

CAMBRIDGE INTERNATIONAL EXAMINATIONS
GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2014 series

9693 MARINE SCIENCE

9693/02

Paper 2 (AS Data-Handling and Free-Response),
maximum raw mark 50

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 will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2014 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

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Question	Expected answers	Additional guidance	Marks
1 (a)	use light (energy)/sun(light)/ photosynthesis / chemical energy/ chemosynthesis / reference to autotrophic nutrition ; to synthesise organic substances / named example / food / provide food for next trophic level / eq ;		[2]
(b) (i)	4513.4 kJ m ⁻² year ⁻¹ ;	answer to include full units for mark	[1]
(ii)	appropriate calculation ; = 89.8(%) ;	correct answer, with no working shown, gains both marks allow ecf from an incorrect answer to (b)(i)	[2]
(c)	1. reference to energy loss by respiration / heat ; 2. not all producers eaten ; 3. some parts not eaten ; 4. reference to losses in undigested material / faeces / egestion ; 5. reference to losses in urine / excretion ;		[3]
(d)	idea of nutrients in estuary ; due to run-off / brought in by rivers ;	accept a named example of a nutrient	[2]
Total			[10]
2 (a) (i)	algae require light for photosynthesis / eq ;	accept a description of the process of photosynthesis	[1]
(ii)	magnesium needed for chlorophyll ; phosphorus for DNA / other appropriate compound ;		[2]

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(b)	<p>as temperature increases to 26 °C, growth increases ;</p> <p>above 26 °C, growth decreases ;</p> <p>reference to 26 °C as optimum temperature ;</p> <p>credit a <u>manipulated</u>, quantitative reference ;</p>	<p>accept 'growth decreases at 30 °C'</p> <p>accept 'most growth at 26 °C'</p>	[3]
(c)	<ol style="list-style-type: none"> 1. reference to using a range of salinities ; 2. credit reference to sodium chloride solutions ; 3. same number of cells at start / same inoculum / stated number (in each tube) ; 4. two stated variables kept constant, e.g. light, temperature, pH, volume of medium ; 5. left for suitable / stated time ; 6. cells counted ; 		[4]
Total			[10]
3 (a) (i)	<p>idea of a change in community ;</p> <p>over (a period of) time ;</p>	<p>accept 'change in ecosystems', 'change in populations', 'one species replaced by another'</p>	[2]
(ii)	<p>credit reference to a hydrothermal vent ;</p> <p>bacteria are the first organisms ;</p> <p>followed by molluscs / tube worms / etc. ;</p> <p>credit reference to <i>Tevnia</i> ;</p> <p>then <i>Riftia</i> ;</p>	<p>candidates will be given credit for other examples, such as succession on a whale carcass</p>	[3]

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(b)	<ol style="list-style-type: none"> 1. credit reference to a shoal as (large) number of fish of same species / eq ; 2. and (approximately) the same age / stage of maturity / size ; 3. reference to hydrodynamic efficiency ; 4. saves energy ; 5. easier to avoid predators ; 6. predators are more likely to be seen by many fish / eq ; 7. predators confused by so many fish ; 8. time taken to find food is decreased / eq ; 9. reproductive advantage ; 10. increased chances of finding a mate in a shoal ; 11. increased chance of fertilisation ; 12. credit reference to the formation of bait balls (by sardines) ; 	<p>accept 'streamlined' or 'less drag' but not 'aerodynamic'</p> <p>accept a reference to many eyes effect</p> <p>accept a reference to improved foraging efficiency</p>	[10]
Total			[15]
4 (a)	<p>fit between coastlines ;</p> <p>distribution of fossil species / palaeontology ;</p> <p>magnetic stripes on the ocean floor ;</p> <p>age of crustal plates ;</p> <p>seismic activity near plate boundaries / eq ;</p>		[3]
(b) (i)	<p>plates moving towards each other / convergent ;</p> <p>subduction ;</p> <p>one plate forced under another ;</p>	<p>accept a description, e.g. 'one plate slides over another'</p>	[2]

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(ii)	<p>associated with divergent (tectonic) boundaries ;</p> <p>upward movement of magma / eq ;</p> <p>solidifies as it cools / eq ;</p>	accept a description, e.g. 'plates moving away from each other'	[2]
(iii)	<p>reference to convergent plate boundaries ;</p> <p>sudden slippage of one plate ;</p> <p>causing an earthquake ;</p> <p>and displacement of water / eq ;</p>	accept a description, e.g. 'plates moving towards each other'	[3]
(c)	<ol style="list-style-type: none"> 1. high temperature ; 2. high pressure ; 3. low pH / acidic ; 4. low oxygen / no oxygen ; 5. presence of hydrogen sulfide ; 6. presence of minerals (e.g. iron, copper or zinc) ; 7. no light ; 		[5]
Total			[15]