MARK SCHEME for the May/June 2010 question paper

for the guidance of teachers

9693 MARINE SCIENCE

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

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1 **(a)** reference to variables;
hydrogen sulfide/high temperature, could also affect organisms;
only effect of carbon dioxide is being investigated; [max 2]

(b) **(i)** 1 pH reduced/acidity increased, close to vents;
2 affects pH up to, 130/140, m from vent;
3 reduces pH (from above 8) to 6.3;
4 maximum effect/minimum pH, at 70 m from vent; [max 2]

(ii) coralline algae absent closer than, 140/150, m to vent;
because skeleton dissolved; [2]

(iii) sea urchins low in numbers when far from vent;
where pH is normal/where vent has no effect on pH; [2]

(c) **(i)** 1 large/stated, number of *Posidona* plants; (*min. 10*)
2 any two variables kept constant; (e.g. light, age, pH, temperature)
3 coverage with coralline algae/substitute for algae, varied;
4 detail of range of coverage; (min 3 values)
5 statement of measurement taken; (e.g. number of shoots, dry mass, leaf area, leaf length)
6 how often/when, measurement taken; (run for at least one week)
7 description of how results would support (not prove) or refute the hypothesis; [max 5]

(ii) reference to carbon dioxide (concentration);
hypothesis states predicted effect of change in carbon dioxide concentration on growth rate;
(e.g.: rate of growth increases as carbon dioxide concentration increases)

or

reference to pH (in relation to *Posidona*, not coralline algae);
hypothesis states that, photosynthesis/growth, takes place faster at, low pH/neutral pH; [2]

[Total: 15]

2 **(a)** four; [1]

(b) correct use of value of 90 and efficiency of 10 % in calculation;
(divided by 2 and) answer 4.5; [2]

(c) allow in terms of either carbon or energy

1 losses in respiration (of phytoplankton)/as heat; (assume in phytoplankton unless otherwise stated)
2 not all phytoplankton eaten;
3 not all material in phytoplankton, digested/absorbed *or* some ingested phytoplankton lost in faeces (of herbivores); [max 2]

[Total: 5]

3 (a) 1 suitable organisms named, e.g. coral-eating butterfly fish and tuna; (do not give this mark for non-marine organisms)

2 niche is the role of an organism in an ecosystem; (accept other suitable definitions, e.g. the range of environmental space occupied by a species) (not 'job' or 'duty, or 'purpose')

3 one feature of specialised niche described – e.g. narrow food requirements, specific habitat;

4 second feature of specialised niche described, or good example related to a particular organism;

5 one feature of generalised niche described – e.g. wide range of food taken, wide range of habitat;

6 second feature of specialised niche described, or good example related to a particular organism; [max 5]

(b) 1 high biodiversity means many different <u>species</u> (within one area/one ecosystem/one habitat);

2 each (species) has its own niche/idea of specialisation;

3 if niches of two species entirely overlap then one will become extinct/idea of competitive exclusion;

4 reference to (interspecific) competition;

5 narrow niches reduce degree of overlap;

6 narrow niches reduce competition;

7 reference to example of marine ecosystem with high biodiversity (e.g. coral reef);

8 reference to organisms with narrow ecological niche (other than the one used in **(a)**);

9 reference to fundamental niche and realised niche;

10 reference to why many possible niches in area with high biodiversity;

11 high biodiversity often in area of high productivity; [max 5]

(c) 1 example of <u>unstable</u> environment, e.g. sand on a reef slope; (do not credit extreme environment or a normal littoral environment)

2 reference to <u>changing</u> physical factors / example of <u>changing</u> factor;

3 reference to difficulty of survival in stated conditions;

4 need for (specific) adaptations/few species possess suitable adaptations;

4a reference to *r*-species/opportunistic species;

5 environment can support only low numbers of organisms;

6 reference to short food chains/low productivity;

7,8 attempt to give the other point of view (e.g. simple statement that it is not always the case that unstable environment has low biodiversity, e.g. of environment where this is not true, reasons why not always true); [max 5]

(max 3 if entire answer is about an extreme rather than an unstable environment)

[Total: 15]

4 **(a)** 1 population is all the organisms of one <u>species</u>;
        2 able to interbreed with one another;
        3 community is all the organisms of different <u>species</u>; (allow 'different populations' if population already correctly defined in terms of species)
        4 (for either) living in the same place (at the same time); [max 3]

    (b) NB question is specifically about sandy shores, not a general littoral environment
        Ignore lists – question is 'Describe'
        1 sand particles, non-cohesive/shifting;
        2 (so) not possible to live permanently on the surface;
        3 poor water-holding capacity;
        4 (so) tendency to dry out between high tides;
        5 good aeration (at low tide);
        6 most animals live in burrows;
        7 reference to at least three animal species that live on sandy shore;
        8 few/no, seaweeds because no firm substrate;
        9 plants adapted to dry conditions live above tideline;
      10 allow one mark for general point not specific to sandy shore, e.g. temperature higher at low tide than high tide;
      11 reference to human impact, e.g. recreational activities on sandy shore; [max 6]

    (c) 1 erosion is the removal of, rock waste/particles; (do not allow if confused with weathering)
        2 sedimentation is the dropping of, rock waste/particles;
        3 rocky shore develops where erosion is, greater than deposition/high;
        4 caused by, fast/strong, water movements;
        5 or where rocks are hard/resistant to weathering;
        6 muddy shore develops where sedimentation is greater than erosion/high;
        7 caused by, slowing down of water/low wave energy;
        8 reference to relationship between rate of water flow and ability to carry sediment of different sizes;
        9 good detail anywhere; [max 6]

[Total: 15]