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MARINE SCIENCE **9693/03**

Paper 3 Structured Questions **October/November 2017**

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.

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This mark scheme will use the following abbreviations:

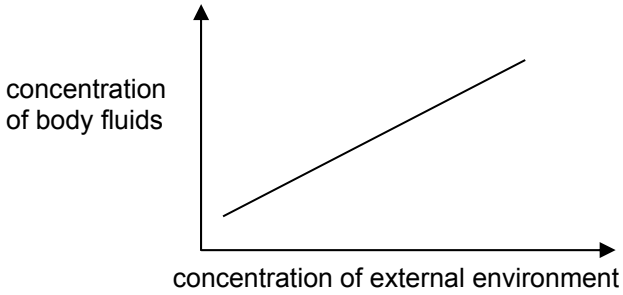
;	separates marking points
/	separates alternatives within a marking point
()	contents of brackets are not required but should be implied / the contents set the context of the answer
R	reject
A	accept (answers that are correctly cued by the question or guidance you have received)
I	ignore (mark as if 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
underline	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)

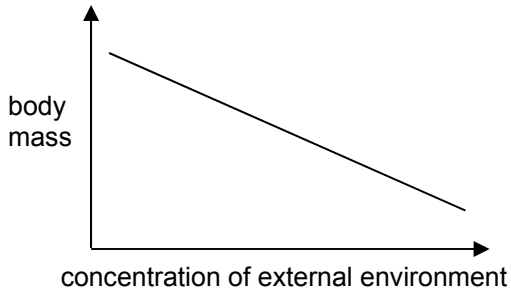
Question	Answer	Marks	Guidance
1(a)(i)	intertidal regions / rocky shore ;	**1**	
1(a)(ii)	idea of, fixing carbon / producing biomass ; idea of, putting energy into ecosystems ;	**2**	
1(a)(iii)	*any **3** of:* photosynthesis will be reduced / no photosynthesis ; light penetration decreases with depth ; (so) light too low to provide enough energy ; idea that, not all wavelengths penetrate to the same depth / red light only penetrates shallow water / only blue light reaches deep water ; wavelength of light not suitable to be captured by, chlorophyll / pigments **OR** special pigments needed to absorb shorter wavelengths ; temperature too cold for enzymes to work ;	**3**	
1(b)(i)	*any **2** of:* urine / excretory material passed out into water ; undigested food / faeces / uneaten food in water ; is broken down / decomposed in the water by bacteria ;	**2**	
1(b)(ii)	to make protein / amino acids ;	**1**	**A** to make chlorophyll / DNA / enzymes / ATP
1(b)(iii)	kelp carries out photosynthesis ; using up carbon dioxide (so concentration decreases) **+** giving out oxygen (so concentration increases) ;	**2**	

Question	Answer	Marks	Guidance
1(c)	*any **2** of:* provides a, habitat / ecological niche, for marine animals / named example ; provides a food source for marine animals ; provides shelter from predators ; provides protection from strong currents / wave action ; provides a nursery area / surface on which to lay eggs ;	**2**	 **I** nutrients

Question	Answer	Marks	Guidance
2(a)(i)	internal fertilisation ; young, develop / provided with food source, inside mothers body **OR** give birth to live young ;	**2**	
2(a)(ii)	*any **3** of:* before birth whale shark fed by yolk **+** before birth minke whale fed by mother / placenta ; whale shark gives birth throughout the year **+** minke whale has breeding season; whale shark several young born at same time **+** minke whale only 1 at a time ; whale shark has a greater number of offspring than minke whale ; whale shark young feed themselves **+** minke whale fed on mothers milk ; whale shark no parental care **+** minke whale stay with mother up to a year ;	**3**	 **A** whale shark breeds every year **and** minke whale every two years

Question	Answer	Marks	Guidance
2(b)	*any **2** of:* whale shark, very much smaller / 5 to 7 times smaller, at birth than minke whale ; young whale shark feed on phytoplankton, young minke whales feed on milk ; milk is nutrient rich, so faster initial growth in minke whales ; (but) adults very similar size ; take much longer for whale shark to grow to adult size ;	**2**	**A** 5 times longer for whale shark to reach adult size.

Question	Answer	Marks	Guidance
3(a)(i)	organism (has a body fluid concentration) stays the same as that of the external medium (in which it lives) ;	**1**	
3(a)(ii)		**1**	

Question	Answer	Marks	Guidance
3(a)(iii)		**1**	
3(a)(iv)	ref. to osmosis ; when the external concentration is lower than the body tissues then the mussel gains water / **ORA** ; gain of water causes increase in mass / **ORA** ;	**3**	
3(b)(i)	*any **3** of:* concentration of skate blood is almost the same as sea water ; ref. to figures ; ref. to high concentration of urea (making concentration higher) ; lose very little water (by osmosis) / no need to replace water lost (by osmosis) ;	**3**	e.g. sea water 1050 au **+** skate 1035 au
3(b)(ii)	sea water has a higher concentration of chloride ions ; chloride enters (by diffusion, so excess has to be excreted) ;	**2**	**A** figures as alternative wording
3(b)(iii)	concentration of eel blood is higher than fresh water ; idea that, (excess) water gained (by osmosis) has to be excreted (in urine) ;	**2**	**A** figures as alternative wording

Question	Answer	Marks	Guidance
4(a)	idea of, allows controlled fishing whilst maintaining stock numbers ;	**1**	
4(b)	*any **2** of:* recruitment / growth / natural mortality / fishing mortality / age of reproductive maturity / fecundity / dependency on particular habitats ; ;	**2**	
4(c)	*any **2** of:* stocks would not be sustainable ; (because) large number of juveniles suggests, reduced number of / too few, adults in the population ; large numbers of juveniles would be caught ; so fewer juveniles survive to mature into breeding adults ; so fewer adults to spawn in future years ;	**2**	
4(d)	*any **2** of:* enough / sustainable stocks of adult fish present now ; sea temperature rise indicates an El Niño ; this will drive the fish away from fishing areas / to colder waters ; fewer / no fish to catch by the start of the fishing season ;	**2**	
4(e)(i)	both have high / similar protein **+** omega-3 levels ;	**1**	**I** ref. to sustainability
4(e)(ii)	(protein) required for growth ;	**1**	

Question	Answer	Marks	Guidance
4(e)(iii)	insects as they can be fed on, manure / fish trimmings / fish waste, which is available in most countries ; insects as they do not require any, commercial / expensive equipment / buildings, for production / **ORA** ; not soya as it requires a suitable climate to grow which is not available in many countries ; not soya as agricultural land is needed to produce food for humans ;	**1**	**A** recycled

Question	Answer	Marks	Guidance
5(a)(i)	wind blows the warmer surface waters away ; replaced by colder nutrient rich water from beneath ;	**2**	
5(a)(ii)	nutrients brought by upwelling increase growth of phytoplankton ; phytoplankton are basis of food webs / attract herbivores ; provide food source for large number of fish ;	**3**	**A** named nutrient
5(b)(i)	algae die when nutrients run out ; dead algae sink to the bottom of the sea ; bacteria use up the oxygen to decompose the algae ;	**3**	
5(b)(ii)	(most) benthic animals die due to, lack of oxygen / no oxygen, for respiration ; idea of, food chains / webs disrupted so other, organisms / fish, die ;	**2**	

Question	Answer	Marks	Guidance
5(c)	*any **1** of:* pesticide or named pesticide / silt / manure ; *correct effect for stated pollutant :* *any **1** of:* (pesticide) contain toxins that kill most marine organisms **or** accumulate in food chains ; (silt) reduces light penetration through water so algae in deeper water die ; **OR** settles on coral killing the polyps ; (manure) brings organic material that decomposes using oxygen ;	**1** **1**	1 mark for pollutant 1 mark for effect. effect must match the pollutant.

Question	Answer		Marks	Guidance
6(a)	**environment**	**stage in life cycle**	**3**	
	nest in stream bed	egg / alevin ;		
	freshwater streams	parr / fry ;		
	estuaries ;	*smolt*		

Question	Answer	Marks	Guidance
6(b)(i)	*any **3** of:* less water in rivers and streams, so salmon can't reach spawning grounds ; rocks are porous, so toxic chemicals could pass into the water and poison the eggs and sperm / alevin / parr / fry ; vibrations / noise, in water from, blasting / explosives, keep fish away from spawning areas ; damage to dams could release toxic chemicals into the water to poison, eggs and sperm / alevin / parr / fry ; damage to dams could release silt which makes water too cloudy and unsuitable for spawning **OR** ref. to silt damaging gills ; dams could block migration route to spawning grounds ;	**3**	**A** vibrations may damage nests / river bed
6(b)(ii)	idea of, a person who has an interest (commercial or ecological) in a particular area ;	**1**	

Question	Answer	Marks	Guidance
6(b)(iii)	**support** villager from Cook Inlet / villager from Iliamna lake ; idea of, new employment opportunities (from mine / new port) / better transport links / more money in local economy ; **oppose** any 1 × 2 of: hunting / fishing lodge owner ; idea of, ensuring local wildlife is preserved to maintain income from tourism ; **OR** villager from Iliamna lake ; idea of, protecting fish stocks in the lake to sustain local population / income from tourism ; **OR** commercial salmon fisherman ; idea of, protecting employment in salmon fishing industry / ensuring salmon stocks are sustainable ; **OR** environmental groups / named environmental groups ; idea of, protecting specific species / representing the interests of their group ;	**4**	**Note**: The stakeholder should be a person or representative of a group of people
7(a)	**term** biotechnology ; gene ; selective breeding ;	**3**	

Question	Answer	Marks	Guidance
7(b)(i)	idea that, transferred genes are not placed in the nucleus / transferred genes are placed in the, cell / cytoplasm ; DNA will attach randomly to the DNA of the host cell ;	**2**	
7(b)(ii)	idea of, switching on a gene ;	**1**	
7(c)	*any **3** of:* transfer of genes into the wild population ; competition with wild populations (for food) ; disruption of food chains ; could introduce disease ;	**3**	