UNIVERSITY OF CAMBRIDGE INTERNATIONAL EXAMINATIONS

GCE Advanced Subsidiary Level and GCE Advanced Level

MARK SCHEME for the May/June 2008 question paper

9693 MARINE SCIENCE

9693/02 Paper 2 (AS Date-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.

All Examiners are instructed that alternative correct answers and unexpected approaches in candidates' scripts must be given marks that fairly reflect the relevant knowledge and skills demonstrated.

Mark schemes must be read in conjunction with the question papers and the report on the examination.

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1 **(a)** **(i)** red mangrove more abundant inland / black mangrove more abundant near water ;
only red present between 0 and 30 m / only black present between 50 and 100 m ;
both red and black present at 40 m ; [max 2]

(ii) at both sites it is found between 40 and 90 m ;
at Pedregal it is found at 0 m (where it is not found at Oxidacion) ;
at Oxidacion it is found at 100 m (where it is not found at Pedgregal) ;
the trees are taller at Oxidacion than at Pedregal ; [max 2]

(b) **(i)** yes, because at Oxidacion only black mangrove grows in regions of high(est) salinity ; [1]

(ii) 1 any two variables kept constant ; ; e.g. light, age, water supply, temperature
2 salinity varied ;
3 detail of range of salinity / how salinity is varied ;
4 statement of measurement taken ; e.g. height, mass, dry mass, leaf area
5 how often / when, measurement taken OR at least 10 of each species ;
6 description of how data would support or refute the hypothesis ; [max 4]

(c) **(i)** higher nutrient availability near water's edge because nutrients carried in by flowing water ;
(accept other suitable answer) [1]

(ii) higher nutrient availability at Oxidacion from shrimp farm waste ; [1]

(d) mangroves are a buffer against storm damage / reduce erosion / provide habitat for young shrimps ; [1]

[Total: 12]

2 **(a)** 1982 and 1983 ;
warm water at surface (at equator off South America) ; [2]

(b) in normal years, (trade) winds blow from southeast / in El Niño year, (trade) winds blow from southwest ;
in normal years, drag warm (surface) water westward / in El Niño year, drag warm (surface) water eastward ;
in El Niño year, the warm water prevents cold current flowing northwards along South American coast ; [2 max]

(c) normally southeast winds bring moisture-laden air to (eastern) Australia ;
in El Niño, trade winds blow away from Australia ;
no moist air over eastern Australia so less rainfall ; [2 max]

(d) normally cold current / Peru current, brings nutrient-laden water ;
warm water contains less nutrients (than cold);
less nutrients means fewer fish ; [2 max]

[Total: 8]

3 **(a)** organisms and their environment ;
including non-living environment ;
interacting with each other ; [2 max]

(b) 1 symbiosis / mutualism ;
2 corals are, animals / heterotrophic ;
3 zooxanthellae are single-celled, plants / organisms ;
4 photosynthesise ;
5 provide nutrients for coral animals ;
6 examples of nutrients (e.g. carbohydrates) ;
7 coral growth pattern provides large surface area ;
8 for maximum absorption of light (by zooxanthellae) ;
9 products of digestion by corals provide minerals / nutrients, for zooxanthellae ;
10 other valid points ; ; [7 max]

(c) 1 high productivity ;
2 grow in regions of warm temperature and high light intensity ;
3 very high efficiency of energy transfer between zooxanthellae and corals / producers and primary consumers ;
4 so can support many different, secondary consumers / predators ;
5 long food chains possible (because of lower energy losses) ;
6 relatively stable environment ;
7 many different niches ;
8 examples of niches / organisms that use them ; ;
9 other valid points ; ; [6 max]

[Total: 15]

4 **(a)** 1 (hydrothermal vents) occur along oceanic ridges ;
2 regions of, sea-floor spreading / formation of new crust ;
3 hot rocks near the surface ;
4 fractures in the rock ;
5 caused by contraction as rocks cool ;
6 high permeability near to active ridges ;
7 high pressures because of great depth of water ;
8 sea water moves down through crust ;
9 hot water is less dense so moves upwards ;
10 ref. to convection ;
11 hot water dissolves minerals from rocks ; [8 max]

(b) 1 no green plants / no photosynthesis ;
2 chemosynthesis ;
3 by bacteria / Archaea;
4 energy from minerals issuing from vent ;
5 e.g. sulphur compounds / other named ;
6 tubeworms contain chemosynthetic bacteria ;
7 tubeworms do not have, mouth / gut ;
8 e.g. *Riftia*, *Tevnia* , other named;
9 giant clams / *Calyptogena* / mussels / *Bathymodius* ;
10 clams contain chemosynthetic bacteria ;
11 crustaceans / shrimps ;
12 scavengers / feed on other organisms ;
13 ref to other species, e.g. anemones, sponges ; [7 max]

[Total: 15]