
MARINE SCIENCE

9693/04

Paper 1 A2 Data Handling and Free-Response

October/November 2017

MARK SCHEME

Maximum Mark: 50

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
<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)

Question	Answer	Marks	Guidance
1(a)(i)	feeding regime / number of feeds per day + temperature ;	1	A total mass food / amount of feeds per day
1(a)(ii)	<i>any two of:</i> volume of water / water level / size of tank / salinity / type of food / oxygen concentrations / age of fish / pH ;	1	
1(b)(i)	0.18 ;;	2	
1(b)(ii)	X: temperature + increasing temperature increases mass / increasing mass of food does not cause an increase ; Y: mass of food + feeding cause an increase / increasing temperature does not cause an increase ;	2	
1(c)	<i>any four of:</i> temperature increases respiration / metabolic rate ; respiration uses up glucose ; loss of body tissues / food reserves / AW ; ref. to enzymes ; more food is required for higher respiration rate / AW ; more food provides <u>more energy</u> for growth / AW ; no food causes a decrease in mass change as temperature increases ; another factor must limit rate at high temperature / digestibility as excess feeding decreases mass change ; credit manipulated numerical example ;	4	

Question	Answer	Marks	Guidance
1(d)	<p><i>any three of:</i></p> <p>populations will decrease ;</p> <p>(because) respiration / metabolic rates will increase ;</p> <p>(idea of) increased demand for food / AW ;</p> <p>insufficient food available (with temperature rise) / AW ;</p> <p>smaller fish breed less ;</p> <p>females produce less eggs / reduced fecundity ;</p> <p>reduced ability to migrate / reach spawning grounds ;</p>	3	

Question	Answer	Marks	Guidance
2(a)(i)	400 ;	1	
2(a)(ii)	same temperature / food levels / substrate / water conditions ;	1	A any suitable biotic or abiotic factor

Question	Answer	Marks	Guidance
2(b)	<p><i>any five of:</i></p> <ul style="list-style-type: none"> a always more lobsters in MPA than control areas ; b in both areas more lobsters are trapped after MPA is set up ; c in site B the increase in lobster trapped is higher than in site A / ORA ; d in site B lobsters caught in control areas have increased / ORA ; e (suggests) lobster move out from MPAs into control areas ; f correct reference to overlapping standard deviations ; g large sample size increases reliability ; h in <u>2007</u>, in site A, the decrease (for MPA) is not significant / AW ; i (the data) is only for lobsters and other species may not do the same ; j the controls also increase in site B so another factor may be increasing lobsters trapped ; k credit correct manipulation of data ; 	5	

Question	Answer	Marks	Guidance
3(a)(i)	<p><i>any three of:</i></p> <p>a low surface area:volume ratio / ORA ;</p> <p>b long diffusion path / distance / ORA ;</p> <p>c high respiration rate / ORA ;</p> <p>d diffusion is insufficient (across body surface) / takes too long / ORA ;</p> <p>e ventilation organs / AW, increase surface area ;</p> <p><i>and minimum of one of:</i></p> <p>f blood transports <u>oxygen</u> to respiring tissues / cells ;</p> <p>g returns <u>carbon dioxide</u> to gills / lungs / AW ;</p>	4	

Question	Answer	Marks	Guidance
3(a)(ii)	<p><i>any six of:</i></p> <ul style="list-style-type: none"> a large gill surface area ; b (due to large numbers of) lamellae ; c thin gill lamellae ; d reducing diffusion distance ; e efficient capillary network / blood supply ; f movement of blood / high heart rate maintains gradient ; g ram ventilation ; h swim with mouth open to force water over gills ; i increases speed of gas exchange / less energy used than in pumped ventilation ; j ram ventilation maintains diffusion gradient ; k swim at surface where there is more oxygen ; l pumped ventilation when stopped / AW ; m buccal cavity / opercular movements to move water over gills / AW ; n ref. to counter-current flow ; 	6	

Question	Answer	Marks	Guidance
3(b)	<p><i>any five of:</i></p> <p>a idea of, different light, colours / wavelengths, penetrating different distances ;</p> <p>b red absorbed at surface ;</p> <p>c blue penetrates deepest ;</p> <p>d chlorophyll absorbs blue and red light ;</p> <p>e named accessory pigment / xanthophyll / phycobilin / fucoxanthin ;</p> <p>f absorbs some of green / yellow / other wavelengths ;</p> <p>g maximise photosynthesis / light required for photosynthesis / AW ;</p> <p>h increased primary productivity ;</p> <p>i outcompete other algae ;</p>	5	<p>A long wavelength light for red</p> <p>A short wavelength light for blue</p>

Question	Answer	Marks	Guidance
4(a)	<p>advantages</p> <p><i>minimum of two:</i></p> <ul style="list-style-type: none"> a (mangrove / artificial reef) reduced coastal erosion / AW ; b (mangrove) stabilises substrate ; c (mangrove) acts as a nursery ground / breeding site for species / habitats for juveniles ; d (artificial reef) acts as a shelter for young fish ; e (artificial reef) provides habitat for attachment of organisms ; f (mangrove / artificial reef) provides safety from predators ; g (mangrove / artificial reef) provides food for food chains / establishes food chains ; h (mangrove / artificial reef) increases fish catch for locals ; i (mangrove) provides oxygen ; j (mangrove) removes carbon dioxide ; k (artificial reef) encourages tourism / diving ; <p>disadvantages</p> <p><i>minimum of two:</i></p> <ul style="list-style-type: none"> l (mangroves may cause) low oxygen due to leaf decay ; m (mangroves may be) invasive / damage other areas / grow out of control ; n (mangroves may) lose land with economic value (e.g. beaches) / AW ; 1 (artificial reefs) may alter water currents affecting coastline ; 2 (artificial reefs) may get in the way of fishing boats ; 3 (artificial reefs) may release toxins / TBT / AW ; 4 (artificial reefs) may damage sea bed / physical destruction of habitats ; 5 (artificial reefs) may cause aggregation of wrong species / AW ; 	7	A correct named toxin

Question	Answer	Marks	Guidance
4(b)	<p><i>any eight of:</i></p> <ul style="list-style-type: none"> a increased global temperature / global warming / enhanced greenhouse effect ; b long wave IR light trapped ; c glacier / ice cap melt causing sea level rise ; d loss of habitats ; e altered salinities ; f food chain effect ; g extinction ; h migration / range changes ; i altered primary productivity / increased photosynthesis ; j acidification / carbonic acid ; k coral bleaching ; l erosion of shells / AW ; m expelling zooxanthellae ; 	8	