Cambridge International AS & A Level

Cambridge International Examinations
Cambridge International Advanced Subsidiary and Advanced Level

CANDIDATE NAME

CENTRE NUMBER | | | | | |

CANDIDATE NUMBER | | | | |

6671653866

MARINE SCIENCE **9693/01**

Paper 1 AS Structured Questions **May/June 2017**

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 **17** printed pages and **3** blank pages.

CAMBRIDGE International Examinations

1 **(a)** Fig. 1.1 shows some geological features of the sea floor.

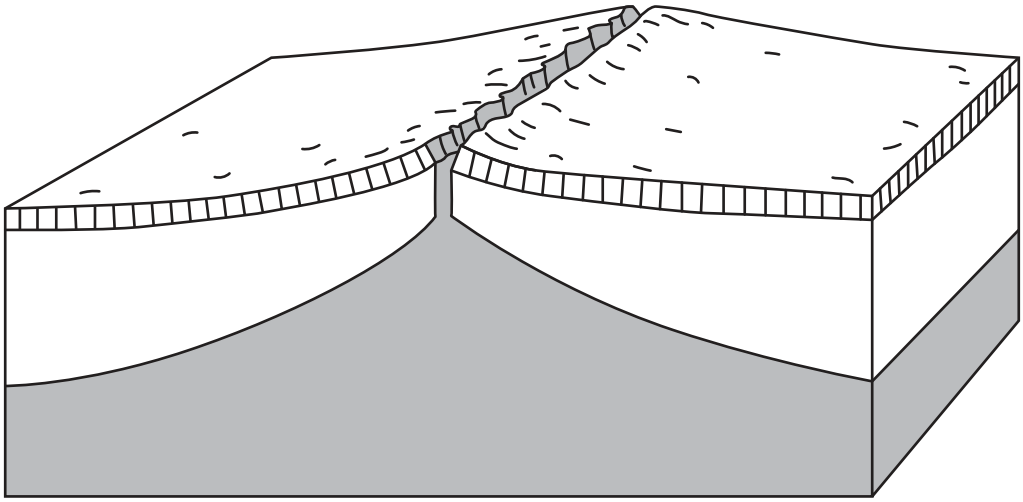

Fig. 1.1

(i) On Fig. 1.1 use label lines to label the following structures:

- a tectonic plate
- magma
- a mid-ocean ridge.

[3]

(ii) Draw **two** arrows on Fig. 1.1 to show the direction in which the sea floor is moving. [1]

(b) Table 1.1 lists three marine geological features.

Complete Table 1.1 by naming the type of tectonic plate boundary at which each feature is formed.

Table 1.1

geological feature	type of plate boundary
ocean trench	
volcano	
hydrothermal vents	

[2]

(c) Explain how tectonic processes lead to the formation of each of the following.

(i) a tsunami .....

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.....[4]

(ii) an underwater volcano .....

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.....[4]

[Total: 14]

2 **(a)** Fig. 2.1 shows some green algae which are found in the tissues of many species of coral. These algae have a mutualistic relationship with the coral.

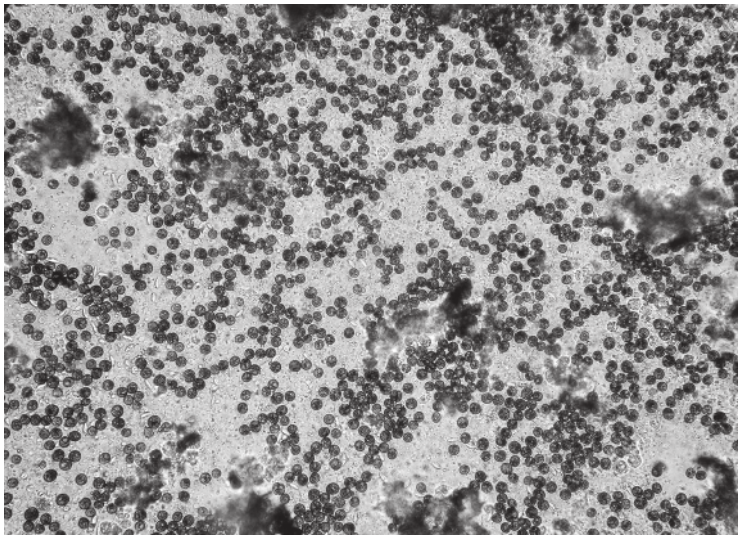

Fig. 2.1

(i) Name this type of alga.

.....[1]

(ii) Describe the mutualistic relationship between these algae and the coral.

.....

.....

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.....[3]

(b) Explain why corals containing algae grow best in shallow water with little or no sediment.

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.....[3]

(c) Coral reefs are threatened by erosion.

Table 2.1 shows information about coral reef area in three regions.

Table 2.1

region	total reef area /km^2	percentage of reef area threatened in 2011	estimated percentage of reef area threatened in 2030
Atlantic	25 849	75	90
Australia	42 315	14	90
South East Asia	69 637	94	99

(i) Describe the data shown in Table 2.1.

.....

.....

.....

.....[2]

(ii) Outline the possible effects of a decrease in reef area on human coastal communities.

.....

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.....

.....[2]

[Total: 11]

3 **(a)** State what is meant by the term *salinity*.

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.....

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.....[2]

(b) Fig. 3.1 shows the relationship between temperature, salinity and density of seawater.

Salinity is measured in parts per thousand, ‰.
The figures shown on the lines show the density in g cm^{-3}.

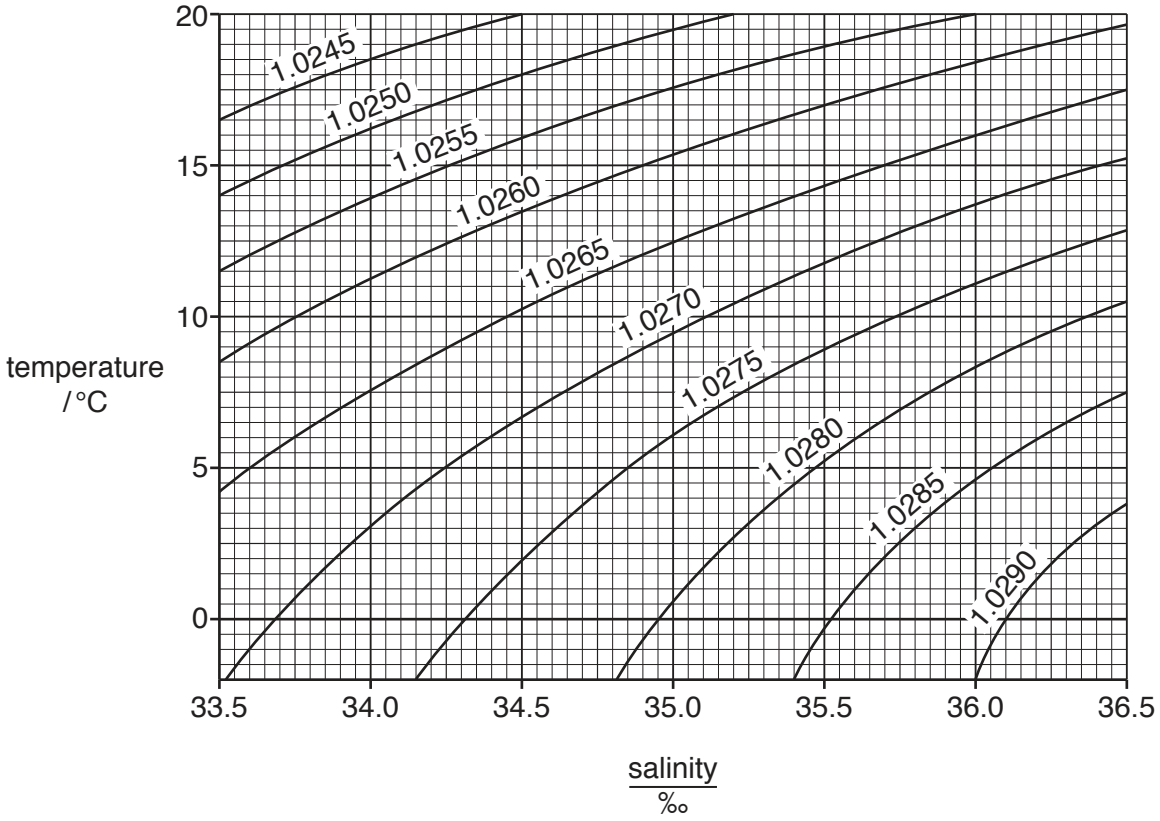

Fig. 3.1

(i) Use Fig. 3.1 to find the density of seawater at a temperature of 17 °C and a salinity of 35.5 ‰. Include the unit.

.....
[2]

(ii) Use Fig. 3.1 to describe the relationship between:

temperature and density .....

.....

salinity and density. .....

.....

[2]

(c) State **two** factors, other than temperature, that would cause the salinity of seawater to increase.

1 .....

.....

2 .....

.....

[2]

[Total: 8]

4 **(a)** Fig. 4.1 represents a tide cycle for an area which has two high tides and two low tides each day.

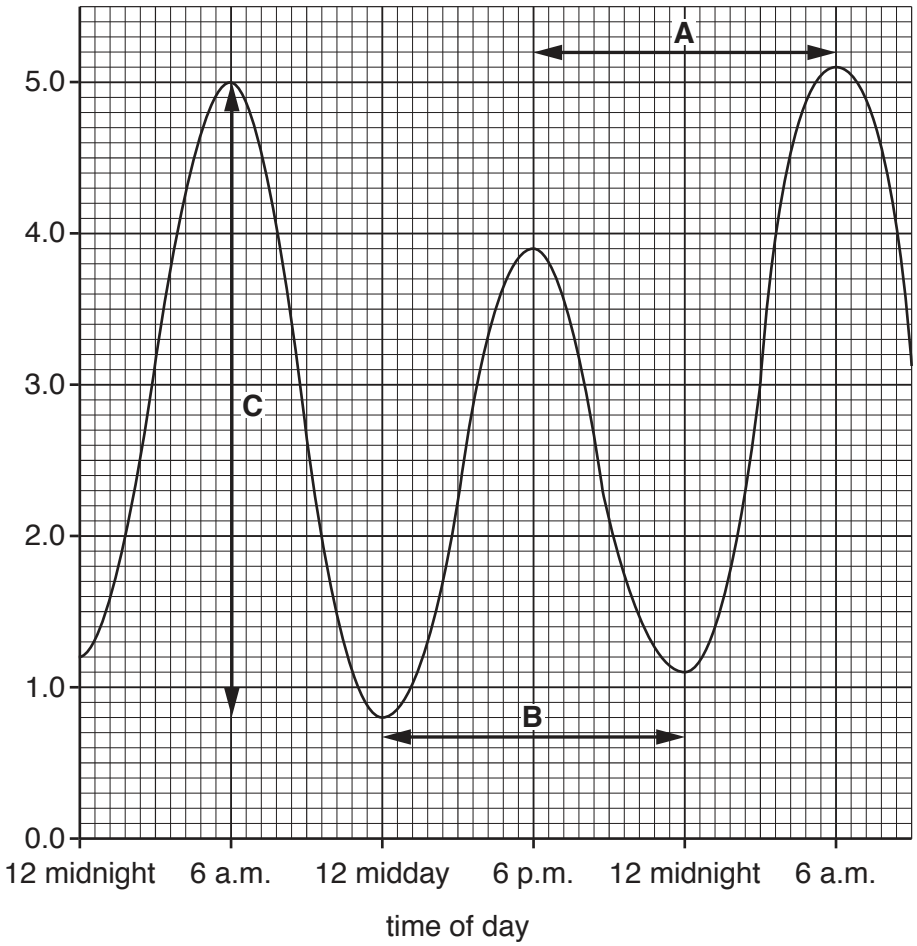

Fig. 4.1

(i) State the label and units that should be shown on the *y*-axis.

.....[2]

(ii) State the length of time between each low tide.

..... hours
[1]

(iii) State which line, **A**, **B** or **C**, represents the tidal range.

.....[1]

(iv) On Fig. 4.1, sketch a line to show the effect of an increase in air pressure on the tidal cycle. [2]

(b) Explain how the alignment of the Moon and Sun affect the tidal range.

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.....

.....

.....[3]

[Total: 9]

5 Fig. 5.1 shows part of a kelp forest.

Fig. 5.1

Kelp are large brown seaweeds that live attached to the rocky sea bed.
Kelp forests occur at and below low tide level in cold, nutrient-rich water. The kelp grow together in large numbers to form dense, underwater forests which reach from the sea bed to the surface.

Fig. 5.2 shows a part of a food web in a kelp forest.

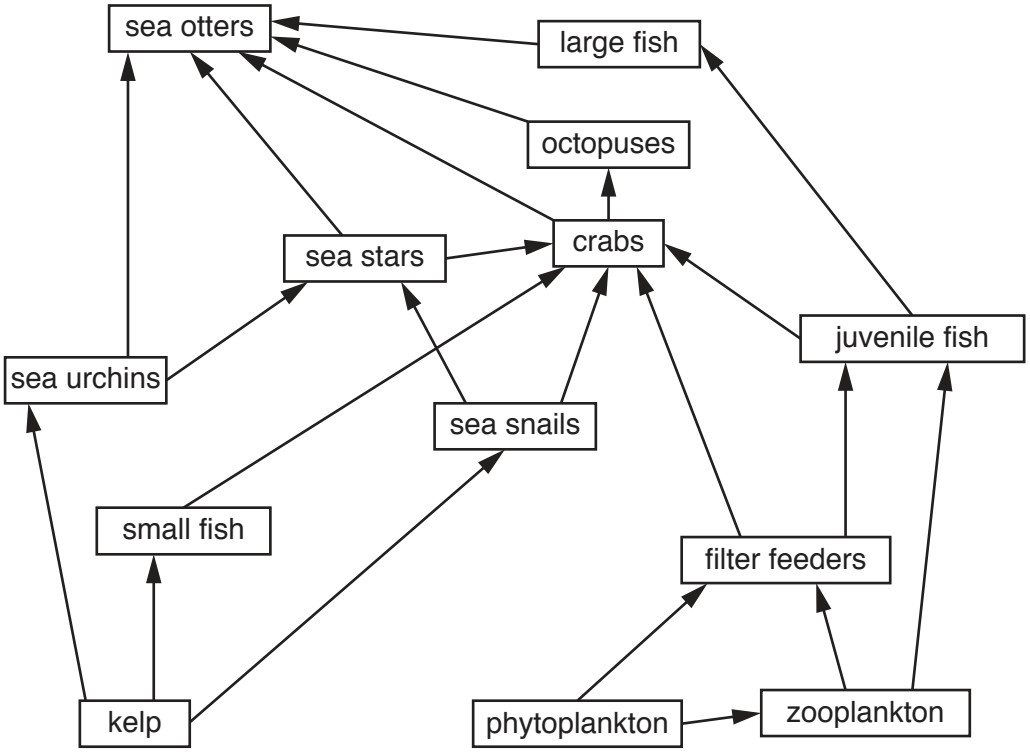

Fig. 5.2

(a) In some parts of the world large areas of kelp forest are harvested by humans.

Suggest **and** explain how this could affect the population of crabs.

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.....

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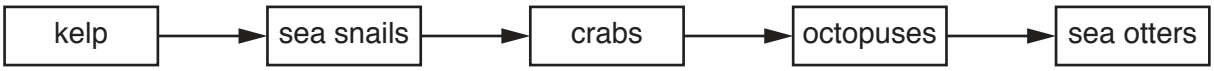
.....

.....

.....[3]

(b) Sketch a pyramid of energy for the following food chain.



[2]

(c) Fig. 5.3 shows a food chain and the energy, in arbitrary units (a.u.), present at each trophic level.

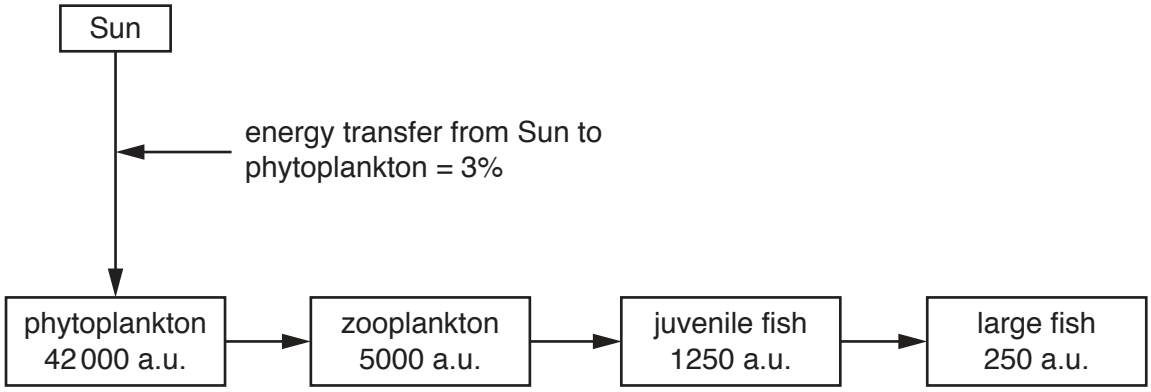


Fig. 5.3

(i) Of the light energy from the Sun that falls onto the water, only 3% becomes incorporated into the phytoplankton.

Suggest **three** reasons why only 3% of the energy is incorporated into the phytoplankton.

1 .....

.....

2 .....

.....

3 .....

.....

[3]

(ii) The efficiency of energy transfer between trophic levels is calculated using the equation:

$$\text{efficiency} = \frac{\text{energy available after the transfer}}{\text{energy available before the transfer}} \times 100$$

Calculate the efficiency of the energy transfer between the zooplankton and the juvenile fish.

Show your working.

.....%

[1]

(d) Suggest how upwelling could increase the productivity of the food web in Fig. 5.2.

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.....[4]

[Total: 13]

6 **(a)** State **one** biological use for each of the following nutrients.

(i) nitrogen .....

.....[1]

(ii) carbon .....

.....[1]

(iii) phosphorus .....

.....[1]

(iv) magnesium .....

.....[1]

(b) Fig. 6.1 shows part of the calcium cycle in marine systems.

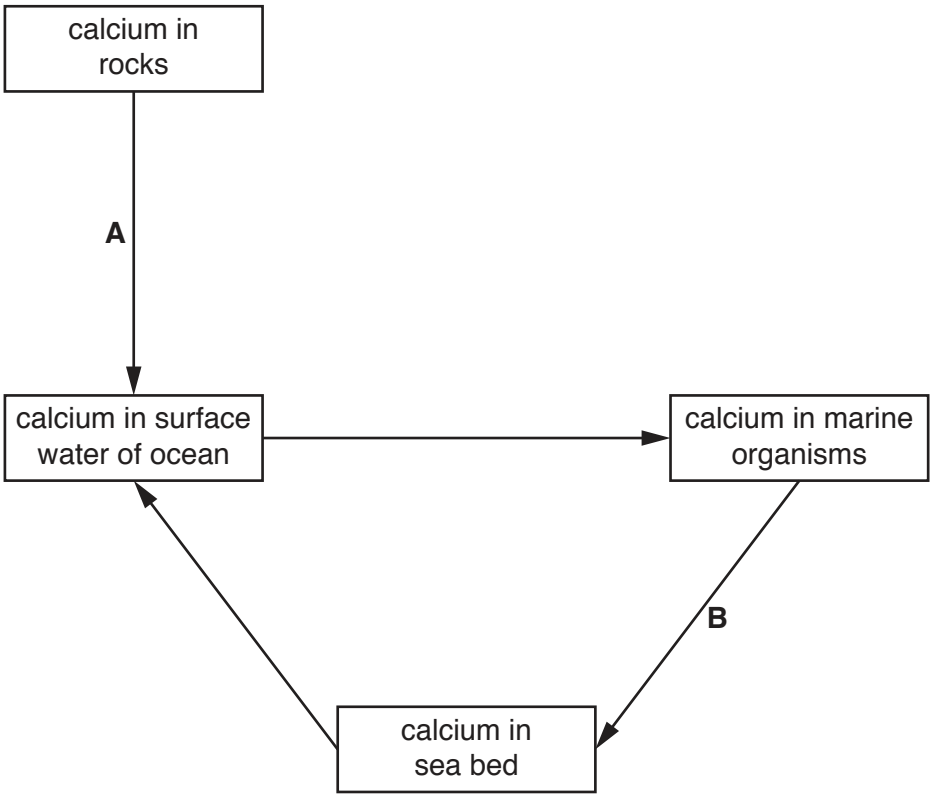

Fig. 6.1

(i) Describe process **A** shown in Fig. 6.1.

.....

.....

.....

.....[2]

(ii) Describe process **B** shown in Fig. 6.1.

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.....

.....

.....[2]

(iii) Suggest how overharvesting of marine organisms could affect the calcium cycle.

.....

.....

.....

.....[2]

[Total: 10]

7 **(a)** Coral-eating butterfly fish occupy a specialised ecological niche. Tuna occupy a general ecological niche.

Define the term *ecological niche*.

.....

.....[1]

The population sizes of a marine predator and a marine prey species were monitored over time. Both species occupy a specialised ecological niche.

Fig. 7.1 shows the relationship between the population sizes of the predator and prey species.

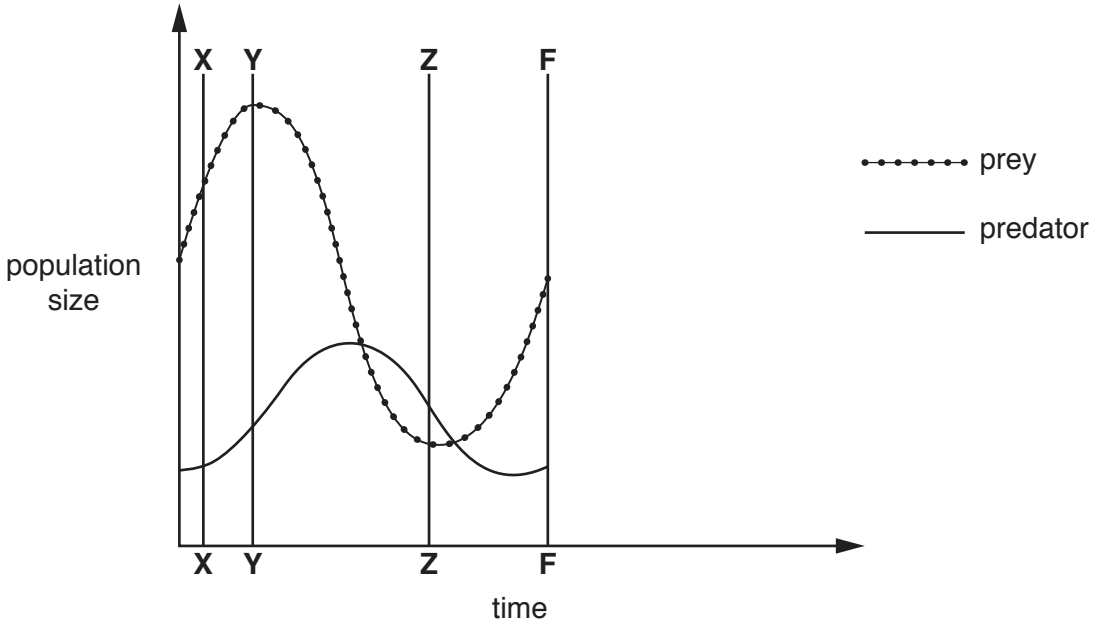

Fig. 7.1

(b) With reference to Fig. 7.1, describe **and** explain what is happening to the population of the predator species:

(i) between time **X** and time **Y**

.....

.....

.....

.....[2]

(ii) between time **Y** and time **Z**.

.....

.....

.....

.....[2]

(c) At time **F** in Fig. 7.1 a second predator species was introduced.

Sketch on Fig. 7.1 the predicted population sizes for the original predator and prey from time **F** onwards. [2]

(d) A sample of the prey species population was removed and introduced to a new habitat.

Fig. 7.2 shows the population growth curve for this species in its new habitat.

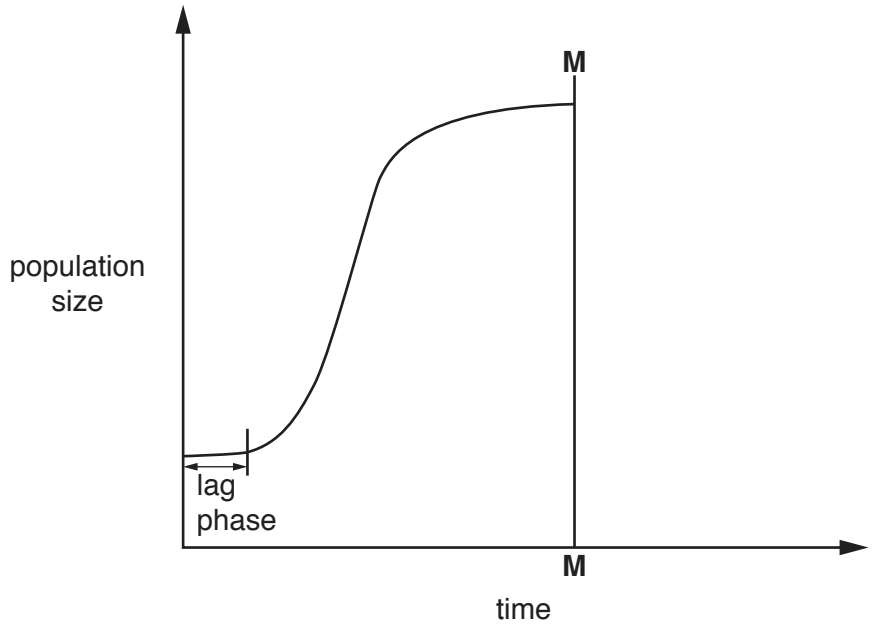

Fig. 7.2

(i) Suggest why there is a lag phase in the population growth curve of the prey shown in Fig. 7.2.

.....

.....

.....[1]

(ii) At time **M**, a toxin was accidentally introduced into the habitat.

Sketch on Fig. 7.2 the predicted population growth curve from time **M**. [1]

(iii) Suggest **one** factor, other than predators and toxins, that could affect the population of the prey species.

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.....[1]

[Total: 10]

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