
MARINE SCIENCE

9693/03

Paper 3 A2 Structured Questions

May/June 2016

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 will not enter into discussions about these mark schemes.

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This mark scheme will use the following abbreviations:

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

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Question	Expected answers	Additional guidance	Marks
1 (a)	organism that maintains its, blood/body fluid/ AW composition, at the same <u>concentration</u> as the external solution ;		[1]
(b) (i)	estuary/rock pool/tidal river/river mouth/delta ;		[1]
(ii)	osmosis ;		[1]
(iii)	<p><i>any 2 of:</i></p> <p>organism A gains more mass than organism B ;</p> <p>organism A gains mass continually/organism B gains and loses mass ;</p> <p>ref. to processed figures ;</p>	e.g. A mean mass gain 3.6 au and B loses 0.4 au	[2]
(c) (i)	<p><i>any 3 of:</i></p> <p><i>organism A:</i></p> <p>the data show a linear relationship between <u>salinity</u> and change in mass ;</p> <p>over <u>time</u> the change in mass continues to increase at 8 and 24ppt/up to 40 ppt/except at 40 ppt ;</p> <p><i>organism B:</i></p> <p>the data shows no relationship between <u>salinity</u> and change in mass ;</p> <p>over <u>time</u> change in mass shows very little change ;</p>	R mass of A decreases as salinity increases	[3]

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Question	Expected answers	Additional guidance	Marks
(ii)	<p>any two of:</p> <p>salinity of 40 ppt has higher chloride/ions/salt concentration than organism B ;</p> <p>salt diffuses / AW into organism B ;</p> <p>need to remove excess / extra taken in (to keep plasma concentration constant) ;</p>		[2]
			[Total: 10]
2 (a) (i)	<p>any 2 of:</p> <p>further north the lower the temperatures ;</p> <p>enzymes work more slowly / metabolic activity is slower / grow more slowly ;</p> <p>less food available (in colder water) ;</p>	A respiration	[2]
(ii)	<p>any 2 of:</p> <p>ref. to changes in physiology to enable osmoregulation in sea water ;</p> <p>any detail of change ;</p> <p>ref. to changes in behaviour ;</p>	<p><i>Idea of a change that enables smoults to live in estuaries / varying salinity/seawater</i></p> <p>e.g. secreting chloride from gills/stop absorbing chloride</p> <p>e.g. start to swim with current/moves to estuaries / from freshwater to sea / migrates to sea</p>	[2]
(b)	keeps the <u>growth</u> / Chinook <u>gene</u> active (all year round) / AW ;		[1]

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Question	Expected answers	Additional guidance	Marks
(c) (i)	$(3800 - 1300) \div 600$ or $\frac{2500}{600}$ = 4.17 ;;		[2]
(ii)	<i>any 2 of:</i> salmon grows bigger / more salmon per year + more to sell / always available to sell ; shorter production time / faster growth + more profit / get to market sooner ; less feed (per kg of fish) + therefore cheaper to produce ;		[2]
(d) (i)	<i>any 3 of:</i> GM salmon kept in cages / ponds / tanks ; (commercially grown fish) are all female ; (females are) sterile / cannot reproduce ; poorly adapted to 'wild environment' ;	A kept in land-based facilities	[3]
(ii)	<i>any 3 of:</i> unknown <u>long term</u> effects (of GM food) on people ; <u>customers</u> unwilling to buy GM food ; plentiful supply of non-GM salmon available ; glut of salmon lowers prices so less profit for supermarket ;		[3]
			[Total: 15]

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Question	Expected answers	Additional guidance	Marks
3 (a) (i)	dinoflagellates / diatoms / cyanobacteria ;		[1]
(ii)	water + (sun)light ; glucose + oxygen ;		[2]
(b) (i)	stronger current / wind / storms (causes more mixing in November) / ORA ;		[1]
(ii)	<i>any 2 of:</i> <u>increased</u> temperature ; <u>increased</u> light (intensity / duration) ; <u>increased</u> nutrients / carbon dioxide supply ; <u>greater</u> light penetration / water less turbid / clearer ;	ORA for any mark point	[2]
(c) (i)	numbers decreased in March ; numbers increased in June ;		[2]
(ii)	<i>any 3 of:</i> numbers decreased (in March) because the depth of mixing was below the critical depth ; numbers increased (in June) because the depth of mixing was above the critical depth ; (in June) rate of photosynthesis is greater than the rate of respiration ; (in June) enough energy / nutrients for more cells / reproduction ;	A <u>population</u> growth	[3]
			[Total: 11]

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Question	Expected answers	Additional guidance	Marks
4 (a) (i)	catching non-target species ;		[1]
(ii)	rod and line catches one fish at a time ;	A purse seine is non-selective	[1]
(iii)	<i>any 1 of:</i> put bird scarers around hooks ; use different hooks ; avoid FADs ; fish at a greater depth (to avoid seabirds diving for bait) ;		[1]
(b)	The <u>sea bed/sea bed habitat(s)</u> will not be damaged or disturbed ; less damage to static benthic organisms / example of ; no/less sediment/silt will be released into the water ;	ORA for any mark point Max 1 for working or correct value if no negative sign or ref. to decrease	[3]
(c)	<i>any 2 of:</i> restriction by season ; restriction of location / creating refuge zones ; restrictions on the size / mass / numbers of fish retained ; restricting the number of boats / fishing gear ;		[2]

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Question	Expected answers	Additional guidance	Marks
(d) (i)	<i>any 1 of:</i> fish meal ; fish oil ; (pelleted) fish / pet food ; health products ; fertiliser ; fish stock ;		[1]

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Question	Expected answers	Additional guidance	Marks
(ii)	<p><i>advantages:</i> <i>max 3 of:</i> more job opportunities ; brings in more people to the town ; better transport links / better roads / better infrastructure ; more money in the community / improved economy / better standard of living ;</p> <p><i>disadvantages:</i> odour from factory ; increase in traffic / trucks ; increase in noise (from transport or factory) ;</p>		[4]
			[Total: 13]

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Question	Expected answers	Additional guidance	Marks
5 (a) (i)	decrease in Thailand + increase in Indonesia ; processing of data ;	Thailand decrease by 0.27 / 0.28 million tonnes (per year) + Indonesia increases by 0.23 million tonnes (per year)	[2]
(ii)	$\frac{0.485 - 0.27}{0.485} \times 100$ or $\frac{0.215}{0.485} \times 100$ = - 44 (.33) ; ;	<i>correct answer with no working gets 2 marks</i> <i>max 1 for working or correct value if no negative sign or ref. to decrease</i>	[2]
(b) (i)	<i>any 1 of:</i> EMS reduced production / is present in Thailand ; EMS has not reached Indonesia ;		[1]
(ii)	<i>any 2 of:</i> buy juvenile shrimp from farms which are, EMS free / disease free / in Indonesia / in South America ; buy older juvenile shrimp / more than 30 days old ; reduce stocking density ;		[2]

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Question	Expected answers	Additional guidance	Marks
(iii)	<p>(healthy) shrimp eat the ones that have died / infected with the virus / have EMS ;</p> <p>virus / EMS passes into (the gut of) the shrimp that have eaten the diseased shrimp ;</p> <p>(so) more shrimp are now infected OR virus / EMS has spread further in the population ;</p>		[3]
(iv)	<p><i>any 2 of:</i></p> <p>easier to see and remove any dead / diseased juveniles ;</p> <p>after 30 days the remaining shrimp should be EMS free ;</p> <p>easier to clean / sterilise than the main aquaculture pond ;</p>		[2]
			[Total: 12]

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Question	Expected answers	Additional guidance	Marks
6 (a)	<p><i>any 2 of:</i> prevents wastes <u>reaching the coast</u> ;</p> <p>deeper water so wastes are more diluted / spread out more / dispersed more ;</p> <p>not likely to be in contact with people in the water ;</p>		[2]
(b)	<p><i>any 2 of:</i> <u>no checks</u> on the quantity / quality of waste released ;</p> <p>large volume of waste water produced per day by one ship ;</p> <p>increasing numbers using cruise ships increases waste water ;</p> <p>oceans may not be able to cope with the continual rise in untreated waste water ;</p>		[2]
(c)	<p><i>any 1 of:</i> build more shore side treatment facilities / enforce use of shore side facilities ;</p> <p>prevent the disposal of any untreated black or grey water ;</p> <p><u>grey water</u> treated and recycled ;</p> <p>larger holding tanks ;</p>	A enforced inspection / monitoring on ships	[1]
(d) (i)	<p>sea water taken up by ship contains the marine organisms from that area ;</p> <p>(these survive in the bilge water) and are let out in another part of the world ;</p>		[2]

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Question	Expected answers	Additional guidance	Marks
(ii)	<p><i>any 1 of:</i> treat the ballast water to kill the organisms in it ; discharge ballast water into a shore side treatment plant ; filter the ballast water ; keeping the same ballast water / recycle ballast water ;</p>		[1]
			[Total: 8]
7 (a) (i)	<p>ref. to management (strategies of human activities) ; to, protect / preserve, habitats / species / ecosystem ;</p>		[2]
(ii)	<p><i>any 1 of:</i> source of food (for humans) ; preserve, rare / endangered, species / stocks (of fish); (phytoplankton / algae) produce (at least) half the oxygen in the atmosphere ; resource for medicinal / pharmaceutical use ;</p>		[1]
(b)	<p>idea of, interdependence of organisms in an ecosystem / habitat ; idea of, loss of one species / conserving of too many of one species, causes imbalance (in food chains and food webs) ; idea that, biological processes in ecosystems recycle materials for re-use by successive generations ;</p>		[3]
			[Total: 6]

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