CAMBRIDGE
International Education

Cambridge International AS & A Level

MARINE SCIENCE **9693/31**

Paper 3 A Level Theory **May/June 2024**

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 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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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.

Question	Answer	Marks
1(a)	variation in ecosystems / many different ecosystems present ;	**1**
1(b)(i)	one that has a (high) risk of becoming extinct ;	**1**
1(b)(ii)	*any **two** of:* it contains salt ; which will inhibit growth of most plants ; so provide more nesting areas for birds for longer ; soil could contain seeds that produce plants quickly ;	**2**
1(b)(iii)	*any **two** of:* (stones) provide a place to hide from predators ; (stones increase) breeding areas ; more prey (found around the stones) ;	**2**
1(b)(iv)	*any **4** of:* idea of increased competition with native species for food / nesting sites ; (increased faeces / nitrogen compound in ponds) causes, eutrophication / increased growth of plants / algae / algal blooms ; less light for photosynthesis (in benthic producers) ; (dead) plants / algae are broken down by bacteria / decomposers ; suitable reason why oxygen is depleted ; correct ref. to why biodiversity is reduced ;	**4**
1(c)	*any **3** of:* competes with, local vegetation / native species, for named resource ; has high growth / reproductive, rate (than local vegetation) ; idea of dominates the area ; suitable effect on local species ; **AVP** ;	**3**

Question	Answer	Marks
2(a)(i)	a change, of form / from larval to adult ;	**1**
2(a)(ii)	*any **4** of:* *advantages – max **2** of:* (more) guaranteed supply of spat ; not affected by pollution / adverse weather ; can develop new strains / hybrids ; can control (abiotic) conditions / provide optimum conditions, (for growth or breeding) ; **AVP** ; *disadvantages – max **2** of:* hatchery / equipment costs are high ; more labour intensive ; artificial conditions / light / temperature, required (for spawning) ; **AVP** ;	**4**
2(a)(iii)	*any **two** of:* mussels always covered in sea water (in A) ; mussels in intertidal area only covered when tide is in (in B) ; so can feed constantly (in A) ; **ORA** reaches harvesting size sooner (in A) ; **ORA**	**2**
2(a)(iv)	*any **two** of:* (dredging) damages sea bed / destroys benthic habitat ; releases sediment which, reduces light penetration / prevents photosynthesis / reduces productivity in producers / smothers benthic organisms ; greater chance of oil pollution from boat ;	**2**
2(b)(i)	*any **two** of:* (less) calcium / carbonate (dissolved in sea water) ; (minerals) required for shell formation ; shells are weaker, (so more easily damaged) ;	**2**

Question	Answer	Marks
2(b)(ii)	*any **two** of:* to remove predators ; to remove algae ; (to check) growth / when to harvest ; for disease / parasites ;	**2**

Question	Answer	Marks
3(a)	as clothing sales increase, the <u>average</u> number of times clothes are worn decreases ;	**1**
3(b)	*any **2** of:* coral bleaching ; as zooxanthellae / algae are expelled ; results in a lack of nutrients for coral (which dies) ; eq less oxygen available for (aerobic) respiration ;	**2**
3(c)	*any **3** of:* less / no light able to reach producers, so less photosynthesis ; reducing productivity ; consumers, die from lack of food / move away to other areas ; less dissolution of gases at surface, so reducing availability of gases for photosynthesis / respiration ; dyes could be toxic ;	**3**
3(d)	*any **3** of:* microplastics taken up by filter-feeders e.g. mussels / zooplankton ; microplastics cannot be excreted / ref. to bioaccumulation ; <u>biomagnification</u> occurs at each trophic level ; as <u>more</u> prey consumed ; microplastics contain toxins which could kill top predators ;	**3**

Question	Answer	Marks
3(e)	*any **2** of:* use natural dyes (instead of synthetic ones) / biodegradable dyes ; (encourage) recycling clothes / wearing them for longer before throwing away / giving clothes to charity ; make / buy clothes made from natural fibres / biodegradable fibres (instead of synthetic ones to reduce release of microplastics) ; produce / market sustainable clothes ;	**2**

Question	Answer	Marks
4(a)(i)	*advantage – any **1** of:* protects domestic producers from cheaper foreign imports ; increases domestic production ; source of revenue for government ; *disadvantage – any **1** of:* reduced imports can lead to shortages / less consumer choice ; can lead to decrease in product quality ; *(idea of)* can lead to trade wars between countries ;	**2**
4(a)(ii)	*any **two** of:* reduced export costs (to China) ; increased (fresh salmon) sales (to China) ; decrease in cost (of fresh salmon) for consumers (in China) ; more products (for consumers) to choose from ;	**2**
4(b)(i)	consumer will be confused / don't know the difference / conflicting advice, between the different organisations ;	**1**
4(b)(ii)	*any **three** of:* (number of MSC certified products) have increased (each year) in all regions ; correct manipulation of data ; due to, education / awareness, about sustainability / increased advertising ; customers in, Eastern / Southern Europe, not prepared to pay extra for sustainable seafood ; **ORA** sustainable fishing methods have increased (in 5 years in each region) ;	**3**

Question	Answer	Marks
5	*any **10** of:* 1 holdfast anchors kelp to rock / substrate ; 2 preventing it from being washed away by tides / storms ; 3 stipe holds blades closer to light ; 4 for (increased) photosynthesis ; 5 flexible stipe / blades ; 6 so kelp moves with current / prevents damage in strong currents / storms ; 7 blades have a large surface area ; 8 to trap more light for photosynthesis ; 9 blades are thin ; 10 for easy diffusion of gases (for photosynthesis / respiration) ; 11 gas bladders, hold blades upright (in water) / provide buoyancy ; 12 closer to light (for photosynthesis) ; 13 gas bladders store gases ; 14 for photosynthesis / respiration ; 15 (blades) contain chlorophyll a ; 16 traps blue light / light at 450 nm / red light / light at 670 nm ; 17 (blades) contain accessory (photosynthetic) pigments ; 18 to trap different wavelengths of light ; 19 e.g. fucoxanthin / xanthophyll ; 20 traps green / yellow light at wavelengths between 500 and 600 nm ; 21 **AVP** ;	**10**

Question	Answer	Marks
6(a)	*any **8** of:* 1 diffusion is the random (net) movement of particles ; 2 from a high concentration to a lower concentration / down a conc. gradient ; 3 (the random movement is) caused by the kinetic energy of the particles ; 4 ref. to **two** (named) examples of particles / gases / liquids / molecules / ions (which move by diffusion) ; 5 it is passive / does not require, ATP / energy ; 6 the greater the difference in concentration, the faster the rate of diffusion ; 7 rate increases with temperature (as particles have more kinetic energy) ; 8 rate increases with surface area ; 9 diffusion can only occur over short distances ; 10 non-polar molecules diffuse more easily through cell membranes than polar ones ; 11 because they are soluble in the non-polar phospholipid tails ; 12 (diffusion used) for gaseous exchange ; 13 for respiration / photosynthesis ; 14 suitable example of a gas exchange surface ; 15 important for mineral uptake (from sea water) ; 16 correct ref.to facilitated diffusion or osmosis ;	**8**
6(b)	*any **7** of:* 1 water moves by osmosis ; 2 from an area of high water potential to an area of lower water potential / down a water potential gradient ; 3 through, a selectively permeable membrane / the cell membrane / tonoplast ; 4 the water potential of a cell is affected by the concentration of solutes in the cytoplasm / vacuole ; 5 the higher the concentration of solutes, the lower the water potential ; **ORA** 6 ref. to pressure increasing water potential ; 7 when a cell gains water its water potential becomes less negative ; **ORA** 8 if plant cells lose (too much) water they can become flaccid / plasmolysed ; 9 if animal cells lose (too much) water they can shrink ; 10 when plant cells gain water they become turgid ; 11 so providing support ; 12 if animal cells gain (too much) water they can burst ; **ORA** 13 as they do not have a cell wall (to provide support) ; **ORA** 14 **AVP** ;	**7**

Question	Answer	Marks
7	*any **5** of:* 1 shrimp has a complex life cycle and a whale has a simple life cycle ; 2 shrimp life cycle shows metamorphosis but whale life cycle does not ; 3 shrimp life cycle has larval forms but these are absent in whales ; 4 both life cycles only have non-sessile forms ; 5 idea of paired mating occurs in both ; 6 external fertilisation in shrimp and internal fertilisation in whales ; 7 internal development in whales but not in shrimp ; 8 idea of parental care of offspring in whales but not in shrimp ; 9 hundreds (AW) of offspring produced by shrimp but only one / few in whales ; 10 both have a breeding season ; 11 a range of habitats are required to complete life cycle of shrimp but only open ocean / coastal waters required by whales ;	**5**