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

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UNIVERSITY of CAMBRIDGE
International Examinations

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]