CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2013 series

9693 MARINE SCIENCE

9693/03 Paper 3 (A2 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.

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CAMBRIDGE
International Examinations

1 (a) (i) green plants use red light for photosynthesis;
A. long / 720 nm wave lengths,
shallow water allows red light to pass through ; [2]

(ii) 3 of:
only shorter wave lengths / green / blue light can pass to deep water;
A. specific wave lengths less than 500 nm
brown algae have pigments / fucoxanthin to absorb blue light;
brown algae also have large number carotenoid pigments to absorb green light;
red algae have pigments / phycoerythrin that can absorb blue light;
A. general statement red and brown algae have pigments / named pigments that absorb green blue / short wave lengths [3]

(b) (i) ref to photosynthesis;
ref. to oxygen release by photosynthesis / description photosynthesis; [2]

(ii) 3 of:
idea that increases the available nitrogen source in the ocean;
A makes nitrogen available I a usable form

algae use additional nitrogen source to make proteins / amino acids;
idea of increased growth / more plants / more biomass produced ;
idea that bigger / more plants means more photosynthesis /productivity ;
A idea of more food availability in food chains increases productivity [3]

(c) (i) 1 of:
detergent / soap;
sewage;
fertiliser;
A run off **R** industrial waste / run off [1]

(ii) 1 of:
blocking light to plants growing under the water;
production of toxins / presence of toxic dinoflagellates into the water;
idea of oxygen depletion due to eutrophication killing fish ;
A descriptions of dead zones / red tides
R eutrophication / red tides unqualified [1]

[Total: 12]

2 (a) (i) has a very large surface area to volume ratio;
flattening / spreading out / long length makes surface area large without increasing volume;
I ref. to actual measurements [2]

(ii) organism C; [1]
3 of:
has the smallest surface area to volume ratio;
A volume is greater than surface area
small surface area will not be able to supply sufficient (nutrient / oxygen);
A diffusion would be too slow
idea that most of the cells are a long way from the gas exchange surface;
idea that transport system takes oxygen to / removes carbon dioxide close to cells;
A nutrient
allow error carried forward for an incorrect organism [3]

(b) (i) increase surface area (for diffusion); [1]

(ii) 2 of :
idea of maintaining the diffusion gradient ;
idea of blood removing oxygen / bringing more carbon dioxide;
idea of water flow bringing in oxygen (and removing carbon dioxide); [2]

(c) (i) 9 ($cm^2 g^{-1}$) $\times$ 256 500 (g);
= 2308500 / 2.395 $\times$ 10^6 $\underline{cm^2}$; [2]

(ii) 2 of:
(tuna) has more total body mass ; **A** bigger / larger
(tuna) more muscle to supply with oxygen ;
(tuna) faster swimming / swim continuously ;
I references to ram and pumped ventilation
allow ora for salmon any of these points [2]

2 of:
more lamellae will give greater surface area ;
A the more lamellae the greater the oxygen supply
(this will) will increase (efficiency) of diffusion ;
skipjack tuna obtains more oxygen than bluefin tuna; [2]

[Total: 15]

3 (a) 5 of:
ref. to being hermaphrodite ;
spawning linked to lunar cycles ;
release large numbers of sperm into water;
then release large number of eggs ;
A if gamete release not separated in time, adults release both eggs and sperm – max 1
fertilised eggs hatch in 12 hours ;
free swimming larvae ;
A zooplankton / meroplankton **/** pelagic
R free floating
ref. several different types of larvae /named stages ; (trochophore / veliger)
changes to juvenile clam 8–10 days ;
settle onto rock / coral ;
A hard substrate **R** suitable substrate
mature in 2-3 years;
A 1–3 years
grow in sea several years before sexual maturity; [5]

(b) (i) 1 of:
oysters have separate sexes;
A not hermaphrodite
controlled by temperature increase;
R references to habitat / length of life cycle [1]

(ii) 2 of:
eggs and sperm released into water / external fertilisation;
A broadcast spawning
free living / plantonic larvae;
A named larvae e.g. veliger
larvae undergo several stages of development before settling;
R sessile habit of adults [2]

(c) 1 of:
overfished for food ;
shells sold on black market to collectors;
pollution of waters in which they live;
A environmental changes / habitat destruction [1]

[Total: 9]

4 **(a)** 3 of:
idea of higher catch reduces population ;
idea that increase percentage caught is not the same as more fish ;
population becomes too small for sustainable recruitment ;
ref. to MSY ;
idea of flooding market so value reduces ;
idea of fewer marketable fish ; [3]

(b) 3 of ;
idea that: profit is made when cost of fishing is less than total value of catch ;
maximum profit 25-40 % total stock ;
A any value between these figures
idea that: value of the catch minus cost the fishing effort has the greatest difference / this is least cost to achieve the greatest value of the catch ;
stop making profit 65% total stock / above 65% no profit;
(at 65%) cost of fishing effort = value of the catch / (above 65%) cost of fishing greater than value of catch ; [3]

(c) 2 × 2 of:
restriction by season / closed seasons ;
breeding season excluded so fish can reproduce ;
restriction by location / idea of refuge zones ;
breeding grounds / juvenile fish areas / marine reserves, allow time for young fish to grow and reach reproductive age ;
restriction on method ;
use of larger mesh size allows juveniles to escape / compulsory pole and line reduces the number caught ;
restrictions on size of fish that can be retained ;
smaller fish are allowed time to mature / reproduce ;
restrictions on fishing intensity / e.g. quotas / restriction on intensity (e.g. number of boats / type or quantity of fishing gear / number of sailings) ;
fewer fish caught so stock remains high / recruitment improves ; [4]

[Total: 10]

5 (a) (i) 3 of:
increases (up to 2005);
and then plateaus (at lower level) ;
R descriptions of the data [2]

(ii) Atlantic Bluefin = 30 091 (US)$ / 1471 tonnes = 20.46 x 1000 (US)$;
yellow fin tuna = 4 699 (US)$ / 730 tonnes = (US)$ 6.44 x 1000 ;
Price difference = (US)$ 20.46 – (US)$ 6.44 = (US)$ 14.02 x 1000 ;
A figures given in thousands (US)$
A figures rounded up to nearest whole number
units without × 1000 on final figure – max 2
no units give – max1 for correct figures / working [3]

(iii) idea of popularity / demand, e.g. bluefin is considered to be better flavour ; [1]

(b) (i) 2 of:
depleting stocks of wild tuna (that are used for farmed tuna) ;
depleting wild stocks of fish use for food of tuna ;
pollution of sea from waste produced by penned tuna ;
A idea of environmental destruction caused by need for large pens [2]

(ii) 2 of:
large size (so are difficult to handle / need a lot of space);
do not breed well in captivity;
young fish easily damaged;
need a lot of food;
slow to mature; [2]

[Total: 10]

6 (a) (i) 4 of:
oil forms a layer on the water ;
blocks light so plankton / producers / zooanthellae unable to photosynthesise ;
kills plankton that are part of the marine food web ;
kills coral / zooanthellae ;
R coral bleaching / coral damage
toxic / harmful chemicals in oil ;
kills fish / blocks gills ;
marine mammals swallow/ inhale oil when coming to surface to breathe ;
swallowed by seabirds feeding (causing death) ;
ref. to oiled feathers of seabirds ;
R general statements 'killing all marine life / organisms [4]

(ii) 2 of:
idea that remote equipment will not be able to reach / remove all of the oil ;
idea that microbes will digest any remaining oil (to prevent further leaks) ;
idea that microorganisms digest harmful oil to harmless products ;
idea that microorganisms are 'safer' than detergents/ chemicals / burning ; [2]

(b) (i) 2 of:
artificial reefs (provide a habitat / ecosystem) ;
protection of coast line ;
attracting (juvenile) fish ;
idea of increases the biodiversity ;
allow idea of conservation of endangered species ; [2]

(ii) 3 of:
attract more tourists / divers ;
location sites for film companies ;
more employment for local people ;
improve inshore fishing / aquarium fish ;
more money into local economy ; [3]

[Total: 11]

7 (a) 1 of:
sea bird nesting site;
fish nursery;
whale migration route; [1]

(b) (i) idea of: a **person** who has an interest (commercial or ecological) in a particular area ; [1]

(ii) 2 x 2 of:
the stakeholder should be a person or representative of a group of people.
owner /manager of the hotel ;
idea of ensuring that the hotel / holiday area is included within the zone / represent interests of local people employed ;
A idea that want to keep business / attract more tourists
owners /managers of water sport activities ;
idea of being involved in decisions about the types of water sport that may be allowed in a protection zone ;
fishery owner / manager ;
A fishermen / the 'fishery'
idea of protecting employment / fishing rights in the new zone ;
idea of (elected) town representatives (e.g. mayor) ;
A the people of the town
represent the interests of the town's inhabitants e.g. employment / restrictions on building / refuse disposal ;
R fishing protection
coast guard / fishery protection agencies ;
idea of being involved in decisions about policing / managing the protection zone ;
environmental groups / named environmental group ;
idea of protecting specific species / representing the interests of their group ; [4]

(c) 1 × 2 of:

There must be a specific statement about the nature of the change. The reason must relate to why the change might be necessary.

idea of reducing the water sport activities / limiting the type of water sports allowed ;

idea that some water sports that disturb the water too much e.g. speed boats / jet ski / water skiing / parasailing

OR waves (from water sports) cause coastal erosion / damage shore lines ;

A ora for wind surfing / sailing / canoeing

idea of changing fishery to more sustainable methods/ type of fishing gear used ;

R close down / move the fishery / change the fishing routes

idea of trawl nets / drift nets catching too many juvenile fish / damage to sea bed by trawling / idea of less CUP ;

R disturbing whale migration / catching fish in the nursery

idea of restrictions on number of people at hotel / places where hotel guests can go ;

ref. to disturbance of seabird nesting / egg hunting / disturbing juvenile fish / hotel pollution ;

[2]

[Total: 8]