



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

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MARINE SCIENCE

9693/03

Structured Questions

For Examination from 2009

SPECIMEN MARK SCHEME

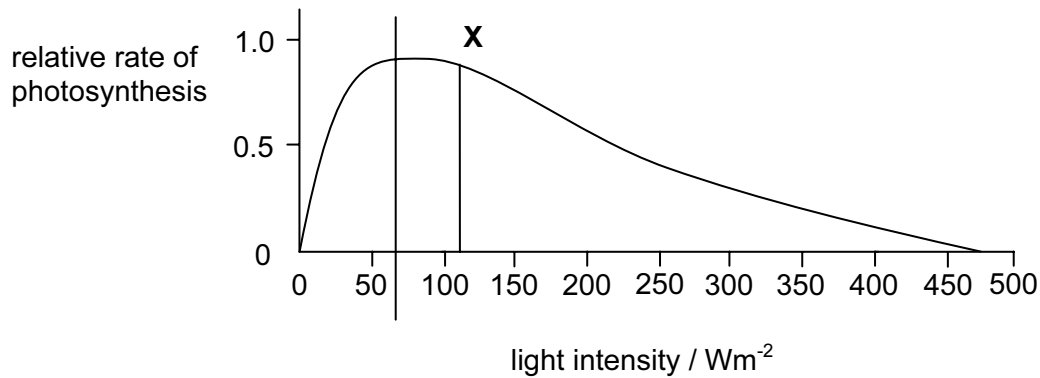
1 hour 30 minutes

MAXIMUM MARK: 75

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



- 1 (a) (i) line at about $65 \pm 5/Wm^{-2}$



[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= 1000 μ m, 1s= 1,000ms)

rates:

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

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

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

- (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;
- (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;
- (ii) high levels of photosynthesis from the phytoplankton;
- (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]**