

**MARK SCHEME for the May/June 2010 question paper
for the guidance of teachers**

9693 MARINE SCIENCE

9693/03

Paper 3 (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.

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- 1 (a) (i) 2 × 2 of:
 nitrates/ammonium;
 used for amino acids/protein synthesis;
 magnesium;
 used for chlorophyll;
 phosphorous/phosphates;
 for DNA/cell membranes/ATP; [4]
- (ii) 3 of:
 cause strong wave action/currents;
 fronds are very long/figs quoted (100–120cm); allow large
 break easily (in strong waves/current);
 likely to uproot (by waves/current);
allow
 ref. to El Niño causing an increase in water temperature;
 kelp unable to survive at higher/temperatures above 20 °C;
 may also cause nutrient depletion/loss of deep water mixing; [3]
- (b) 2 of:
 idea of primary producers;
 idea of providing habitat/shelter;
 idea of oxygenation;
 idea of carbon sink; [2]
- [Total: 9]**
- 2 (a) movement of molecules from a high concentration to a low concentration/down
 a concentration gradient; do not allow along a concentration gradient [1]
- (b) (i) an increase in surface area results in an increase in volume;
 idea of a proportional relationship that reduces as surface area increases;
 e.g. volume increases more in proportion to the surface area [2]
- (ii) ref. to idea that
 greater size decreases surface area to volume ratio;
 larger volume may not receive sufficient oxygen/remove carbon dioxide; [2]
- (c) (i) 3 of:
 tentacles increase surface area;
 only two layers of cells/diploblastic so thin;
 water (with oxygen) can enter central cavity (so can diffuse from both sides);
 protrudes out of skeleton into water for maximum exposure;
 low oxygen demand as relatively small/has few cells/sedentary; [3]
- (ii) ref. to idea that
 many cells are a long way from the surface/contact with water;
 diffusion too slow (to reach these cells);
 high demand for oxygen as more active;
 impermeable body surface (restricts gas exchange); [3]

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- (d) 6 of:
mouth opens/water enters the mouth;
operculum valve closed;
buccal cavity/opercular cavity expand;
pressure falls (in buccal cavity);
so water enters/pulled into buccal cavity/pharynx; allow ref. to buccal pump
operculum contract;
opercular cavity reduced;
pressure rises;
operculum valve opens and water leaves; [6]

[Total: 17]

- 3 (a) (i) 2 of:
eggs released into sea/external fertilisation;
(free swimming) planktonic larvae;
undergo (several stages of) metamorphosis/development; [2]
- (ii) 1 of:
adult oyster is sessile, shrimp free living;
oyster often changes sex in breeding season/male then female/shrimps mostly parthenogenic AW; [1]
- (b) 2 of:
both are filter feeders/feed on small floating material;
water movement in intertidal/estuaries brings food (to filter mechanisms);
tidal flow constantly replenishes food supply; allow nutrient supply [2]
- (c) (i) 2 of:
temperature controlled for maximum growth;
food supplied;
salinity controlled for different stages;
allow ref. to growth enhancers/hormones; do not allow ref. to predators [2]
- (ii) 3 of:
ignore reference to advantages to the aquaculture system
mangrove has ready supply of larval shrimps;
feeding not necessary (so no pollution from excess food);
conserves/prevents development of mangroves (that act as storm shelters);
makes use of land not suited to other forms of agriculture;
maintains biodiversity;
allow ref. to chemicals that may be toxic/pollutant are not used [3]

[Total: 10]

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- 4 (a) (i) *question is about ecological damage not fishery conservation, so ignore answers that only refer to fishery protection*
3 of:
bottom trawlers drag substratum/sea bottom/damage corals;
(restriction) will help maintain habitat/conserves ecosystem;
enables survival of (non-target) organisms living in sea bottom;
allows escape of some bottom dwelling target fish/increases recruitment/prevents overfishing; [3]
- (ii) 3 of:
idea that gill nets are indiscriminate e.g. trap/entangle a range of organisms;
marine mammals/dolphins/whales/turtles/sea birds are trapped;
unable to get to surface to breathe/suffocate;
many species of turtles/whales endangered; [3]
- (iii) 3 of:
idea that drift nets are very large and indiscriminate;
includes many juveniles of target species/protected/endangered species;
will reduce (number thrown away) by catch;
should improve survival rate (as most throw backs die)/improve recruitment/allow fish stocks to recover; [3]
- allow points from (i) and (iii) in either section but only once*

- (b) 4 of:
idea of 'policing' difficult in large expanses of territorial waters;
ref. to cost/investment needed for a 'policing' system;
international waters not subject to restrictions;
dumping of illegal catch/fast freezing before landing/boarding inspections;
idea of political differences between countries/difficulty in reaching agreements;
illegal poaching/fishing methods in protected waters ignored by some countries;
fines imposed for illegal catches not paid/difficult to collect;
forged/illegal fishing permits (for use in protected waters of another country);
ref. to scientific research catches/pressure groups in the food industry;
idea of local resistance to restrictions/economic hardship due to restrictions; [4]

[Total: 13]

- 5 (a) (i) 2 of:
increasing population;
tourism increasing sewage;
unable to afford costs of treatment/old systems unable to cope or poorly maintained/no more sites available; [2]

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- (ii) 2 × 2 of:
 (detergent/soap) contains high levels of phosphate;
 can cause excessive growth of blue green algae (that produce toxins);
 sewage solids float in water/deposited on beach;
 ingested by filter feeders and can block gills;
 (solids) food source for detritus feeders;
 excessive population growth unbalances food web/chains;
 sewage contains urea/high levels nitrogen;
 encourages growth of algae that block light from bottom dwelling plants;
- allow sewage can block light from algae;
 (and) reduce photosynthesis; [4]

- (b) 3 of:
 untreated sewage contains disease organisms/parasites;
 shrimps (are filter feeders and so) accumulate these in their bodies;
 when eaten can cause diseases/examples;
 (sewage) may also contain high levels of toxins/examples from industrial sources that are mixed with the sewage/waste water; [3]

- (c) 3 of:
 antifouling paints contain mercury/PBC/TBT;
 toxic to marine organism/(TBT) causes imposex/description in molluscs);
 accumulate in food chains/(imposex) causes sterility/population loss;
 ref. to effects on secondary/tertiary consumers; [3]

[Total: 12]

- 6 (a) (i) 3 of:
 employment for local people;
 foreign currency into local/national economy;
 improved standard of living;
 better access to mainland;
 improved transport for fish export/travel;
 opportunity for locals to develop tourist attractions;
 ref. to tourist attractions/ecotourism; [3]

- (ii) 3 of:
 idea of interference with 'traditional way of life';
 e.g. young people not wanting fishing jobs, exposure to different cultural values, tourists in village
 noise from airport/road transport;
 pollution from additional sewage;
 pollution from engines boats in harbour/water sport centre;
 litter from tourists;
 loss of turtles due to noise/disturbance;
 damage to reef by collecting/killing reef organisms/increased boat traffic/increased pollution;
 damage/loss of marine ecosystem by building deep sea port; [3]

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- (b) 1 of:
 ref. to sewage treatment insufficient;
 ref. to well as only source of fresh water; [1]

[Total: 7]

- 7 (a) industrial application of biological processes;
 allow use of a biological process to solve a human/industrial problem [1]

- (b) (i) 1 of:
 tanker/oil rig accidents;
 ships 'washing out' tanks before docking;
 leaking from underwater wells/pipelines;
 ignore evaporation from tankers [1]

- (ii) some microorganisms can digest/decompose oil;
 broken down to harmless compounds; do not allow smaller particles [2]

- (iii) 2 of:
 stops the microorganisms washing away;
 stops the oil washing back out to sea;
 thin layer increases surface area speeding up digestion; [2]

- (iv) bacteria unable to survive without food supply; [1]

[Total: 7]