

**MARK SCHEME for the October/November 2014 series**

**9693 MARINE SCIENCE**

**9693/03**

Paper 3 (Structured Questions), maximum raw mark 75

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.

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Question	Expected answers	Additional guidance	Mark
1 (a) (i)	photosynthesis ;		[1]
(ii)	respiration ;		[1]
(iii)	gases have different solubilities in water ;		[1]
(b) (i)	TWO of: decreases as temperature increases ; falls most rapidly from 0° – 20°C ; ref. to figs, e.g. 3.4 at 20°C to 0.5 at 0°C ;		[2]
(ii)	curve approximately same shape and to left / below curve in Fig.1.1 ;		[1]
(c) (i)	layer of water where the temperature changes (more) rapidly with depth ; separates the upper (mixed) layer from deep water ;	<b>A</b> idea of a blanket between the upper and lower layers	[2]
(ii)	TWO of: (above thermocline) carbon dioxide increases with depth ; (because) temperature decreases with depth ; below thermocline very little carbon dioxide as unable to cross the barrier ;		[2]
(d)	TWO of: idea of bigger population in the North Atlantic / ora ; thermocline deeper level in colder water ; more carbon dioxide in colder water / ora ; (to) support photosynthesis ;	<b>A</b> more primary producers   higher productivity  <b>A</b> North Atlantic	[2]
			<b>[Total: 12]</b>

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<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Mark</b>
<b>2 (a)</b>	<p>sea has a higher concentration / solute content / lower water potential than the body fluids of the fish / ora ;</p> <p>water leaves by osmosis ;</p> <p>down water potential gradient ;</p>	<p><b>A</b> description of a gradient</p> <p><b>A</b> concentration gradient</p>	<b>[3]</b>
<b>(b)</b>	<p><b>B</b> mussel ; osmoconformer / body fluids change with the salinity ;</p> <p><b>C</b> marine fish ; osmoregulator / body fluids do not change with salinity ;</p>		<b>[4]</b>
<b>(c) (i)</b>	surface water shark ;		<b>[1]</b>
<b>(ii)</b>	surface water bony fish ;		<b>[1]</b>
<b>(iii)</b>	<p>the total concentration of surface water shark body fluids is close to that of sea water</p> <p><b>OR</b></p> <p>the total concentration of surface water bony fish body fluids has greatest difference to that of sea water ;</p> <p>ref. to figures for shark (e.g. seawater 1020, shark 894) ;</p> <p>ref. to figures for bony fish (e.g. surface 392, middle 562) ;</p>		<b>[3]</b>
<b>(iv)</b>	increase the concentration of the blood to reduce water loss ;		<b>[1]</b>
			<b>[Total: 13]</b>

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<b>Question</b>	<b>Expected answers</b>	<b>Additional guidance</b>	<b>Mark</b>
<b>3 (a) (i)</b>	open sea / offshore because this is where the eggs are laid ;		<b>[1]</b>
<b>(ii)</b>	external fertilisation ; large loss of gametes / named gametes ;	<b>A</b> sperm and eggs released to the environment <b>A</b> few eggs fertilised <b>A</b> increases chance of fertilisation	<b>[2]</b>
<b>(iii)</b>	TWO of: idea of: water currents carry them to other habitats ; idea of: water current brings food supply ; idea of better oxygen supply ;	<b>A</b> feed on plankton in surface water <b>A</b> warmer water	<b>[2]</b>
<b>(iv)</b>	TWO of: plentiful food supply ; (from) sediment brought in by tides / river ; high biodiversity so variety of food sources ; sheltered from strong wave action / currents ;	<b>A</b> feed on sediment <b>A</b> sediment is trapped by roots of mangroves <b>I</b> named organisms	<b>[2]</b>
<b>(b) (i)</b>	TWO of: loss of local fishing livelihood ; loss of food source / e.g. fish, birds ; loss of fuel / wood source ; loss of farmland ;	<b>I</b> ref. to shrimps	<b>[2]</b>
<b>(ii)</b>	loss of coastal protection from tropical storms destroys habitats / AW ; erosion removes fertile sediments ; mangrove shelter for juvenile fish lost (reducing fish population) ;	<b>I</b> destruction of the ecosystem <b>A</b> removal of detritus / leaves that are decomposed <b>A</b> general ref. to loss of shelter / habitats for juvenile organisms	<b>[2]</b>
<b>[Total: 11]</b>			

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Question	Expected answers	Additional guidance	Mark
4 (a) (i)	idea of: a required <u>reporting / checking</u> of fishing activities ;	<b>A</b> in the context of individuals / vessels, fisheries <b>I</b> quotas, net mesh, fishing zones unqualified	[1]
(ii)	TWO of:  idea of catch reporting (catch size / species caught) ;  ships logs / ship observer records ;  fishing effort / description (e.g. number of vessels / time spent/ gear used) ;  by-catch ;  fishing areas / exclusion zones ;		[2]
(iii)	<i>must be qualified by the purpose of the surveillance system used</i>  TWO of:  patrol vessels around coastal regions to <u>check licences / catches</u> ;  stop and search vessels / patrol vessels for <u>suspected illegal fishing</u> ;  low flying aircraft / helicopters <u>to identify ships / position of ships</u> ;  GPS satellites to check fishing boats are not in closed areas ;  radar (land or ship) to <u>detect presence of boats</u> (in territorial waters) ;	<b>A</b> coast guard for patrol vessels	[2]
(iv)	ONE of:  idea of national marks / identifiers / numbers that can be seen clearly ;  idea of a registered electronic signal / GPS signal / vessel monitoring system (VMS) ;		[1]

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<p><b>(b) (i)</b></p>	<p><i>must be qualified by the likely effect of the enforcement method</i></p> <p>THREE of:</p> <p>on-board observers check that all gear / nets / catch size / fishing efforts are legal ;</p> <p>finer discourage overfishing / catches above quota ;</p> <p>confiscation of boats prevents fishing / to put illegal fishermen out of business) ;</p> <p>confiscation of illegal gear to limit the catch / fishing effort ;</p> <p>imprisonment gives criminal record so employment unlikely / unable to fish ;</p> <p>surveillance vessels / planes can track easily / quickly (more likely to be caught) ;</p> <p>armed vessels able to catch at sea and prevent evidence being hidden ;</p>	<p><b>A</b> fines for breaking the law</p>	<p><b>[3]</b></p>
<p><b>(ii)</b></p>	<p>THREE of:</p> <p>very expensive to maintain patrol vessels / aircraft ;</p> <p>idea of: ocean is very large and a small number of patrol vessels may miss many boats ;</p> <p>not all boats carry GPS so may not be found by satellite ;</p> <p>patrol vessels can be seen far enough away for illegal catch to be dumped ;</p> <p>not all countries enforce regulations strictly ;</p> <p>idea of corruption / illegal permits / false registrations of vessels / false declarations ;</p>	<p><b>A</b> idea that some fishermen break the law and fish illegally and hope not to get caught</p>	<p><b>[3]</b></p>
			<p><b>[Total: 12]</b></p>

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Question	Expected answers	Additional guidance	Mark
5 (a)	the farming / rearing of aquatic organisms (for food) / named examples ;		[1]
(b)	THREE of:  ref to: growth-promoting gene from another species / Chinook salmon ;  ref to: promoter (to keep this gene active) from another species / pouter fish ;  ref to: (both) genes inserted / added to the genes of (Atlantic) salmon ;  ref to: (genes) keep fish feeding all year round (so grow more) ;	<b>A</b> to keep growing all the year / in colder water	[3]
(c) (i)	idea of a control / comparison for the other (types of) salmon ;		[1]
(ii)	$(430\text{g} - 170\text{g}) = 260\text{g}$ ;	<b>R</b> if units not included	[1]
(iii)	$310(\text{g}) - 80(\text{g}) = 230(\text{g})$ ;  $\frac{230}{80} = 2.9$ ;	<b>A</b> 3 / 2.87 / 2.88	[2]
(iv)	GM salmon / group B salmon reduces the growth ;  non- GM salmon / group D salmon increases the growth ;		[2]
(d)	TWO of:  bigger size / reach market size sooner so more profit ;  less concern about effects on food chain as not GM ;  sterile so if escape unable to breed with wild population ;		[2]
			<b>[Total: 12]</b>

Question	Expected answers	Additional guidance	Mark
6 (a) (i)	gold production ;		[1]
(ii)	TWO of: in rain / precipitation from atmosphere ; run off (from land) ; in rivers ; dredging ;	I from sewage	[2]
(b) (i)	ONE of: swallowed in water ; absorbed through gills of fish ; absorbed / taken up by plankton ;		[1]
(ii)	FOUR of: mercury cannot be broken down by body ; it is deposited in tissues in the body and stays there / stored in body ; ref. bioaccumulation ; animal higher in the food chain eats a lot of the food source ; (therefore) takes in higher concentration (of mercury) ; repeated at each trophic level so concentration increases ; ref. biomagnification ;	A non-biodegradable	[4]
(iii)	ONE of: may have to reduce fish intake due to high levels of mercury ; fish meal / waste used for animal feed so could build up in other foods ;	I ref. to effect on humans of eating fish with high mercury concentrations I ref. to contamination of fish / food	[1]
			<b>[Total: 11]</b>



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Question	Expected answers	Additional guidance	Mark
<p>Answers for <b>all</b> of question 7(a) should be in the context of the information in the question. General statements about loss of employment, loss of income should not be given unless they are qualified by reference to the two proposals in the question.</p>			
7 (a) (i)	<p><i>Fishing boat owners:</i> ONE of:</p> <p>would retain some use for boats ;</p> <p>reduce loss of money if boats have to be scrapped / sold cheaply ;</p> <p>some employment for fishermen ;</p> <p><i>Support business owners:</i> ONE of:</p> <p>their businesses would still have the same market ;</p> <p>more boats / leisure craft might increase business ;</p>		[2]
(ii)	<p><i>Fishing boat owners:</i> ONE of:</p> <p>would retain traditional use for boats / no need to convert fishing boats ;</p> <p>long term employment in fishing / traditional way of life ;</p> <p>some employment for fishermen ;</p> <p><i>Support business owners:</i> ONE of:</p> <p>aquaculture platform may require some equipment that they could supply ;</p> <p>fishing vessels still in use would need repair ;</p> <p>deep harbour suitable for transport ships which might increase business ;</p>		[2]

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<b>(b)</b>	<p><i>Ignore all references to costs and the reasons why proposal 2 might succeed.</i></p> <p>TWO of:</p> <p>depends on attracting tourists who be very few in numbers / slow to visit / seasonal ;</p> <p>local attractions may not be appealing enough;</p> <p>leisure craft owners may already have moorings ;</p> <p>waters around the area may not be suitable for leisure craft ;</p> <p>idea of: no existing safety measures for leisure craft / no suitable leisure craft in the area ;</p>	<b>[2]</b>
<b>[Total: 6]</b>		