CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2013 series

9693 MARINE SCIENCE

9693/02 Paper 2 (AS Data-Handling and Free-Response), maximum raw mark 50

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.

Mark schemes should be read in conjunction with the question paper and the Principal Examiner Report for Teachers.

Cambridge will not enter into discussions about these mark schemes.

Cambridge is publishing the mark schemes for the May/June 2013 series for most IGCSE, GCE Advanced Level and Advanced Subsidiary Level components and some Ordinary Level components.

1 **(a)** highest percentage settled on sea grass leaves / eq ;
[accept: 'most settled on sea grass leaves' or an equivalent statement]

lowest on sand / similar results for crushed coral and mixture of crushed coral and sand ;

credit a manipulated quantitative comment (e.g. 9.1% more on sea grass leaves than on crushed coral) [3]

(b) Idea that sea cucumber larvae prefer sea grass leaves (as a substrate for settlement) ; [1]

(c) sea grass leaves provide source of food / nutrients ;

reference to protection from predators ; [2]

(d) set up containers of each species of sea grass ;(accept use of a choice chamber)

reference to replication ;

two stated variables controlled (e.g. light, temperature, salinity) ;
[two variables required for one mark]

stated number of larvae in each container ; [accept 'approximately 550']

left for stated time (e.g. 96 hours) ;

count numbers of larvae which have settled ;

calculate means (of replicates) ; [max 6]

[Total: 12]

2 **(a)** carbon dioxide ; [accept CO_2]

dissolves / reference to dissolution ;

reference to formation of HCO_3^- / H_2CO_3 ; [accept words] [max 2]

(b) (92.5 + 40 + 36) – (90 + 38 + 40) **or** 168.5 – 168 ;

= 0.5 ;

$\times 10^{12}$ kg (per year) ; [accept 5×10^{11} kg]
[correct answer with units gains 3 marks]

[could award the units mark if calculation is incorrect] [3]

(c) more carbon (dioxide) dissolves ;

(therefore) the concentration in (surface) water increases / eq ;

more carbon (dioxide) available for photosynthesis ;
of producers ;
[accept equivalents such as 'phytoplankton', 'aquatic plants', etc]

more food available to higher trophic levels / consumers / eq ;
[accept references to an increase in biomass / increase in primary production] [max 3]

[Total: 8]

3

(a) (i) **For Mutualism**
relationship between two different organisms / two (different) species ;

both benefit ;

e.g. corals and zooxanthellae / cleaner fish and grouper / eq ;

For symbiosis in a broader sense:

relationship between two different organisms / two (different) species ;

reference to parasitic / commensal / mutualistic ;

e.g. sea anemone and clown fish / remora and shark / etc ; [3]

(ii) parasite gains benefit / gains food / feeds on host ;

reference to harm to host ;

e.g. roundworms / fish lice / eq ; [3]

(b) increased hydrodynamic efficiency / reduced drag ;

can swim faster ;

save energy ;

time taken to find food is decreased / can find food more easily / eq ;

males and females shoal together ;

more likely to find a mate ;

increased chances of fertilisation ; [max 6]

(c) as the number of silver sprats increases / converse ;

there is more food available to tuna / converse ;

(therefore) numbers of tuna increase / converse ;

credit a graph showing cyclical changes in numbers of predators and prey ; [max 3]

[Total: 15]

4 (a) (coral reefs) absorb wave energy / dissipate wave energy ;

reduce wave action / reduce size or strength of waves / slow down waves ;

reduce erosion of shore / shore not washed away / not worn down ;

provide protection to coastal properties ;

reference to protection of ecosystems;
[accept a named example, such as mangroves]

safer for ships to anchor / moor / dock ; [max 5]

(b) reference to storms / cyclones / hurricanes / extreme wave action ;

breakage / eq of corals ;

exposure to air / sea level falls ;

causes drying ;

temperature change / global warming ;

reference to coral bleaching / loss of algae / loss of zooxanthellae ;

presence of predators ;
e.g. crown-of-thorns starfish /parrot fish ;

increased carbon dioxide / increased acidity / acid rain ;

dissolves coral skeleton ;

reference to garbage / pollution / run-off / sediments / (damage by) human activity ;

reference to physical damage to corals ; [5]

(c) reference to carbon taken up as corals grow ;

reference to ^{14}C ;

^{14}C slowly decays (to ^{12}N) ;

proportion of ^{14}C can be used to estimate age / ratio of ^{14}C **:** ^{12}C used to estimate age ;

reference to taking samples from different parts / depths of reef / cores / drilling ;

can find age at different depths ;

relate to growth of reef ; [max 5]

[Total: 15]