

## **MARK SCHEME for the May/June 2014 series**

### **9693 MARINE SCIENCE**

**9693/03**

Paper 3 (A2 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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Page 2	Mark Scheme	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2014	9693	03

Question	Expected answers	Additional guidance	Marks
1 (a) (i)	open ocean/ sea (surface) ;	A pelagic	1
(ii)	1 of: dinoflagellates ; cyanobacteria ; floating large algae ;		1
(b)	2 of:  ref. to phytoplankton being the basis of food chains in the oceans ;  idea that low phytoplankton productivity results in less energy/food available to food web/ora ;  idea that fish population is a human food source and is affected by productivity ;	A in terms of increased or reduced fish population	2
(c) (i)	temperature increase leads to a decrease in phytoplankton population ;	A it is an inverse relationship	1
(ii)	(thermocline is) layer (of water) in the ocean (separates surface and deep water) ;  (in which) temperature decreases (rapidly) with depth ;  warm water is on the surface / cold water below thermocline ;		2
(iii)	3 of:  idea that thermocline creates a barrier between surface and deeper water ;  idea of more nutrients mixing from deeper water ;  idea that availability of minerals / nutrients at surface limits growth ;  ref. to named mineral, e.g. magnesium needed for chlorophyll formation ;	I reference to temperature and oxygen	3
<b>Total</b>			<b>10</b>

<b>Page 3</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>GCE AS/A LEVEL – May/June 2014</b>	<b>9693</b>	<b>03</b>

<b>2 (a) (i)</b>	<p>2 of:</p> <p>photosynthesis (of algae/seaweeds/phytoplankton);</p> <p>wave action /owtte ;</p> <p>diffusion from the air ;</p>	<b>A dissolution</b>	<b>2</b>
<b>(ii)</b>	<p>2 of:</p> <p>benthic community ;</p> <p>migratory plankton /fish that move up and down in the water ;</p> <p>migratory fish that move from cold to warm water ;</p> <p>(organisms that live) around hydrothermal vents ;</p> <p>(organisms that live) in deep mud on muddy shores ;</p>		<b>2</b>
<b>(b)</b>	<p><i>slow movement:</i></p> <p>less muscle movement/less muscle contraction ;</p> <p>uses/needs/requires less energy ;</p> <p>less respiration needed ;</p> <p><i>large gill surface area:</i></p> <p>(greater area over) which oxygen can diffuse ;</p> <p>allows more oxygen to be obtained (from the surroundings) ;</p> <p><i>increased ventilation mechanism:</i></p> <p>increases flow rate /water movement across gill (surfaces) ;</p> <p>maintains a diffusion /concentration gradient ;</p> <p>increases rate /amount of oxygen that enters blood ;</p>		<b>6</b>

<b>Page 4</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>GCE AS/A LEVEL – May/June 2014</b>	<b>9693</b>	<b>03</b>

<b>(c)</b>	<p>3 of :</p> <p>swim in relatively straight line ;</p> <p>high speed / constant swimming with mouth open ;</p> <p>forces / pushes / constant movement of water over gills ;</p> <p>passive / no muscle movements of mouth or operculum needed ;</p>		<b>3</b>
<b>Total</b>			<b>13</b>
<b>3 (a)</b>	<p>1 of:</p> <p>need a means of transferring sperm ;</p> <p>have to find / attract a mate ;</p> <p>idea that mating may need complex behaviour / competition with others ;</p>		<b>1</b>
<b>(b) (i)</b>	idea that the young are very large at birth so takes a long time to grow ;		<b>1</b>
<b>(ii)</b>	the larger the size of the pod the smaller the mass of the offspring ;		<b>1</b>
<b>(c)</b>	<p>1 of:</p> <p>idea of using a lot of energy / resources from female (to produce milk) ;</p> <p>idea that whale has to be close to young for a long period of time / stated time ;</p>		<b>1</b>
<b>(d)</b>	<p>2 of:</p> <p>idea of other whales providing (physical) protection for the young (from predators) ;</p> <p>idea that some whales act as 'lookouts' for predators / hazards ;</p> <p>groups more successful at finding / supplying food ;</p> <p>idea that young learn social / survival skills ;</p>		<b>2</b>

<b>Page 5</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>GCE AS/A LEVEL – May/June 2014</b>	<b>9693</b>	<b>03</b>

<b>(e)</b>	1 of:  idea of pollution from toxic/oil wastes in sea ;  idea of loss of food sources due to pollution / overexploitation ;  idea of habitat loss from oil exploration / global warming ;  idea of noise pollution causing disorientation / disruption of migration ;	<b>A</b> overfishing	<b>1</b>
<b>Total</b>			<b>7</b>
<b>4 (a) (i)</b>	the number of fish (surviving) to enter a fishery / fish stocks ;	<b>R</b> idea of rate or addition of fish	<b>1</b>
<b>(ii)</b>	2 of:  mortality / number of deaths of (adult) fish (in the population) ;  breeding success / fecundity (of the population) ;  environmental factors affecting the pre-recruitment stage ;  examples of environmental factors, e.g. food supply / temperature / disease / parasites ;	<b>A</b> age of reaching maturity	<b>2</b>
<b>(b) (i)</b>	2 of:  as the number of mature fish increases, the number of 3-year old fish increases until max. ;  (above max.) as the number of mature fish increases number of 3-year old fish decreases ;  idea that the increase is steeper than decrease (in number of 3-year old fish) ;		<b>2</b>

<b>Page 6</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>GCE AS/A LEVEL – May/June 2014</b>	<b>9693</b>	<b>03</b>

<b>(ii)</b>	<p>3 of:</p> <p>idea of breeding of mature fish produces fish that are in the population 3 years later ;</p> <p>the greater the number of mature fish the greater the number of eggs/ offspring ;</p> <p>idea of competition between mature fish and young fish ;</p> <p>large numbers of mature fish use more resources ;</p> <p>(so) less available for young fish ;</p> <p><i>allow reverse arguments for increase in recruits</i></p>		<b>3</b>
<b>(c)</b>	<p>3 of:</p> <p>appears to have had some success ;</p> <p>the (total) catch has decreased (from 1980–2002);</p> <p>the quota / catch for most of individual countries has decreased ;</p> <p>Sweden only one to increase/ have larger quota ;</p> <p>idea that still likely to be overfished as total still higher than in 1970s ;</p> <p>use of manipulated figures ;</p>	<p>I figures before 1980</p> <p>A percentage calculations</p>	<b>3</b>
<b>Total</b>			<b>11</b>
<b>5 (a) (i)</b>	<p><math>78 - 31 = (47) ;</math></p> <p><math>\frac{47}{31} \times 100 = 152 (\%) ;</math></p>	<p>A 151.6</p> <p>A ecf for incorrect figures used correctly</p>	<b>2</b>
<b>(ii)</b>	<p><math>\frac{78}{3} = 26 ;</math></p> <p><math>26 \times 2 = 52 ;</math></p> <p>million tonnes ;</p>	<p>A ecf for calculations</p>	<b>3</b>

Page 7	Mark Scheme	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2014	9693	03

<b>(b)</b>	<p><i>availability of stock:</i></p> <p>breeding stock and rear eggs in hatchery / method 2 ;</p> <p>idea that does not reduce wild fish stocks ;</p> <p><i>supply of clean water:</i></p> <p>offshore sea cages / method 1 ;</p> <p>idea that tide / currents will constantly replace water ;</p> <p><i>availability of food:</i></p> <p>pellets from fish waste from human food production / method 2 ;</p> <p>idea that does not reduce fish stocks even further ;</p>		6
<b>(c)</b>	<p>2 of:</p> <p>idea of demand for the fish ;</p> <p>idea of export market / cash crop ;</p> <p>idea of return on investment ;</p> <p>availability / cost of labour ;</p>		2
<b>Total</b>			<b>13</b>
<b>6 (a) (i)</b>	<p>3 of:</p> <p>human wastes contain bacteria and viruses / pathogens ;</p> <p>fish / shellfish eat human waste ;</p> <p>become contaminated by pathogens ;</p> <p>if eaten can cause disease / food poisoning ;</p> <p>ref. to example, <i>E coli</i>, <i>Salmonella</i> sp ;</p>	<p><b>A</b> filter feeders</p> <p><b>I</b> bioaccumulation</p>	3

<b>Page 8</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>GCE AS/A LEVEL – May/June 2014</b>	<b>9693</b>	<b>03</b>

<b>(ii)</b>	<p>3 of:</p> <p>blocks light (from water below surface) ;</p> <p>kills algae/ prevents photosynthesis, reducing oxygen ;</p> <p>kills coral ;</p> <p>some produce toxins that kill fish/humans ;</p> <p>decreases biodiversity/reduces numbers of fish ;</p> <p>blooms die back and are decomposed (by bacteria) reducing oxygen ;</p>	<b>A</b> in context of disruption to food chains	<b>3</b>
<b>(b) (i)</b>	<p>2 × 2 of:</p> <p>refuse/example (plastic bags/corks/fishing line) may get stuck in throat ;</p> <p>causes death by choking/unable to breathe ;</p> <p>(turtles) eat plastic bags/cigarette butts which expand in the stomach ;</p> <p>causes death by starvation as unable eat anything else ;</p> <p>refuse may contain sharp edges/example (tins/blades/knives/hooks) ;</p> <p>cuts cause death from internal bleeding ;</p> <p>refuse may contain poisons/harmful chemicals/ examples (disinfectant, pesticide, paint) ;</p> <p>causes death by poisoning/sterility ;</p> <p>waste food may contain bacteria ;</p> <p>cause death by disease ;</p>	<b>A</b> poisoning in context of bioaccumulation	<b>4</b>



Page 9	Mark Scheme	Syllabus	Paper
	GCE AS/A LEVEL – May/June 2014	9693	03

	<b>(ii)</b>	1 of:		1
		<i>hazard:</i> fishing line / fishing nets / rope / hooks ;  1 × 2 of explanation:  idea of lines / net ropes wrapping around body / neck of mammals and diving equipment / air lines ;  ref. to (trapping underwater) causing suffocation / drowning ;  OR  idea of hooks getting caught in mouth of marine mammals ;  death by starvation as unable to eat ;		2
			<b>Total</b>	<b>13</b>
<b>7</b>	<b>(a) (i)</b>	tourism based on an appreciation of the natural environment ;	<b>A</b> in context of raising awareness / education of the natural world	1
	<b>(b) (i)</b>	3 of:  log style cabins using local woods / number 1 uses local resources ;  idea that camp site and cabins / number 2 low impact on the environment ;  idea that solar cells / number 4 use renewable source / reduces carbon emissions / aw ;  idea that (solar cells) do not need generators / quiet so do not disturb animals ;  idea that using rain water and river water for washing without treatment / number 5 use local resources / limits use of chemicals for treatment ;  parking away from development / using horses / number 7 reduces pollution from car exhausts ;	<b>A</b> is a renewable / recycled resource  <b>A</b> less roads needed on the development <b>A</b> less noise pollution to disturb animals	3

<b>Page 10</b>	<b>Mark Scheme</b>	<b>Syllabus</b>	<b>Paper</b>
	<b>GCE AS/A LEVEL – May/June 2014</b>	<b>9693</b>	<b>03</b>

<b>(ii)</b>	<p>2 of:</p> <p>self-catering / number 1 might cause pollution from litter left from food packing / left overs ;</p> <p>use of camping equipment for cooking / number 2 could cause fires / damage soil or plants ;</p> <p>use of river water / number 5 may reduce water supply in river / water table / to village ;</p> <p>water treatment / number 6 uses chemicals which could cause pollution in the sea / disposal of waste water in sea could pollute the bay / kill coral ;</p>	<b>A</b> examples, etc. detergent causes eutrophication	<b>2</b>
<b>(c)</b>	<p>2 of:</p> <p>employment at site / in village ;</p> <p>improvement of local economy from tourist spending ;</p> <p>improvements in infrastructure (for travel), e.g. roads / walkways / shops ;</p> <p>idea of sharing culture with visitors ;</p>		<b>2</b>
<b>Total</b>			<b>8</b>