

MARK SCHEME for the October/November 2014 series

9693 MARINE SCIENCE

9693/04

Paper 4 (Data-Handling and Free-Response),
maximum raw mark 50

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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2014 series for most Cambridge IGCSE[®], Cambridge International A and AS Level components and some Cambridge O Level components.

Page 2	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2014	9693	04

Question	Expected answers	Additional guidance	Mark
1 (a)	26.8(%)/26.9(%) ;		[1]
(b)	axis labelled “species” ; linear axis labelled “percentage of total landing” ; all bars/plots correct ; all bars/plots labelled with fish names ;		[4]
(c) (i)	positive correlation / as mesh size increases, fish length increases / ora ; weak correlation (due to high spread of data) ;		[2]
(ii)	small fish escape through mesh; more larger fish retained (causes an) increase in mean ;	look for idea of greater proportion of larger fish “skewing” the mean	[2]
(d)	THREE of: allows fish to reach sexual maturity/eq ; increase recruitment / reproduce / eq ; increase fish stocks / population / stops overfishing / eq ; small fish are thrown back dead / dumping of fishing ; more fishing to compensate for the loss / fishing for other species increases / illegal fishing ; effects on economy / unemployment / eq ;		[3]
			[Total: 12]

Page 3	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2014	9693	04

Question	Expected answers	Additional guidance	Mark
2 (a)	<p>overall increase in oxygen production as light intensity increases ;</p> <p>negative oxygen up to 100 light / converse ;</p> <p>oxygen production levels off / decreases at 420 – 450 au of light ;</p>		[2]
(b)	<p>from 0 to 100 a.u., increase in salinity to 3.8% tends to reduce oxygen ;</p> <p>from 100 a.u., increase in salinity to 3.8% increases oxygen production ;</p> <p>4.0% and 3.6% salinity show similar oxygen levels / eq ;</p>		[2]
(c)	<p>3.8% (salinity) is optimal / ideal salinity / eq ;</p> <p>respiration uses oxygen / photosynthesis releases oxygen / eq ;</p> <p>respiration is faster than photosynthesis below 100 a.u. ;</p> <p>photosynthesis faster than respiration above 100 a.u. ;</p> <p>idea of compensation point at 100 a.u. / respiration rate and photosynthesis rate are equal ;</p> <p>non optimal Salinity affects respiration <u>and</u> photosynthesis ;</p> <p>reference to enzymes ;</p>		[4]
			[Total: 8]

Page 4	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2014	9693	04

Question	Expected answers	Additional guidance	Mark
3 (a)	<p>SEVEN of:</p> <p>ref. to SA:Vol ratio ;</p> <p>large organisms have lower SA:Vol ratio / small organisms have larger SA:Vol ratio ;</p> <p>example of small organisms with high SA:Vol ratio / example of large organisms with low SA:Vol ratio ;</p> <p>ref. to oxygen movement in <u>and</u> carbon dioxide movement out ;</p> <p>ref. to diffusion (of O₂/CO₂) ;</p> <p>large organisms have higher oxygen demand;</p> <p>for respiration of <u>cells / tissues</u> ;</p> <p>need gas exchange organs / gills / lungs / eq ;</p> <p>protrusions / eq (to increase SA) ;</p> <p>multicellular organisms have a long diffusion path / eq / converse ;</p> <p>transport system / blood ;</p> <p>ventilation movement to maintain gradient ;</p>	<p>only accept correct example of an organ</p>	[7]

Page 5	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2014	9693	04

(b)	<p>EIGHT of:</p> <p>large (gill) surface area ;</p> <p>(achieved by) primary gill lamellae ;</p> <p>(and) secondary gill lamellae ;</p> <p>ref. to pumped ventilation ;</p> <p>buccal cavity volume increases / pressure reduces (during intake of water) ;</p> <p>due to muscle contraction (ONCE) ;</p> <p>buccal cavity volume decreases and pressure increases (forcing water over gills / into opercular cavity / eq) ;</p> <p>by raising floor plate / eq ;</p> <p>operculum prevents back flow / acts as a valve / eq ;</p> <p>ref. to maintaining diffusion gradient ;</p> <p>of O₂ <u>and</u> CO₂ ;</p> <p>(due to) rich blood supply / capillary network ;</p> <p>heart pumping blood ;</p> <p>ref. to counter current ;</p>	<p>accept a labelled diagram of gill structure</p>	[8]
[Total: 15]			

Page 6	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2014	9693	04

Question	Answer	Additional Guidance	Mark
4 (a)	<p>Max. FIVE of:</p> <p>For:-</p> <p>commercially viable fish / high market value / eq ;</p> <p>(sturgeon is a) major foodstock / loss would affect food chains / eq ;</p> <p>(loss of sturgeon causes) a reduction in biodiversity / eq ;</p> <p>prevent loss of fishing fleet & jobs / eq ;</p> <p>Against:-</p> <p>may disrupt food chains in other lake ;</p> <p>may eat other organisms ;</p> <p>may have no predator ;</p> <p>outcompete indigenous species ;</p> <p>loss of commercially viable fish in other lake ;</p> <p>bringing in disease ;</p> <p>Factors to consider:-</p> <p>Max. THREE of:</p> <p>predators ;</p> <p>food source / niche changes ;</p> <p>breeding ability ;</p> <p>abiotic factors e.g. temperature ;</p> <p>potential of habitat damage at other lake ;</p> <p>logistics of moving the fish ;</p> <p>sufficient numbers to prevent inbreeding ;</p>		[7]

Page 7	Mark Scheme	Syllabus	Paper
	Cambridge International AS/A Level – October/November 2014	9693	04

(b)	<p>EIGHT of:</p> <p>oil (tanker) spill ;</p> <p>oily water from ballast ;</p> <p>oil blocking light penetration ;</p> <p>(causing) reduced photosynthesis ;</p> <p>effect of oil on feathers / fur ;</p> <p>toxicity (to animals) / eq ;</p> <p>effect on food chains ;</p> <p>drilling causing damage to sea bed / eq ;</p> <p>silt / sediment (from drilling) ;</p> <p>burning oil ;</p> <p>release of CO₂ ;</p> <p>(causing) enhanced greenhouse effect / eq ;</p> <p>one stated consequence of greenhouse effect;</p>		[8]
			[Total: 15]

e.g. ice cap melting / sea level rise / climate change / acidification / eq