

CANDIDATE
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MARINE SCIENCE

9693/01

Paper 1 AS Structured Questions

October/November 2016

1 hour 30 minutes

Candidates answer on the Question Paper.

No Additional Materials are required.

READ THESE INSTRUCTIONS FIRST

Write your Centre number, candidate number and name on all the work you hand in.

Write in dark blue or black pen.

You may use an HB pencil for any diagrams or graphs.

Do not use staples, paper clips, glue or correction fluid.

DO NOT WRITE IN ANY BARCODES.

Answer **all** questions.

Write your answers in the spaces provided on the Question Paper.

Electronic calculators may be used.

You may lose marks if you do not show your working or if you do not use appropriate units.

At the end of the examination, fasten all your work securely together.

The number of marks is given in brackets [] at the end of each question or part question.

This document consists of **14** printed pages and **2** blank pages.

Answer **all** the questions in the spaces provided.

- 1 (a) Fig. 1.1 shows a food chain at a hydrothermal vent and a food chain in the surface waters of the ocean.

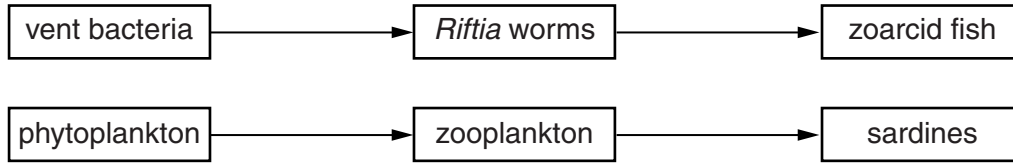


Fig. 1.1

- (i) With reference to Fig. 1.1, explain the meaning of each of the following terms.

producer

.....

consumer

..... [2]

- (ii) Compare the ways in which vent bacteria and phytoplankton make energy available to these food chains.

.....

.....

.....

.....

.....

..... [3]

- (b) List **three** reasons why phytoplankton cannot survive at a hydrothermal vent.

1

.....

2

.....

3

..... [3]

[Total: 8]

2 (a) Outline the theory of plate tectonics.

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..... [4]

(b) Explain how tectonic processes lead to the formation of mid-ocean ridges.

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.....
..... [4]

(c) Name the type of plate tectonic boundary at which each of the following are formed.

- (i) earthquakes [1]
- (ii) tsunamis [1]
- (iii) volcanoes [1]

[Total: 11]

3 (a) Fig. 3.1 shows a food web from a sandy shore.

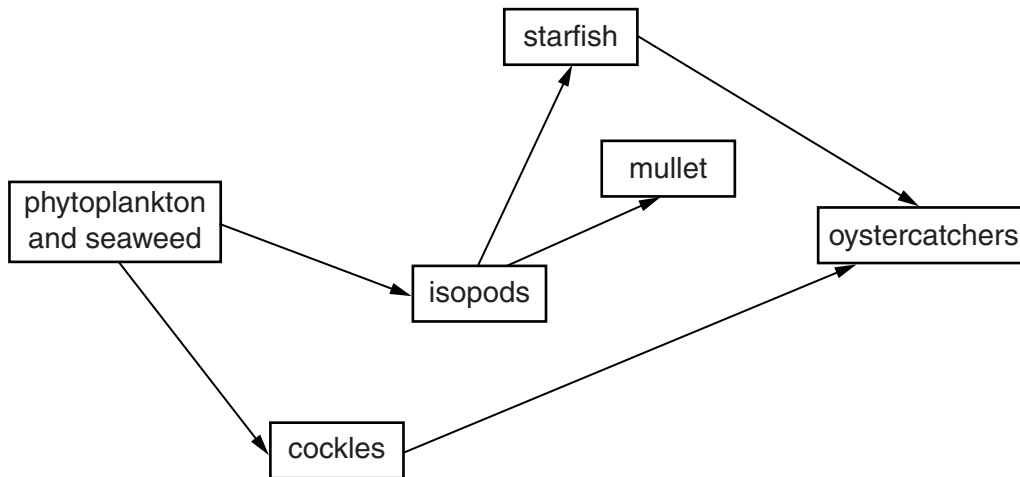


Fig. 3.1

(i) With reference to Fig. 3.1, explain what is meant by the term *trophic level*.

.....
.....
.....
..... [2]

(ii) Draw and label a pyramid of energy for the food chain shown.

phytoplankton and seaweed → isopods → starfish → oystercatchers

[2]

(iii) With reference to Fig. 3.1, explain what is meant by the term *community*.

.....
.....
.....
..... [2]

(b) Table 3.1 shows the geological conditions that contribute to the formation of different types of shore, and some information about the communities found there.

Table 3.1

shore type	geological conditions	community
	sedimentation of silt, little erosion	mangroves
sandy	sedimentation of sand, some erosion	burrowing animals
rocky		

(i) Complete Table 3.1. [3]

(ii) Fig. 3.2 shows a littoral environment.

Suggest **three** environmental factors that influence communities in this environment.



Fig. 3.2

1

.....

2

.....

3

..... [3]

[Total: 12]

4 (a) Fig. 4.1 shows a water column in the open ocean.

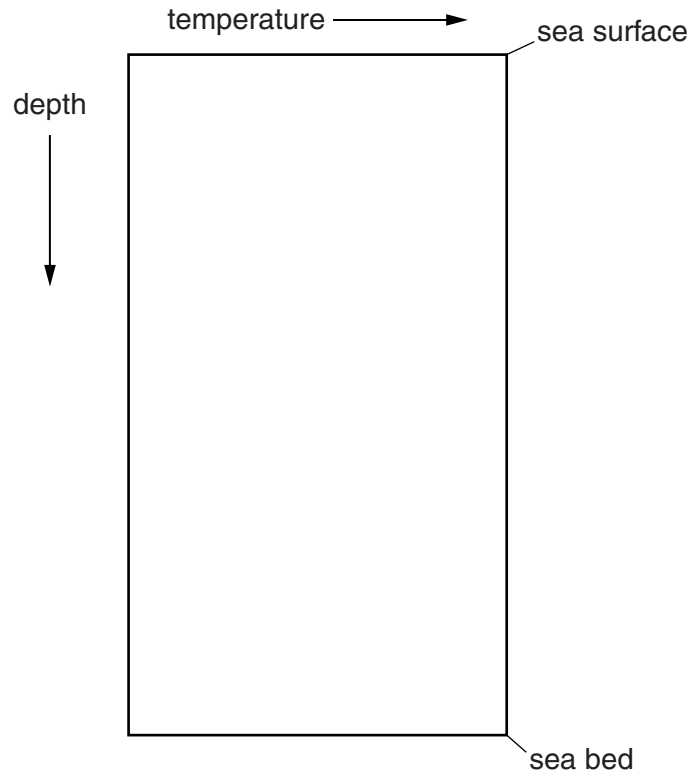


Fig. 4.1

- (i) On Fig. 4.1, sketch a line to show how the temperature of the water changes from the sea surface to the sea bed. [4]
- (ii) On Fig. 4.1, draw and label the position of the thermocline. [1]

(b) Describe and explain the relationship between salinity and depth in the open ocean.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

(c) (i) List **two** factors that cause mixing of the layers in the water column in the open ocean.

1

2 [2]

(ii) Explain why mixing of the layers in the water column increases the productivity of marine producers.

.....

.....

.....

.....

..... [2]

[Total: 12]

- 5 (a) Table 5.1 shows the estimated value, in millions of US dollars, of four factors associated with six coral reef locations.

Table 5.1

reef location	total reef area / km ²	value of factor / millions of US dollars			
		fisheries	coastal protection	tourism	biodiversity
Southeast Asia	89 000	2281	5407	4872	458
Caribbean	19 000	391	720	663	79
Indian Ocean	54 000	969	1595	1408	199
Pacific Ocean	67 000	1060	579	269	172
Japan	3000	89	268	779	529
Australia	49 999	858	629	1147	3645

- (i) State the relationship between reef area and fisheries value.

.....
 [1]

- (ii) Suggest a reason for this relationship.

.....
 [1]

- (iii) Suggest **two** reasons why the reefs around Japan have a higher tourism value than the reefs in the Pacific Ocean.

1

 2
 [2]

(iv) In Table 5.1, the biodiversity of the reefs is allocated a value in millions of US dollars.

Suggest why biodiversity is considered to have an economic value.

.....
.....
.....
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..... [2]

(b) Explain how reefs provide protection to coasts.

.....
.....
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.....
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..... [3]

[Total: 9]

6 Fig. 6.1 shows a butterfly fish.



Fig. 6.1

Butterfly fish are examples of organisms that occupy a specialised niche. Some marine organisms occupy general ecological niches.

(a) Using a named example, explain what is meant by the term *general ecological niche*.

.....

.....

.....

.....

..... [2]

- (b) Blast fishing or dynamite fishing is the practice of using explosives to stun or kill schools of fish for easy collection.

Table 6.1 shows the number of species of butterfly fish on seven coral reefs in Sabah, Malaysia. The amount of damage caused by blast fishing was also assessed on each reef, and scored on a scale of 0 to 4, with 0 indicating no damage and 4 indicating severe damage.

Table 6.1

reef	number of species of butterfly fish	damage score
A	38	0
B	16	1
C	22	1
D	12	2
E	16	3
F	4	4
G	2	4

- (i) Describe the relationship between the number of species of butterfly fish on the reef and the amount of damage sustained by the reef.

.....
 [1]

- (ii) Suggest an explanation for the relationship you have described in (i).

.....

 [2]

- (iii) Suggest further data scientists would need to collect in order to be certain that blast fishing is directly responsible for the relationship described in (i).

.....

 [2]

[Total: 7]

7 (a) Fig. 7.1 shows the cycling of magnesium in the marine environment.

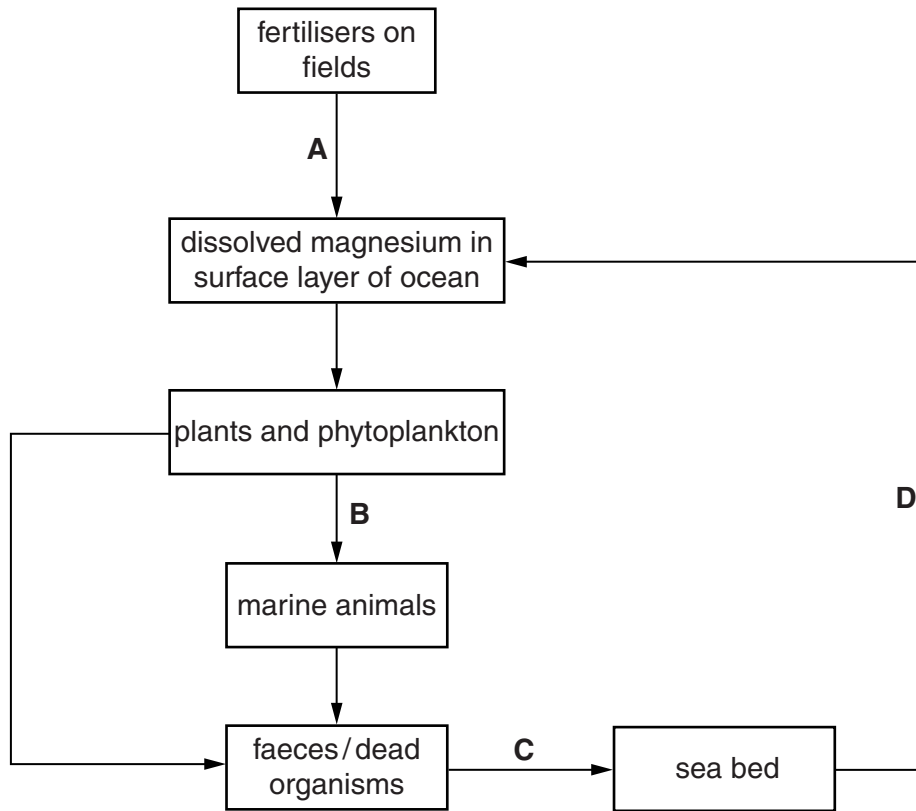


Fig. 7.1

(i) Name processes **A**, **B**, **C** and **D** shown on Fig. 7.1.

A

B

C

D

[4]

(ii) State a biological use of magnesium.

.....

..... [1]

- (b) Complete Table 7.1 to show **two** nutrients, other than magnesium, and their biological use in marine organisms.

Table 7.1

nutrient	biological use

[4]

[Total: 9]

8 With reference to specific examples from the marine environment, explain the meaning of each of the following terms.

(a) *parasitism*

.....
.....
.....
.....
..... [2]

(b) *mutualism*

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..... [2]

(c) *succession*

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.....
.....
..... [3]

[Total: 7]

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