

MARK SCHEME for the May/June 2014 series

9693 MARINE SCIENCE

9693/03

Paper 3 (A2 Structured Questions), maximum raw mark 75

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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
Total			10

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2 (a) (i)	<p>2 of:</p> <p>photosynthesis (of algae/seaweeds/phytoplankton);</p> <p>wave action /owtte ;</p> <p>diffusion from the air ;</p>	A dissolution	2
(ii)	<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>		2
(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>		6

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(c)	<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>		3
Total			13
3 (a)	<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>		1
(b) (i)	idea that the young are very large at birth so takes a long time to grow ;		1
(ii)	the larger the size of the pod the smaller the mass of the offspring ;		1
(c)	<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>		1
(d)	<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>		2

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(e)	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 ;	A overfishing	1
Total			7
4 (a) (i)	the number of fish (surviving) to enter a fishery / fish stocks ;	R idea of rate or addition of fish	1
(ii)	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 ;	A age of reaching maturity	2
(b) (i)	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) ;		2

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(ii)	<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>		3
(c)	<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>	3
Total			11
5 (a) (i)	<p>$78 - 31 = (47) ;$</p> <p>$\frac{47}{31} \times 100 = 152 (\%) ;$</p>	<p>A 151.6</p> <p>A ecf for incorrect figures used correctly</p>	2
(ii)	<p>$\frac{78}{3} = 26 ;$</p> <p>$26 \times 2 = 52 ;$</p> <p>million tonnes ;</p>	<p>A ecf for calculations</p>	3

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(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
(c)	<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
Total			13
6 (a) (i)	<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>A filter feeders</p> <p>I bioaccumulation</p>	3

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(ii)	<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>	A in context of disruption to food chains	3
(b) (i)	<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>	A poisoning in context of bioaccumulation	4

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	(ii)	1 of:	A hooks tearing airlines	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
			Total	13
7	(a) (i)	tourism based on an appreciation of the natural environment ;	A in context of raising awareness / education of the natural world	1
	(b) (i)	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 ;	A is a renewable / recycled resource A less roads needed on the development A less noise pollution to disturb animals	3

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(ii)	<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>	A examples, etc. detergent causes eutrophication	2
(c)	<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>		2
Total			8