CAMBRIDGE INTERNATIONAL EXAMINATIONS

Cambridge International Advanced Level

MARK SCHEME for the October/November 2015 series

9693 MARINE SCIENCE

9693/03 Paper 3 (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.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the October/November 2015 series for most Cambridge IGCSE®, Cambridge International A and AS Level components and some Cambridge O Level components.

Question / part	Answers to be awarded credit	Mark
1 (a)	any 2 of: (green) plants that fix / use carbon dioxide **or** (green) plants that convert light energy to chemical energy / carbohydrate ; carry out photosynthesis / chemosynthesis ; provide the food source at the beginning of all food chains ;	[2]
(b) (i)	any 2 of: narrow leaves that offer little resistance to water movement / wave action ; flexible leaves that can bend as water moves ; (spreading / shallow) roots that anchor plants to the sea bed ;	[2]
(ii)	need light for photosynthesis ; in shallow water there is high / more light (intensity) / red light needed for green plants ; **A** reverse argument	[2]
(iii)	the leaves trap the sediment / roots bind sediment so the water is clearer ;	[1]
(c)	any 3 of: (high productivity means) there is a lot of food available ; dense plants / leaves provides shelter from predators ; photosynthesis releases a lot of oxygen ; slowed water movement limits damage / prevents animals being swept away ; some marine animals lay eggs on sea grass ;	[3]
(d)	any 2 of: boat propellers / benthic trawling / dredging / divers ; land used for aquaculture ; collected for use in medicine ; pollution from sewage / industrial / agricultural waste ; global warming increasing water temperature ; oil spillage from ships ;	[2]
	Total for Question	**[12]**

Question / part	Answers to be awarded credit	Mark
2 (a) (i)	1 river bed / gravel ; 2 yolk sac ; 3 fresh ; **A** rivers / streams / lakes 4 sea ; **A** (open) ocean	[4]
(ii)	any 1 of: protection from predators ; increased chance of fertilisation ; prevent eggs being carried away in current ;	[1]
(iii)	idea of eggs underneath not getting enough oxygen ;	[1]
(b) (i)	any 4 of: selective breeding involves choosing parents that have required features and breeding together ; offspring with desired character are selected and bred together ; repeat this for many generations ; genetic engineering involves removing a gene (giving a desired character) from one species ; transferring the desired gene into the genome / DNA of another species ; relevant example ;	[4]
(ii)	gene that increases the growth rate of the salmon ; promoter gene that keeps the growth gene active all year round ;	[2]
(iii)	any 1 of: disease resistance ; protein content (of meat) ; early maturity / produce more eggs / sperm ; any valid example ;	[1]

Question / part	Answers to be awarded credit	Mark
(c) (i)	idea of, if an activity raises threats of harm to human health or environment, precautionary measures should be taken to prevent any harm ;	[1]
(ii)	any 2 of: keeping in cages separate from wild fish ; to prevent damage to food chains / spread of disease / spread of parasites ; inhibition / blocking breeding ability of non - breeding / sterile stock ; to prevent cross breeding / transfer of genes to wild stock ; maintaining separate breeding stock that is used to obtain eggs ;	[2]
	Total for Question	**[16]**
3 (a) (i)	any 3 of : animals find shelter / protection from predators (in mangrove roots) ; branches provide nesting sites for birds ; food available for a number of different species ; mangroves reduce waves / current flow so giving a stable / protected habitat ; nursery / spawning areas for many fish / crustaceans ;	[3]
(ii)	any 2 of: improved coastal protection / prevents coastal erosion ; more food resources ; **A** named resources e.g. fish / shrimp / prawn ; income / employment through the sustainable forest management ; **A** firewood / building wood **or** income / employment from greater fishing area improved coastal water quality ;	[2]
(b) (i)	volunteer labour / income for local community / tourists fund restoration ;	[1]
(ii)	provides a 'starter' for new mangrove to develop / preventing human interference while mangroves establish ;	[1]
(iii)	prevents developers / outside people claiming rights to disused area / allows land to revert to mangroves ;	[1]

Question / part	Answers to be awarded credit	Mark
(c)	any 2 of: captive-bred fish often have low fertility ; **R** sterile wild and captive-bred fish do not cross breed successfully ; captive-bred fish may have disease / parasites that spread into wild population ; captive-bred fish have low resistance to diseases in wild population ; captive-bred fish unable to compete successfully with wild fish ;	[2]
	Total for Question	**[10]**
4 (a) (i)	any 2 of: opportunity for employment ; more money into local community / improved standard of living ; improved infrastructure ; **A** ref. to roads / communication ; fish could be an extra / guaranteed source of food ;	[2]
(ii)	any 1 of: traffic increase ; loss of amenity land ; **A** deforestation loss of fishing sites ; immigration of 'outsiders' ;	[1]
(b) (i)	any 3 of: available land that is not being used ; land floods with fresh water ; river can supply water for ponds and rice fields ; local village close by to supply labour ; mangroves protect rice fields from coastal erosion ;	[3]
(ii)	any 2 of: river used as a source of water ; oxygen from the river / no artificial source of oxygen ; water flow used to remove waste ; fish free in rice fields and ditch / fish **not** in tanks ;	[2]

Question / part	Answers to be awarded credit	Mark
(iii)	contamination of the river water by waste from the ponds ; excessive use of water for ponds (in dry season) decreases water for irrigation / drinking water for local community ;	[2]
(iv)	any 2 of: fish waste / fish food go into the water (around the rice roots) ; more nutrients, so can grow more rice ; fish eat (larvae of) pests, giving more yield ;	[2]
	Total for Question	**[12]**
5 (a) (i)	$\frac{155-4}{20}$ **or** $\frac{151}{20}$; 7.55×10^5 (dm^3 per year);	[2]
(ii)	any 1 of: increase in population ; increase in agriculture / irrigation ; increase personal use of water ; increase in hotels / accommodation for tourism ; climate becoming drier / drought ;	[1]
(b) (i)	fish eggs / plankton / fish are sucked in, reducing the population in the sea ;	[1]
(ii)	brine is more concentrated / more dense than the sea water ; sinks to the bottom ; causes animals and plants to lose too much water by osmosis / cannot osmoregulate ;	[3]
	Total for Question	**[7]**

Question / part	Answers to be awarded credit	Mark
6 (a)	the shorter the wave-length the deeper the penetration ; **A** reverse argument red light does not penetrate far into water;	[2]
(b) (i)	chlorophyll used for photosynthesis ; chlorophyll only pigment that absorbs light energy from both short / blue wave length **and** long / red wave length ;	[2]
(ii)	any 4 of: chlorophyll a in green algae can use the red light (as well as blue light), which is in shallow water only ; chlorophyll a only uses blue light in deep water ; phycobilin / phycoerythrin in red algae absorb light energy in middle wave lengths / 520–600 nm / green light ; provide greater ability to photosynthesise, so red algae can live in deeper water ; ref. to competition ;	[4]
	Total for Question	**[8]**
7 (a) (i)	direct diffusion / dissolution from the air ; idea of, wave action / wind stirring water and air ;	[2]
(ii)	photosynthesis increases oxygen content ; respiration reduces oxygen content ; **A** decomposition / decay	[2]
(b) (i)	11 – 8.5 = 2.5 ; $\frac{(2.5)}{11} \times 100$ = 22.7 / (23) % ;	[2]
(ii)	sea water at 35 °C has a low concentration / 4.9 mg dm^{-3} of dissolved oxygen ; tuna have high oxygen demand as fast swimming ; ref. to respiration using oxygen ; ref. to ram ventilation being more efficient than pump ventilation ;	[4]
	Total for Question	**[10]**