic zone is) the bottom of a body of water / the seafloor ; <i>plus any 1 of:</i> coastal waters (in this zone) are shallower / open waters (in this zone) are deeper ; shallower waters receive light / deeper waters receive no light ;	1+ 1	A ref to zone A benthic zone as having more light and zone D as having less light

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Question	Answer	Marks	Guidance
5(a)(i)	weathering is the breakdown of <u>rock</u> (into smaller pieces) ; erosion is the, movement / transport, of rock / sediments / minerals, (to new locations) ;	2	I particles / material / sediment for MP1 A particles / named substrates for MP2 I material for MP2
5(a)(ii)	<i>any 2 of:</i> (by) wind ; (by) gravity ; (by moving) ice ; (by moving) water ;	1	A tidal OR wave for water
5(b)	<i>any 3 of:</i> speed of water faster at A than at B ; particles are deposited when the speed of / energy in, the water reduces ; at B water flow is slower because it, is flatter / forms many channels ; smaller particles can travel further than the larger particles ;	3	I waves A faster water can move larger particles A sedimented for deposit A smaller particles are suspended in the river for longer
5(c)	<i>any 4 of:</i> lagoons, are enclosed ; they experience less run off of fresh water (from the river) / ORA ; only refill when tide is in ; lagoons are at a greater temperature than C / ORA ; experience greater evaporation / ORA ;	4	A larger surface area to volume ratio A C receives fresh water from the river (so is more dilute)

Question	Answer	Marks	Guidance
6(a)	<i>any 8 of:</i> a) upper shore submerged during high tides only ; b) splash zones only submerged during, spring tides / storm surge ; c) experiences, high / changes in, temperature ; d) experiences lack of water / desiccation / exposure ; e) experiences <u>intense</u> wave action ; f) ref to named organisms that lives in, splash zone / upper shore ; g) muscular foot for attachment to substrate (to prevent being washed away) ; h) byssal threads for attachment to substrate (to prevent being washed away) ; i) shell traps water to prevent desiccation ; j) shell traps water to allow gas exchange ; k) shell traps water for temperature regulation ; l) shell protects from impact of waves ; 1) algae have curled fronds to reduce evaporation ; 2) macroalgae have holdfasts for attachment to substrate (to prevent being washed away) ; 3) AVP ;;	8	A strong / turbulent waves e.g periwinkles / limpets / chitons Behavioural adaptations e.g. moving with the tide / hiding under macroalgae / in crevices structural adaptations e.g. macroalgae mucus layer / thick epidermis / gas bladders for floating to get light for photosynthesis

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Question	Answer	Marks	Guidance
6(b)	<i>any 6 of:</i> a) unstable substrate / constantly shifting sand ; b) fewer areas for attachment ; c) porous substrate ; d) exposure to, high / changes in, temperature ; e) (high) risk of desiccation ; f) fewer producers ; g) lack of, food sources / nutrients ; h) fewer niches ; i) higher rates of competition ; j) lack of shelter from predators / high exposure to predators ; k) few organisms adapted to conditions of sandy shore ; l) the main organisms (that are adapted) are, burrowers / infauna ;	6	A the only producers are phytoplankton A extreme temperatures / freezing at night A need to be highly adapted

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Question	Answer	Marks	Guidance
7	<i>any 9 of:</i> a) exist as, phosphate ions / PO_4^{3-} ; b) (phosphorus / phosphate ions) are soluble ; <i>replenishment:</i> c) (chemical) weathering of rocks (containing phosphorus) ; d) (phosphorus) from agricultural practices / sewage / industrial effluent / fertilisers ; e) release phosphorus into, rivers / runoff ; f) decomposition / decay / excretion, (of organic matter) ; g) upwelling / nutrient-rich deep ocean water brings phosphorus to the surface ; h) atmospheric dissolution ; i) from volcanic eruptions / hydrothermal vents ; <i>depletion:</i> 1) uptake into organisms ; 2) for, growth / repair / energy / metabolic processes ; 3) phosphorus used to make, DNA / bones ; 4) sedimentation / burial in the seafloor / incorporated into coral reefs / form sedimentary rock ; 5) removal of phosphorus through, commercial fishing / harvesting ; 6) marine snow / transfers phosphorus from surface waters to the deep ocean ;	9	for full marks some marking points required from both replenishment and depletion A any correct biological molecule instead of DNA e.g. ATP / proteins

Question	Answer	Marks	Guidance
8	any 7 of: a) ref. to continental drift / plate movement ; b) (any one of a - g provide) evidence for, a single land mass / Pangea / supercontinent (at one time) ; c) matching of, rock formations / mountain ranges, between continents ; d) matching of rock, strata / types, between (different / edges of) continents ; e) distribution of, similar / same, fossils on separate continents ; f) distribution of similar living organisms on separate continents ; g) jigsaw fit of the continental coastlines ; h) (alternating) paleomagnetic stripes on the ocean floor ; i) demonstrates, sea floor spreading / new seafloor being formed ; j) as, new rock forms / magma cools, it records the, magnetic field / polarity, of Earth at the time (of formation) ; k) matching, ages of rock / polarities, either side of mid-ocean ridges ; l) (named) tectonic activity ; m) distribution of tectonic activity <u>at plate boundaries</u> ; n) AVP ;	7	e.g. mountain chains e.g volcanoes / earthquakes A named tectonic activity and named boundary e.g. coal deposits in Antarctica / glacial scarring across continents