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

MARINE SCIENCE **9693/02**

Data-Handling and Free-Response **For Examination from 2008**
SPECIMEN MARK SCHEME

1 hour 15 minutes

MAXIMUM MARK: 50

This document consists of **4** printed pages and **0** blank pages.

1 **(a)** coral polyps/algae/zooxanthellae ;
they are, producers/autotrophs ;
can use inorganic nitrogen compounds ;

(b) decreases (with distance from reef crest) ;
relatively constant/fluctuates, to, 600/900 m, then falls ; [2]

(c) **(i)** support ;
something must be removing nitrate from the water ; [2]

(ii) only done twice/perhaps nitrate ions were at different depths/other ; [1]

(iii) take further sets of readings and average/take sets of readings at different depths/other ; [1]

(d) **(i)** loss of energy ;
ref to friction ; [2]

(ii) results show that *rate* of uptake appears to be greatest between 600 to 1200 m then falls;
lower (rate of) uptake, on reef flat/from 1200 m onwards, correlates with lower velocity (of water) ; [2]

[Total: 12]

2 **(a)** **(i)** salinity increases with greater distance from land ; [1]

(ii) rivers flow in from land ;
dilution ;
evaporation removes water (but not salt) ; [2 max]

(b) salinity affected by precipitation – evaporation ;
the greater this difference the lower the salinity/vice versa ;
difference (between p and e) is greatest at around 20º N or S/lowest near equator ; [3]

(c) type of sediment (require relatively small particle size) ;
depth of sediment (require fairly deep sediment) ;
exposure (require fairly sheltered shore) ;
temperature (tropical or subtropical) ; [2 max]

[Total: 8]

3 **(a)** position in a food chain/food web ;
example of marine producer and consumer ;

(b) example of predator and prey ;

population sizes may be related ;
predator population size smaller than prey population size ;

when predator relies heavily on one prey species ;
availability of prey may be a limiting factor (for predator population size) ;
oscillations described ;
one follows the other/not synchronised/time lag ;

population spatial distributions may be related ;
predator may follow prey ; [5 max]

(c) *tuna*
improves chances of finding prey/more individuals to sense prey ;
improves chances of catching prey ;
simultaneous attack may cause shoal of prey to break up ;

sardines
predator protection ;
odds of an individual fish being eaten are small(er) ;
improves chances of detecting predators/more individuals to sense predators;
'fear' chemicals secreted which warn all individuals ;
synchronised movements/appearance, confuses predators ;

either
better success at navigation (for migration) ;
easier to move through the water/slipstream effect ;
ref to reproduction, e.g. better chance of fertilisation ; [8 max]

[Total: 15]

4 **(a)** reef in open ocean ;
ring/horseshoe shape ;
enclosing lagoon ;

(b) coral colonizes in shallow water ;
around edge of volcanic island ;
forms fringing reef ;
island subsides ;
or sea level rises ;
reef grows, vertically/towards the surface ;
eventually island completely drowned ;
ref. to time scale (up to 30 m years) ; [max 5]

(c) deep drilling ;
ref to example e.g. Marshall Islands/Bikini Atoll/other ;

shows coral deposits on top of, volcanic rock/basalt ;
fossil corals dated ;
using carbon dating ;
description of carbon dating ;
corals lived around, 30 m/55 m, years ago ;

coral deposits now very deep ;
more than 1000 m ;
known to grow only 50 m below surface ;
so the top of the reef must have originally been much higher than now ;
this is evidence that sea level has risen/bedrock has eroded ;

soils on atolls relatively young ;
around 3500 years old ;
matches dates of post-glacial period ;
supports hypothesis that sea level fall exposed reef platform (to erosion) ; [max 8]

[Total: 15]