

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

9693 MARINE SCIENCE

9693/01

Paper 1 (AS 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) sun/light; [1]
- (ii) any 4 of:
 photosynthesis;
 carbon dioxide and water;
 glucose/sugar/named carbohydrate;
 oxygen;
 ref to chlorophyll; [4]
- (b) (i) phytoplankton → herbivorous zooplankton → carnivorous zooplankton;
 squid → king penguins/albatross;
- arrows in the correct direction; [2]
- (ii) (producer) phytoplankton;
 (primary consumer) herbivorous zooplankton/krill; [2]
- (c) less light penetrates/owtte;
 reduced population of phytoplankton;
 less food for krill, population falls;
 less food for fin whales, population falls; [4]
- (d) any 3 of:
 dead organisms/organic matter;
 reference to decay/decomposition/rotting;
 release of nutrients/ions/salts;
 used by phytoplankton for growth; [3]
- [Total: 16]**
- 2 (a) continuous/directional;
 movement of sea water; [2]
- (b) wind/upwellings/rivers; [1]
- (c) any 4 of:
 reference to wind;
 fall in temperature/cooling of sea water;
 evaporation of water;
 increase in salinity/owtte;
 increase in density*;
 dense water sinks below less dense;
- *accept once only with reference to temperature or salinity
 accept converse points [4]

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- (d) any 3 of:
 wind-driven;
 movement of dense water;
 movement of cooler water;
 towards the ocean surface;
 brings nutrients to the surface; [3]

[Total: 10]

- 3 (a) any 2 of:
 large group of fish;
 same species;
 swimming/moving together; [2]

- (b) any 5 of:

 reference to reproduction/mating;
 detail x 2;;

 reference to avoiding predators (sardines);
 detail x 2;;

 reference to feeding (tuna)
 detail x 2;; [5]

[Total: 7]

- 4 (a) any 3 of:
 wave action;
 action of other organisms/e.g;
 human activity/e.g. dredging
 storms;
 reference to acid; [3]

- (b) (i) 25 (%);; if answer incorrect allow 1 for correct working ($3/12 \times 100$) [2]

- (ii) any 3 of: (reef A)
 greater reduction in soft corals;
 greater increase in bare rock ;
 greater increase in rubble;
 greater increase in sand;
 greater decrease in massive corals;
 use of comparative figures for any point; [3]

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- (c) any 5 of:
reference to radioactive isotope carbon-14;
taken in during photosynthesis, passes through food chain;
reference to constant proportion of carbon-14 atoms to carbon-12 atoms;
reference to same as the proportion in the atmosphere;
reference to carbon-14 decays;
reference to half-life;
dead organisms stop taking in new carbon-14 atoms.
ratio of carbon-14 atoms to carbon-12 atoms in a living thing is a constant;
count number of carbon-14 atoms;
compare with original number;
calculate age;

[5]

[Total: 13]

- 5 (a) any 3 of:
reduced wind;
smoother seas;
increased rain over sea/less rain over land masses;
lack of/reduced upwelling;
lower water levels;
increased flow of warm water to east;

[3]

- (b) any 3 of:
lack of nutrients from deep water;
less phytoplankton;
less food for fish;
fish population reduced;

[3]

- (c) any 3 of:
higher water temperature kills zooxanthellae;
coral bleaching;
coral dies;
warmer water allows coral growth where it was not possible previously;

[3]

[Total: 9]

- 6 (a) very large ocean wave/body of water;
moving at high speed;

[2]

- (b) any 1 of:
underwater earthquake;
volcanic eruptions;
reference to movement of tectonic plates;

[1]

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- (c) (i) axes fully labelled;
appropriate scales;
accurate plots;
accurate line of best fit; [4]
- (ii) 145 +/- 2.5 km/hour or km h⁻¹; accept reading from candidate's graph [1]
- (iii) wave speed decreases; [1]
- (iv) increases; [1]
- (d) any 2 of:
loss of life;
damage to infrastructure e.g. road;
damage to buildings;
damage to environment;
loss of income e.g. fall in tourism;
salinisation of water supplies;
disease;
loss of habitats;
other valid point; [2]

[Total: 12]

- 7 (a) any 3 of:
low pressure;
with high winds;
thunderstorms;
cyclic winds;
heavy rain; [3]
- (b) any 2 of:
water temperature above 26 °C/warm water;
high level of evaporation of sea water;
spiral wind pattern;
low pressure;
heat/energy from condensation of water vapour; [2]
- (c) (i) 96; [1]
- (ii) increases;
by 56 / from 40 to 96; [2]

[Total: 8]