UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9693 MARINE SCIENCE

9693/04 Paper 4 (Data-Handling/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 must be read in conjunction with the question papers and the report on the examination.

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1 **(a)** **(i)** two peaks (or eq.);
at (approx.) 440 nm and 650 nm;
lower absorbance between 450 and 600; [m

(ii) chlorophyll has 2 peaks **and** fucoxanthin has 1;
chlorophyll has higher maximum absorbance;
fucoxanthin has absorbance from (approx.) 450 nm to 525 nm;
fucoxanthin has no absorbance beyond 570 nm; [max 2]

(b) some wavelengths of light do not penetrate very deeply;
light of 600 nm – 700 nm/300 nm – 350 nm does not penetrate to higher depths;
only 440 nm light is available for chlorophyll in deeper water;
green algae contain mainly chlorophyll;
lower rate of photosynthesis in deeper water; [max 2]

(c) algae contain both pigments;
fucoxanthin levels are higher than chlorophyll at depths beyond 30 m (accept converse);
fucoxanthin absorbs light around the 450–500nm range;
algae with fucoxanthin are able to photosynthesise with more wavelengths of light than those without/less;
idea of competitive advantage; [max 3]

[Total: 9]

2 **(a)** major decrease in catch of all ages;
majority of catches consist of fish age 2–5 years;
reference to numerical detail; [max 2]

(b) decline in stocks of fish;
decline in older fish;
due to high catch of fish of 3 years or under;
less fish reaching full reproductive capacity; [max 3]

(c) 66.15%;;
325–110; (one mark) [2]

(d) ACTIONS
restrict fishing by season/breeding times;
use of non-fished refuge zones;
minimum mesh sizes/rod and line;
imposition of quotas;
reduced boat numbers/hours at sea/boat sizes;

EFFECTS
under employment;
loss of earnings;
need to diversify catch;
increased earnings due to demand price;

(max 3 actions of effects) [max 4]

[Total: 11]

3 **(a)** eggs laid in fresh water stream/river;
alevin stay in gravel;
feed on yolk sac/nutrients in egg;
fry in river/stream;
parr in streams;
1–3 years;
(smolt) moves into ocean/sea;
changes juvenile markings;
adult in sea/becomes sexually mature;
feeding (in sea/ocean);
1–4 years (in sea/ocean);
return to river to spawn/breed;
do not feed in rivers;
kelts (female) may return to sea, cocks (males) usually die; [max 7]

(b) internal less wasteful/less energy loss/more protection from predators;
internal more likely to lead to fertilisation;
internal allows mate choice;
external useful for sessile organisms; [max 3]

(c) tuna produces millions (or eq) of offspring;
no/little parental care/hiding eggs;
larvae are planktonic;
most die/are eaten/a few survive/ref. to r selection;

whales give birth to live offspring/placental mammals;
only 1 produced;
lactation;
protection from mother/school/learning;
high investment in one calf/k selection. [max 5]

[Total: 15]

4 **(a)** intensive – in tanks/man made areas (or eq);
extensive – in ocean/bays/estuaries (or eq);

(b) named species e.g. grouper, salmon, bass, oyster, mussel;
constant source of food/addition of fertiliser for plankton;
oxygenation method;
waste removal/filtration of water;
removal of dead fish/use of antibacterial agents/disease prevention;
prevention of predators/nets;
monitoring to prevent overcrowding;
labour force available;
market demand for fish (or eq);
transport links to market;
care taken with breeding strategies; [max 6]

(c) pollution (credit correct refs to eutrophication);
reduce overfeeding/treat waste/treat effluent;
low use of pesticides;

escape of fish into natural area;
loss of habitat;
effect on food chains/ecosystems;
nets/other method of confinement;

disease spread;
monitoring of fish;
prevent overstocking;

fall in fish price;
loss of fishing income;
unemployment;

improved employment due to successful venture;
more food for people; [max 7]

[Total: 15]