MARINE SCIENCE

Paper 9693/01
AS Structured Questions

General comments

Marine Science was examined for the first time this year and the few candidates entered showed evidence of being well prepared and were able to tackle the paper competently.

The candidates attempted all parts of all questions and there was no evidence that candidates were having difficulty finishing the paper in the allotted time.

Good answers were seen in some parts of the paper, for example **Question 2**.

Nevertheless, there were some areas where the candidates lacked basic knowledge and understanding, and found the concepts involved in the questions difficult to comprehend, for example **Question 4**.

Comments on specific questions

Question 1

(a) (i) Phytoplankton, rather than sunlight, was one of the responses given to this question.

(ii) The extraction of an appropriate food chain from the food web was well answered.

(iii) While candidates gained 1 of the 2 marks for referring to the transfer of energy from one trophic level to another, the transfer of biomass was not appreciated.

(iv) Candidates were able to construct a pyramid of biomass, although in one instance labels were absent.

(b) Candidates understood that a fall in the number of leopard seals would be unlikely to affect the killer whales, as they would be able to feed on other organisms.

(c) The calculation of the energy input to trophic Level 2 that becomes part of the biomass at trophic Level 3 was a relatively straightforward calculation of which one of the candidates was capable.

(d) The interpretation of the graphical data in this part of the question and the use of the data to explain the changes in productivity was excellent. Candidates appreciated that the productivity would fall from September to October due to reduced light leading to reduced photosynthesis, with a consequent fall in the number of producers and primary consumers.

Question 2

(a) Vague responses, such as ‘make food’ were not acceptable as a response to this question which required a more precise explanation of photosynthesis. References to the energy source, chlorophyll and carbon dioxide and water as well as the products were valid scoring points.

(b) There was evidence of a good understanding of the concept of *succession.* References to replacement of communities or species, over time, in response to changes in the environment and references to competition for light, nutrients or space were all valid scoring points.

A reference to named organism such as Tevnia, Rifta, bacteria, and mussels found at hydrothermal vents were acceptable examples.

Question 3

(a) (i) Process **1** shown in Fig. 3.1 was correctly identified as runoff, and process **2** as uptake or absorption.

(ii) The response required was a reference to the phytoplankton using nitrates to produce amino acids or proteins.

(iii) A reference to bacteria as being the organisms involved in process **3** was required. Candidates need to be careful if specifying a type of bacteria, as many types are not involved in the particular process shown on the diagram.

(iv) This question was intended to test candidate's ability to apply their knowledge and understanding to an unfamiliar situation as shown in Fig. 3.1. The **X** on the diagram illustrated the harvesting of fish.

(b) (i) Candidates gained the descriptive marks in this question but not those for the explanation. What was required was a description of how the concentration of ammonia changed between days 0 and 20, i.e. an increase followed by a decrease and an explanation for these changes. A reference to correct changes expressed as numbers was allowed for a mark. However, candidates were unable to give an explanation for the changes and were unable to interpret the graph and apply their knowledge and understanding in order to see the link between the changes in the concentration of ammonia, nitrite and nitrate. The initial increase was a result of excretion by the fish, and the subsequent decrease due to the conversion of the ammonia to nitrite.

(ii) Responses to this question followed the same pattern as the previous one, i.e. a correct description of the changes but no valid explanation.

(iii) It was realised that the rapid fall in the nitrate concentration was due to rapid plant growth.

Question 4

(a) This was very well answered by one candidate who clearly had been well prepared for this aspect of the syllabus and was able to give a clear and accurate description of atoll formation.

(b) The methods used to reconstruct the history of coral reefs, i.e. carbon dating, drilling and geomorphological analysis were well known by one candidate.

(c) Suggestions for the reasons for the use of artificial reefs including prevention of erosion, providing anchorages, protection of harbours, provision of new habitats for marine organisms, increase in fishing areas and references to tourism were all considered as valid responses to this question

Question 5

(a) (i) This question was not well answered. Errors included use of an inappropriate scale, omission of an axis label, and plotting of incorrect data.

(ii) This section of the question was also poorly answered and the only factor affecting the chemical composition of sea water that appeared to be known was runoff. Other factors such as dissolution, evaporation and volcanic activity were not referred to.

(b) (i) The calculation based on the graph readings was answered correctly.

(ii) This 'suggest' type of question was well answered. These types of questions imply that there is no one correct answer, or that the candidate needs to apply their knowledge and understanding to unfamiliar contexts. The reasons and explanations given for the change in salinity shown on the graph such as increased runoff and increased rainfall were both considered by the Examiners as valid responses to the question.

Question 6

(a) (i) This part of the question was well answered and the readings from the graph and the relatively simple calculation proved to be easy.

(ii) This was a more difficult calculation based on the data in the graph and was not as well answered as the previous one.

(iii) Some aspects of the changes in the percentage cover of coral and the relative numbers of starfish were described accurately, but the possible explanation that the starfish was a predator of the coral was not appreciated.

(iv) The use of quadrats, sampling in an appropriate area over a time period with repeats was well understood in some cases but not in others. Responses such as 'checking the population' were too vague to merit any credit.

(b) An appreciation of the fact that one organism benefits and one is harmed was evident in answers, but references to a named example were either missing or incorrect. Candidates need to be aware of the examples quoted in the syllabus.

MARINE SCIENCE

Paper 9693/02
AS Data Handling and Free Response

General comments

This was the first time that this paper has been sat, and the entry was small.

The candidates were able to make good attempts at all of the questions. One candidate appeared to run short of time, but did still managed to complete answers to all questions.

Comments on specific questions

Section A

Question 1

This question provided extensive information and data about two mangrove swamps, in relation to shrimp farming. Candidates were asked to work through this information, and then to use this and their own knowledge to answer a range of questions.

(a) The question began by asking candidates to look very carefully at the information provided in two graphs, and to make comparisons between different sets of data.

(i) This asked about the *distribution* of the two types of mangroves at one of the sites. Not all the candidates recognised this, but others approached the question entirely appropriately. One mentioned that red mangroves are more abundant inland, and that black mangroves are more abundant near open water. It is often useful to begin this type of question with a generalisation such as this, before looking in more detail about precise distributions. Candidates should always try to use figures in their answers, and to use unambiguous wording.

(ii) A similar task was set here, but this time comparisons were to be made between two graphs. Answers were not always sufficiently precise. For example, a statement that 'there are differences in height' was not rewarded; the answer needed to state that the trees were taller at Oxidacion then at Pedregal.

(b) (i) All candidates recognised that the data did support the hypothesis, but most were unable to state clearly why they thought this. For example, they needed to say that the evidence came from Oxidacion and that here only the black mangroves grew in the regions of high salinity.

(ii) There was a wide range of answers to this question. Candidates did generally manage to imply the variable that they will change (their independent variable), in this case salinity. However, only one candidate mentioned other variables that would need to be controlled (such as light, temperature or age of the trees), or what they would measure (for example, rate of growth, colour of leaves) – despite the fact that these components of the investigation were specifically asked for in the question.

(c) This section was quite demanding in terms of bringing together information – in particular the statement above the graph explaining the causes of a high C:N ratio.

(i) Some candidates correctly stated that the contact of the swamp with the sea would provide nutrients, resulting in a lower C:N ratio.

(ii) Here, candidates needed to remember that waste from the shrimp farm flows into Oxidacion.

(d) There were several possible answers here, but the only correct one seen was the provision of shelter for (young) shrimps. Candidates should also be aware of the role of mangroves in providing a buffer against storm damage and reducing erosion.

Question 2

(a) This required the use of information from two figures, unless candidates had sufficient recall of the circumstances of an El Nino event to be able to work out the answer from the temperature chart alone. Both years were expected for one mark, plus a supporting statement for the second mark. This was well answered.

(b) Answers to this question showed poor understanding of the role of winds in an El Nino event. Some left it blank, while others described the winds as bringing up nutrients from the depths. One mark was available for stating the difference in wind direction between normal and El Nino years – information which was provided on one of the diagrams.

(c) This was better answered in general, as some candidates understood that rain is brought by winds carrying moisture-laden air and applied this knowledge to the information provided. Others incorrectly suggested that it was *currents* that affected the rainfall.

(d) The lack of nutrients off the western coast of South America in an El Nino year was well known, but candidates were not able to relate this to the distribution of warm and cold currents.

Section B

Question 3

(a) Candidates did appreciate that an ecosystem includes organisms and their environment, but they tended not to state that this includes *non-living* components of the environment, nor that all of these components interact with one another.

(b) This was rather surprisingly poorly answered. Candidates did know that there is a symbiotic (mutualistic) relationship between coral animals and zooxanthellae, and that these photosynthesise, but most had little to say beyond this. One stated that corals had no source of food other than what they gained from the zooxanthellae, despite drawing a diagram of a coral polyp showing tentacles and 'stingers'.

(c) Here again, answers tended to be very shallow, with one candidate making no attempt. The only relevant point seen was that the reef is a relatively stable environment. A wide range of marking points was available and examiners were, as always, ready to accept other sensible suggestions provided by candidates. Answers needed to discuss why there is such a large number of *different species* associated with coral reefs, not simply why there are large *numbers* of organisms there.

Question 4

(a) This asked candidates for a straightforward description of the formation of hydrothermal vents. The answers ranged from very good to very poor. Some marks were awarded to labelled diagrams.

(b) This elicited some good answers, with excellent descriptions of the ecosystem found at hydrothermal vents. All knew that the food web is based on chemosynthetic bacteria, and some provided quite full explanations of the way in which their activities support a range of other organisms, some of which were correctly named.