UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS
General Certificate of Education
Advanced Subsidiary Level and Advanced Level

MARINE SCIENCE **9693/03**

Structured Questions **For Examination from 2009**

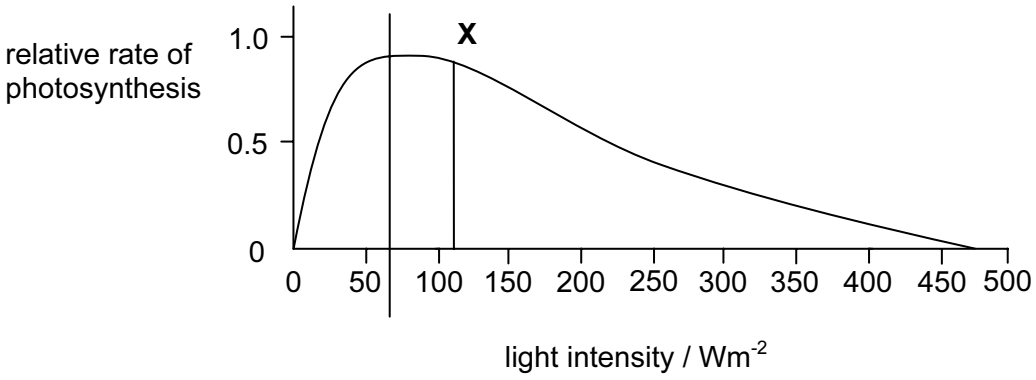
SPECIMEN MARK SCHEME

1 hour 30 minutes

MAXIMUM MARK: 75

This document consists of **6** printed pages and **0** blank pages.

1 (a) (i) line at about 65 ±5/Wm^{-2}



[1]

(ii) another factor/named factor has become limiting;
reaction rate cannot increase any further; [2]

(b) (i) 4 of:
at the sea surface the light is at highest intensity;
may cause photo-inactivation of chlorophyll;
or cause motile phytoplankton to migrate deeper;
as light enters water some of it is absorbed so intensity falls;
just below surface the light intensity is still high so photosynthesis rate is highest;
as depth increases the light intensity decreases;
photosynthesis rate falls with decrease in light until insufficient for photosynthesis;
[4]

(ii) 2 of:
at Y photosynthesis production equals respiration use;
below this depth photosynthesis could not meet demand of respiration; AW
reserves would be used up so plant would die;
[2]

(c) 2 of:
dinoflagellates are able to swim to the surface;
enable the plant to reach higher light intensities for more photosynthesis;
show cycles of movement/ sinking and then swimming upwards;
[2]

[Total: 11]

2 (a) (i) calculations:
correct conversion of units; (1mm= 1000μm, 1s= 1,000ms) [1]

rates:

$\frac{1000}{4980000} = 2 \times 10^{-4}$ μm/ms = 0.0002μm/ms; or $\frac{1}{83}$ = 0.012mm/min [1]

$\frac{12}{48}$ = 0.25μm/ms or $\frac{0.012}{0.0008}$ = 15mm/min [1]

ratio: $\frac{0.25}{0.0002}$ or $\frac{15}{0.012}$ = 1250× faster [1]

(ii) ref. to idea that:
some cells too far from the external environment;
these cells receive insufficient supply raw materials/named material to survive; [2]

(iii) ref. to idea that:
transport system links specialised exchange surfaces/named surfaces to all cells;
mass transfer of materials enables constant supply to cells; [2]

(b) 3 of:
species Z has shortest distance between water and blood;
diffusion of oxygen will be faster;
to allow more respiration/ATP production;
enabling species to use muscles more (for greater activity) [3]

[Total: 11]

3 (a)

environment	stage of life cycle
nest in stream bed/reeds	eggs
between gravel in a stream bed	**alevin**
(reeds) freshwater streams	parr
estuaries	**smoult/adults (at spawning)**

[4]

(b) (i) 2 of:
salmon develop into different sexes from hatching;
grouper develops into female first and lays eggs;
then develops into male and produces sperm; [2]

(ii) eggs of salmon are less visible to predators (in a nest);
eggs of grouper float on the surface of ocean/in plankton [2]

[Total: 8]

4 (a) (i) a sequence of DNA nucleotides coding for the production of a specific polypeptide/protein ; [1]

(ii) all the alleles of the genes (inherited) of an organism; [1]

(iii) transfer of DNA/gene from one species to another; [1]

(b) (i) 2 of:
some genes require a promoter to function;
the promoter is a site where RNA attaches before transcription;
unless promoter attached, gene will not operate in new location [2]

(ii) the injected genetic material/genes/DNA may not attach to the host DNA/chromosome;
marker gene can be used to detect cells that have the gene/DNA attached;
[2]

(c) 1 of:
selective breeding transfers whole genome
wide range of variants obtained/unwanted genes transferred;
takes many generations; [1]

[Total: 8]

5 **(a)** **(i)** new/young fish added to the population;
at a specific stage of the life cycle; [2]

(ii) initially increased mortality increases recruitment;
reduces when level of fishing too high/overfishing; [2]

2 of:
fewer fish in the population reduces competition for food/oxygen
(or predation by older fish);
more young fish survive to reach the age for recruitment;
overfishing reduces breeding population too much; [2]

(b) the number of fish removed is balanced by recruitment; [1]

(c) reference to idea
3 of:
as fish age they grow and increase in biomass;
as fish age some are lost due to mortality;
highest population biomass is 'mid age' as there are still a lot of fish with higher body mass;
falls in oldest and heaviest fish as there are very few in the population;
[3]

[Total: 10]

6 **(a)** **(i)** 1 of:
fry obtained from the wild/estuaries;
no processed food supplied/depends on natural food supply; [1]

(ii) fish feed on plants;
fertilisers encourage the growth of algae/plants; [2]

(b) 2 of:
fast average growth rate;
high commercial value/good return on investment;
high consumer demand;
tolerant to confinement;
stock available [2]

(c) **(i)** 2 of:
fish stocks in sea are declining;
less energy efficient in terms of feeding;
may spread disease from one fish to another; [2]

(ii) 2 of:
populations/ catch of fish can vary widely;
nutrient content can be controlled more easily;
sustainable crop;
can track source (for food labelling) [2]

[Total: 9]

7 **(a)** **(i)** sewage provides a source of nutrients that encouraged the growth of the phytoplankton; [1]

(ii) high levels of photosynthesis from the phytoplankton; [1]

(iii) large amount of dead phytoplankton sink to the bottom of bay;
decomposition of phytoplankton consumes oxygen; [2]

(b) layer of warm water floats the top of thermocline;
cuts off lower levels from atmospheric oxygen; [2]

(c) 3 of idea that;
all organisms are likely to die at 0mg oxygen as needed for respiration/energy release;
only species highly adapted to low oxygen content likely to survive at 1/2mg;
variety/species diversity would decrease (as oxygen dependent die) ;
low oxygen tolerant species may increase in number; [3]

[Total: 9]

8 **(a)** the protection/ preservation/ management/ restoration;
of wildlife and of natural resources such as forests, soil, and water; [2]

(b) **(i)** 2 of idea that;
over fishing reduces the stocks below a sustainable level
pollution introduces toxins/disease organisms that kill marine organisms;
loss of some organisms causes balance of ecosystem to change/disrupts food chains;
dredging removes bottom layers that may supply nutrients/removes habitats;
[2]

(ii) 2 of idea:
raising awareness of threatened species;
informing about the dangers of human activities/named activities;
improving recognition of threatened species; [2]

(c) 3 of:
organisms important to humans are part of an ecosystem;
part of food chain/web that involves other organisms;
may cause killing of organisms seen as a threat to human resource; if other organisms ignored/killed may disrupt food chain;
contribution of other organisms to ecosystem may be essential to survival of human resource in a way as yet not known; [3]

[Total: 9]