UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2012 question paper

for the guidance of teachers

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 must be read in conjunction with the question papers and the report on the examination.

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1 (a) (i) 2 of:
carbon dioxide dissolves and forms carbonic acid;
ref. to formation of hydrogen carbonate ions;
causes the pH to fall; [2]

(ii) calcium carbonate dissolves in acid;
external structures reduced or unable to form; [2]

(iii) 1 of:
ref. to loss of species due to low pH killing sensitive species;
ref. to loss of species due to inability to make external structures; [1]

(b) (i) 3 of:
ref. to more in coastal regions / open oceans less;
ref. to southern hemisphere more than northern hemisphere;
ref. to zone south of Tropic of Capricorn / SE of S America / below Australia higher than any other region; [3]

ref. to none / very little in N Pole / Arctic region;

(ii) 2 of:
(B is a) nutrient rich area;
coastal regions have more wave action that mixes nutrient / runoff from land / more currents bring more nutrients to area;
(A is) open ocean where there is little recycling of nutrient; [2]

[Total: 10]

2 (a) 3 of:
body fluid / blood has higher water potential / is less concentrated than sea water;
constantly losing water;
by osmosis;
through permeable surfaces / e.g. of permeable surface;
maintains the body fluid / blood composition for metabolic / enzyme function, [3]

(b) *Mitochondria*:
release the energy / produce ATP;
(energy) needed for active transport / excretion;
Cell surface membrane
folds increase surface area;
increases (rate of) excretion of chloride ions; [4]

(c) (i) idea of comparing the results with the experimental fish / idea that ensures the results are due to increase in carbon dioxide / control; [1]

(ii) 2 of:
same <u>volume</u> of sea water used (for experimental and control);
same number / mass of fish;
age / sex of fish;
(initial) light intensity;
food supply;
temperature;
salinity;
fixed / same concentration of carbon dioxide added; *allow amount* [2]

(d) 1 of:
idea that increase in carbon dioxide affects the respiration rate / (rate of) oxygen consumption; [1]

[Total: 11]

3 **(a)** 4 of:
spawning takes place in fresh water / rivers;
eggs laid in groove / nest / gravel / river bed;
(alevin) feed on yolk sac (in nest);
(fry) feed on small animals / plankton / are carnivorous several weeks – year;
change physiologically to live in sea water; allow *<u>smoulting</u>*
idea of: growing in sea several years before sexual maturity;
most die after spawning; [4]

(b) 3 of:
spawning occurs in seawater
males and females gather together in a large group;
eggs float on ocean surface;
larvae pelagic / form part of plankton;
young fish migrate to feeding grounds in shallow water;
adults spawn many times during life; [3]

(c) 2 of:
idea of increased predation of free floating eggs / larval stages of tuna;
increased risk of being (over) fished during spawning;
increased risk of overfishing of young in shallow water; [2]

[Total: 9]

4 **(a)** 2 of:
idea of less time spent looking for fish / know where the fish can be found;
less cost in / use of fuel;
increased catch; [2]
allow idea of early warning of storms / *poor weather for fishing*

(b) **(i)** total catch divided by the <u>time</u> spent fishing; [1]

(ii) increases the catch;
by approximately double / increased by 150;

(iii) 2 of
easy for fishermen to catch fish;
leads to overfishing / exceeding MSY;
leaves too few adults to reproduce / juveniles to replace stock; [2]

(c) *restrictions on fishing times:*
ref. to closed seasons to protect breeding stock;
ref. to refuge areas / marine reserves to allow fish population to increase;
restrictions on fishing method:
ref. to mesh size that allows juveniles to escape;
ref. to size of nets / banning of drift nets that catch too many unwanted species;
ref. to compulsory use of rod and line for catching fish to reduce number caught;
restrictions on fishing intensity;
ref. to reducing the number of boats allowed to catch fish;
ref. to limitations on the size of the boat and engine (so less caught);
ref. to the quantity / type of gear allowed; [6]

[Total: 13]

5 **(a)** **(i)** ref. to idea that oxygen will be provided by the sea; [1]

(ii) 1 of:
non-native species may predate local organisms;
local species may predate the fish;
idea of disturbing balance of food chains; [1]

(b) 5 of:
ref. to overfeeding of fish;
excess food falls to bottom and decomposes;
oxygen level falls in the water which may cause death of benthic organisms;
some species may increase in number with extra food;
imbalance in food chains may cause death of some species;
fish excreta / urine / decomposition causes excess minerals in water;
excessive growth of algae / euthrophication around sea cages;
some algae produce toxins that kill fish;
chemicals used on the cages may be toxic to local fish; [5]

(c) *advantage*, 1 of:
more employment for local;
financial benefits to the community;
disadvantage, 1 of:
disruption to local way of life;
immigration into town; [2]

[Total: 9]

6 **(a)** 4 of:
oil forms a layer on the surface;
birds dive through oil to reach fish;
oil is absorbed by feathers;
causes loss of water proofing / buoyancy (so sink);
causes loss of insulation so more susceptible to cold;
swallow oil that causes damage to internal organs / blocks gut; [4]

(b) **(i)** 2 of:
idea of the continuous input of oil;
idea that this oil is not managed / controlled;
idea that large spills are treated / managed to reduce impact; [2]

(ii) 2 of:
birds killed by pollution a long way from the shore decay / sink / eaten;
birds on the shore may be eaten before they are counted;
only a (small) sample of beaches sampled;
birds might die after survey; [2]

(c) **(i)** 1 of:
long coast line difficult to monitor;
busy sea lanes have more ships;
ports have high proportion of visiting ships; [1]

2 of:
increase the number of inspections;
increase the size of fines for ships caught illegally discharging oil;
use patrol boats to watch ships on their way to port; [2]

(d) **(i)** Idea of industrial use / application;
(of) a biological process; [2]

(ii) idea of promoter / other gene (from another organism / bacteria);
transferred to the bacteria to increase metabolism / rate of digestion (of oil); [2]

[Total: 13]

7 **(a)** ref. to management strategies (of human activities);
to protect / preserve the marine ecosystem; [2]

(b) **(i)** 3 of:
support the economy of Greenland / local area;
world demand for oil / gas is rising;
drilling operations have strict controls to limit environmental damage;
stringent safety regulations for workers; [3]

(ii) 3 of:
hostile / very cold environment is too hazardous for workers;
the ecosystem is very fragile and could be severely damaged;
ref. to polar bears already under threat from human activities / global warming;
any oil spill would cause habitat destruction as oil will not break down in cold;
very remote area so aid for a disaster would be costly and technically difficult; [3]

[Total: 8]