

# Cambridge International AS & A Level

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**MARINE SCIENCE**

**9693/13**

Paper 1 AS Level Theory

**May/June 2024**

MARK SCHEME

Maximum Mark: 75

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**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 2024 series for most Cambridge IGCSE, Cambridge International A and AS Level and Cambridge Pre-U components, and some Cambridge O Level components.

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This document consists of **13** printed pages.

**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.

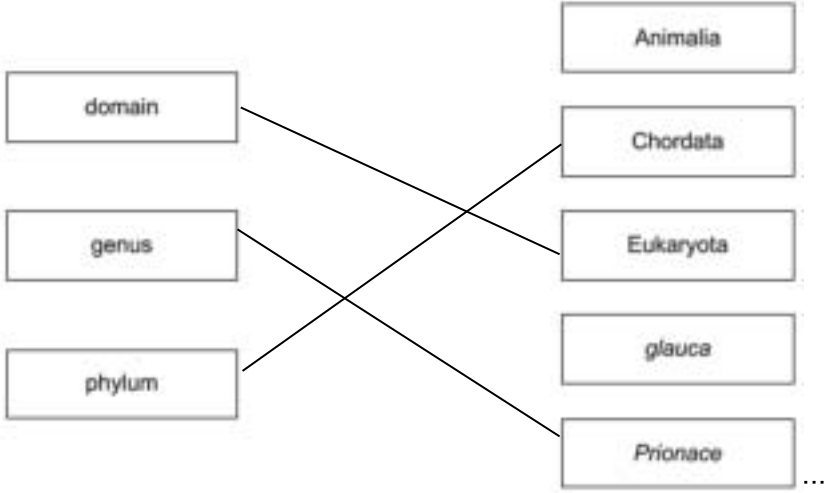
State symbols given in an equation should be ignored unless asked for in the question or stated otherwise in the mark scheme.

This mark scheme will use the following abbreviations:

<b>;</b>	separates marking points
<b>/</b>	separates alternatives within a marking point
<b>()</b>	contents of brackets are not required but should be implied / the contents set the context of the answer
<b>R</b>	reject
<b>A</b>	accept (answers that are correctly cued by the question or guidance you have received)
<b>I</b>	ignore (mark as if this material was not present)
<b>AW</b>	alternative wording (where responses vary more than usual, accept other ways of expressing the same idea)
<b>AVP</b>	alternative valid point (where a greater than usual variety of responses is expected)
<b>ORA</b>	or reverse argument
<b><u>underline</u></b>	actual word underlined must be used by the candidate (grammatical variants excepted)
<b>MAX</b>	indicates the maximum number of marks that can be awarded
<b>+</b>	statements on both sides of the <b>+</b> are needed for that mark
<b>OR</b>	separates two different routes to a mark point and only one should be awarded
<b>ECF</b>	error carried forward (credit an operation from a previous incorrect response)

Question	Answer	Marks
1(a)(i)	(A) continental crust ; (B) oceanic crust ; (C) mantle ; (D) core ;	<b>4</b>
1(a)(ii)	(3 400 000 + 35 000 <b>OR</b> $3.4 \times 10^6 + 3.5 \times 10^4 =$ ) 3 435 000 <b>OR</b> $3.435 \times 10^6$ ; ( $6.36 \times 10^6 - 3.435 \times 10^6$ <b>OR</b> $6\,360\,000 - 3\,435\,000 =$ ) $2\,925\,000$ <b>OR</b> $2.925 \times 10^6$ (m) ; ( $2.925 \times 10^6 \div 1000$ ) = 2925 (km) ;	<b>3</b>
1(b)(i)	<i>any 2 of:</i> 1 jigsaw fit of continents ;  2 (distribution of) similar fossils / same type of fossil, on both continents ;  3 (distribution of) similar living organisms or species, on both continents ;  4 matching rock, type / formations, on both continents ;  5 <b>AVP</b> ;	<b>2</b>
1(b)(ii)	two arrows diverging ;	<b>1</b>
1(b)(iii)	divergent / diverging ;	<b>1</b>
1(b)(iv)	<u>newly formed</u> , crust / rock / seafloor ;	<b>1</b>

Question	Answer	Marks
2(a)		3
2(b)	ice / glaciers + water + wind + gravity ;;;	3
2(c)	<p><i>any 2 of:</i></p> <p>1 close fitting / impermeable, shell to avoid, drying out / desiccation (when tide is out) ;</p> <p>2 muscular foot to hold (tight) onto rocks ;</p> <p>3 (thick / ref to shaped) shell protects from, predators / wave action ;</p> <p>4 <b>AVP</b> ;</p>	2

Question	Answer	Marks
3(a)	(A) caudal (fin) ; (B) pelvic (fin) ; (C) dorsal (fin) ;	<b>3</b>
3(b)		<b>3</b>
3(c)(i)	$360\,000 - 600\,000 = -240\,000$ $\frac{-240\,000}{600\,000} \times 100 ;$ (-) 40 (%) ;	<b>2</b>



Question	Answer	Marks
3(c)(ii)	<p><i>any 3 of:</i></p> <p>1 <i>idea of fewer people will eat them / less demand / boycott / idea of shark conservation ;</i></p> <p>2 <i>fewer / lower, population / supply (of blue sharks) <b>OR</b> named reason for smaller population ;</i></p> <p>3 <i>increase in price ;</i></p> <p>4 <i>decrease in fishing effort or days / correct ref to quotas ;</i></p> <p>5 <i>more people in <u>Japan</u> eating it / larger domestic market ;</i></p> <p>6 <i>fresh / frozen, shark (meat / fin) being exported instead ;</i></p> <p>7 <i>laws / legislation / designated a protected species ;</i></p>	<b>3</b>
3(d)	<p>(epipelagic) sunlit (open ocean) ;</p> <p>(mesopelagic) twilight (open ocean) ;</p>	<b>2</b>

Question	Answer	Marks
4(a)	<p><i>any 2 of:</i></p> <p>1 <i>(organisms that) have limited motility ;</i></p> <p>2 <i>drift in water currents ;</i></p> <p>3 <i>(generally) microscopic ;</i></p>	<b>2</b>
4(b)(i)	<p>4 rectangular closed bars stacked vertically and centrally aligned ;</p> <p>correct relative proportions ;</p> <p>correctly labelled with organisms from food chain in correct order ;</p>	<b>3</b>
4(b)(ii)	<p>phytoplankton bloom(ed) ;</p> <p>ref to photosynthesis / light energy transferred to biomass ;</p> <p>more food for copepods / more phytoplankton eaten ;</p> <p>large(r) copepod population ;</p>	<b>4</b>

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Question	Answer	Marks
4(c)	sea cucumber added with arrow from phytoplankton and from copepod ; arrow from sea cucumber to turtle ; arrow from sea cucumber to copepod ;	3

Question	Answer	Marks
5(a)	<p><i>any 7 of:</i></p> <ol style="list-style-type: none"> <li>1 Moon and Sun exert gravitational pull on water ;</li> <li>2 gravitational pull from the Moon is larger than from the Sun ;</li> <li>3 because the Moon is closer ;</li> </ol> <p><i>spring tide:</i></p> <ol style="list-style-type: none"> <li>4 largest range (consecutive between high and low tides) ;</li> <li>5 Earth, Moon and Sun are in a (straight) line ;</li> <li>6 gravitational pull of Sun and Moon in same direction / is amplified ;</li> <li>7 therefore (total) gravitational pull (on water) is greatest (in one direction) ;</li> </ol> <p><i>neap tide:</i></p> <ol style="list-style-type: none"> <li>8 is smallest range (consecutive between high and low tides) ;</li> <li>9 Moon and Sun perpendicular to Earth ;</li> <li>10 gravitational pull of the Moon and Sun are in opposite directions ;</li> <li>11 so (total) gravitational pull (on water) is weakest (in one direction) ;</li> </ol>	7

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Question	Answer	Marks
5(b)	<p><b>factors:</b></p> <p><b>a</b> wind direction / onshore wind / offshore wind ;</p> <p><b>b</b> windspeed / high winds ;</p> <p><b>c</b> <u>air</u> pressure ;</p> <p><b>d</b> runoff / flooding ;</p> <p><b>e</b> coastal geomorphology / shape of coast / named example ;</p> <p><b>f</b> shape of seabed ;</p> <p><b>g</b> size of the body of water ;</p> <p><b>h</b> <b>AVP</b> ;</p> <p><b>explanations</b></p> <p><b>1</b> onshore wind increases tide height / <b>ORA</b> ;</p> <p><b>2</b> higher wind(speed) pushes more water / <b>ORA</b> ;</p> <p><b>3</b> low air pressure increases tide height / <b>ORA</b> ;</p> <p><b>4</b> increased runoff / flooding rivers, increases tide height / <b>ORA</b> ;</p> <p><b>5</b> funnel-shaped (coastline) increases tide height / <b>ORA</b> ;</p> <p><b>6</b> shallow waters increase tide height / <b>ORA</b> ;</p> <p><b>7</b> large bodies of water (generally) increase tide height / <b>ORA</b> ;</p> <p><b>8</b> steep channels / basins on seabed decrease tidal height or continental ridges / shelves increase tide height ;</p> <p><b>9</b> <b>AVP</b> ;</p>	<b>7</b>

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Question	Answer	Marks
6(a)	<p><i>any 4 of:</i></p> <ol style="list-style-type: none"> <li>1 water is the solvent ;</li> <li>2 salts / (named) solutes, are <u>dissolved</u> in, water / solvent ;</li> <li>3 by the disassociation of <u>ions</u> / described ;</li> <li>4 ref to polar property of water molecules ;</li> </ol> <p>5,6 <b>plus any 2 stated salts:</b>  <math>\text{Na}^+ / \text{Cl}^- / \text{NaCl}</math> / sodium chloride ;  <math>\text{Mg}^{2+} / \text{SO}_4^{2-} / \text{MgSO}_4</math> / magnesium sulfate ;  <math>\text{Ca}^{2+} / \text{CO}_3^{2-} / \text{CaCO}_3</math> / calcium carbonate ;  <math>\text{PO}_4^{3-}</math> / phosphate ions ;  <math>\text{NO}_3</math> / nitrate ions ;  <b>AVP ;</b></p> <p>7,8 <b>plus any 2 named nutrients:</b>  carbohydrates / glucose ;  proteins / amino acids ;  lipids / fatty acids ;  <b>AVP ;</b></p> <p>9,10 <b>plus any 2 gases dissolved:</b>  carbon dioxide ;  oxygen ;  nitrogen ;  <b>AVP ;</b></p>	8

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<b>Question</b>	<b>Answer</b>	<b>Marks</b>
6(b)	<p><i>any 8 of:</i></p> <ol style="list-style-type: none"><li>1 typical sea water pH stated / seawater is (slightly) alkaline ;</li><li>2 pH is a measure of the hydrogen ion concentration in water ;</li><li>3 reference to precipitation / run-off / melting glaciers (decreasing pH) ;</li><li>4 ocean acidification / lower pH (than typical pH) ;</li><li>5 less (calcium) carbonate available for shells / (hard) coral ;</li><li>6 causing reef erosion ;</li><li>7 low pH / acidity, dissolves coral skeleton / calcium carbonate ;</li><li>8 reduces ability of coral to absorb calcium carbonate ;</li><li>9 zooxanthellae die / leave the coral ;</li><li>10 zooxanthellae provide the nutrients for coral ;</li><li>11 reef damage faster than reef growth ;</li><li>12 <b>AVP</b> ;;</li></ol>	<b>8</b>