

# Biodiversity

## Question Paper 5

<b>Level</b>	International A Level
<b>Subject</b>	Biology
<b>Exam Board</b>	CIE
<b>Topic</b>	Biodiversity, classification and conservation
<b>Sub Topic</b>	Biodiversity
<b>Booklet</b>	Theory
<b>Paper Type</b>	Question Paper 5

**Time Allowed :** 70 minutes

**Score :** / 58

**Percentage :** /100

**Grade Boundaries:**

A*	A	B	C	D	E	U
>85%	'77.5%	70%	62.5%	57.5%	45%	<45%

- 1 The Atlantic herring, *Clupea harengus*, lives in large populations called shoals and may grow up to 40 cm long.

Fig. 8.1 shows the appearance of *C. harengus*.

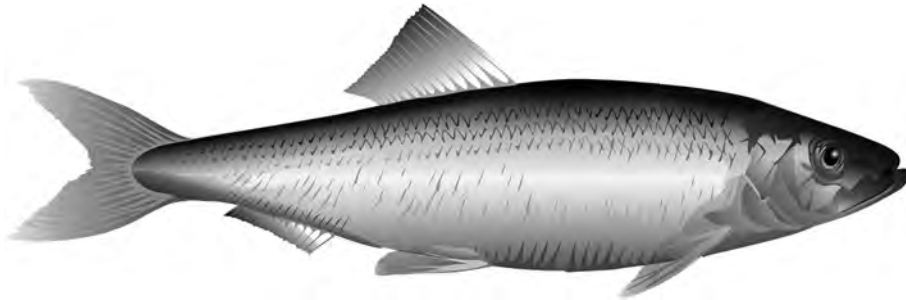


Fig. 8.1

The length of *C. harengus* shows wide variation.

Fig. 8.2 shows the numbers of fish of different lengths in a population of *C. harengus*.

The arrows show the selection pressures, **P** and **S**.

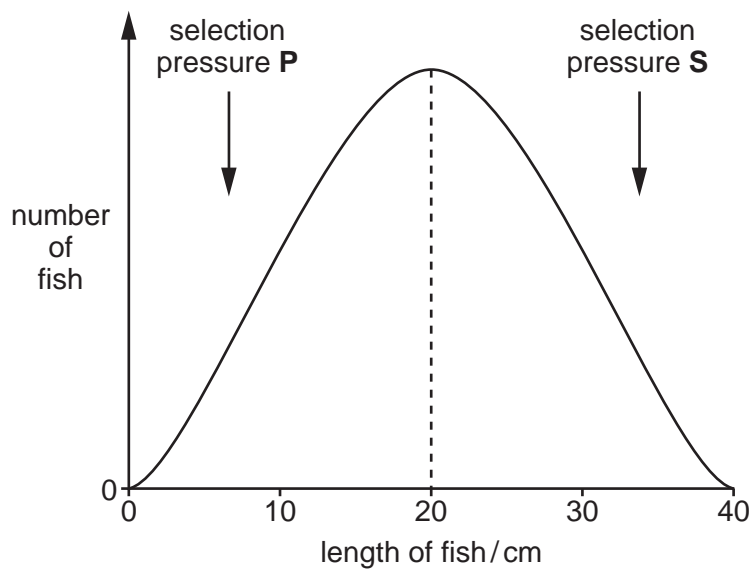
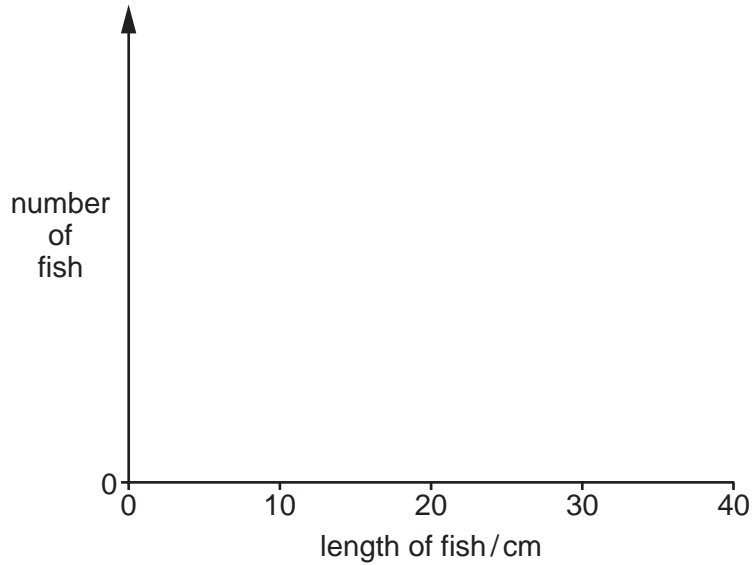


Fig. 8.2

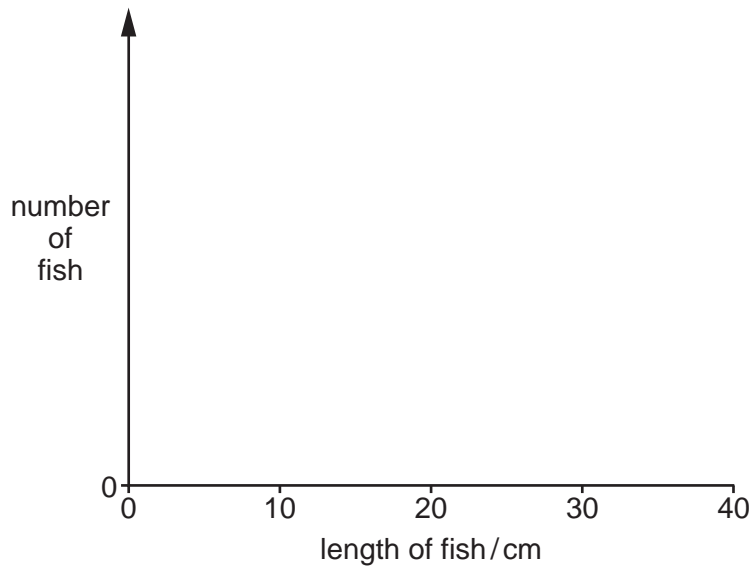
- (a) (i) Sketch a graph on the axes below to show the distribution of length of *C. harengus*, when selection pressures **P** and **S** operate for a few years.



[2]

- (ii) Name this type of natural selection ..... [1]

- (b) (i) Sketch a graph on the axes below to show the distribution of length of *C. harengus*, when selection pressure **S** alone operates for a few years.



[2]

- (ii) Name this type of natural selection ..... [1]

- (iii) Suggest two examples of selection pressure **S**.

1. ....

2. .... [2]

[Total: 8]

- 2 The eelgrass, *Zostera*, is a marine plant that forms dense vegetation in shallow coastal waters. The primary consumers in this ecosystem eat the eelgrass and the photosynthetic algae that grow on its surface.

Fig. 5.1 shows the flow of energy through an eelgrass ecosystem. The figures in circles represent the energy transfer in  $\text{kJ m}^{-2} \text{yr}^{-1}$ .

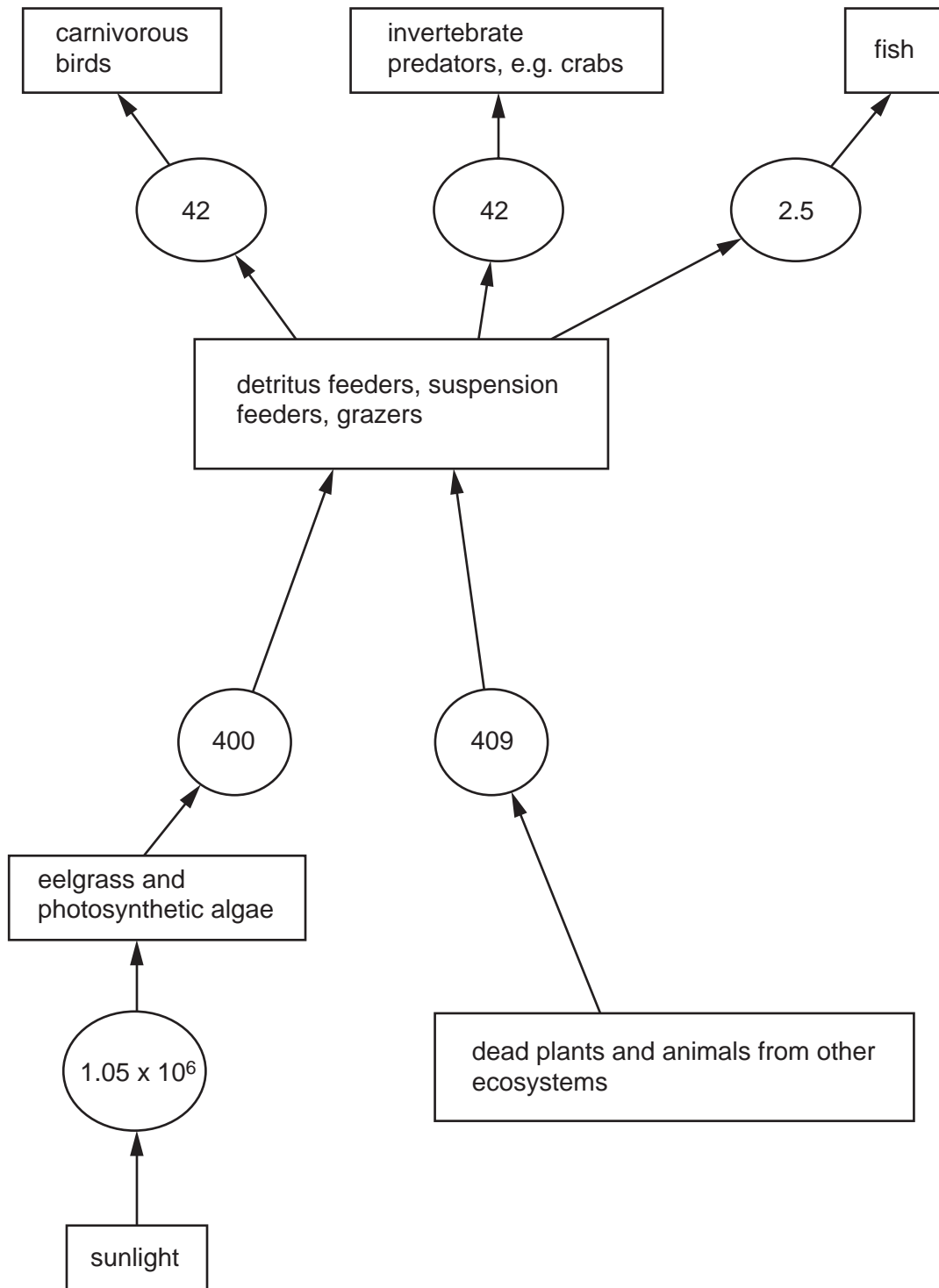


Fig. 5.1

- (a) Calculate the percentage of energy transferred from primary consumers to the secondary consumers in the ecosystem shown in Fig. 5.1. Show your working and express your answer to the nearest whole number.

Answer ..... [2]

- (b) Explain why little of the energy present in producers is transferred to the secondary consumers.

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

- (c) Dead plants contain nitrogen in the form of proteins. These are decomposed by bacteria.

Outline how bacteria convert nitrogen in these proteins to a form that may be taken up by living plants.

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

[Total: 8]

- 3** In some ecosystems there are very low concentrations of nitrate ions in the soil. Some species of flowering plants are able to obtain the nitrogen that they need from other sources. Carnivorous plants have modified leaves that trap animals.

Leaves of *Drosera rotundifolia* have hairs around each leaf that secrete a sticky solution. Insects, such as the one shown in Fig. 5.1, stick to this solution. The leaves curl around the insect and secrete enzymes to digest its body.



**Fig. 5.1**

- (a) Explain why *D. rotundifolia* can be considered to be both an autotroph and a heterotroph.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

- (b) In 1999, Dutch scientists discovered a new reaction, the anammox reaction, to add to the nitrogen cycle. They discovered the bacterium *Brocadia anammoxidans* that converts ammonia, nitrite ions and nitrate ions to nitrogen gas (N<sub>2</sub>) in anaerobic environments.

The reaction carried out by these bacteria is thought to be responsible for the loss of a large quantity of nitrogen-containing compounds from marine ecosystems, such as the oceans.

Suggest and explain the effect that this reaction has on marine ecosystems.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 7]

4 Fig. 2.1 shows a food chain in a freshwater ecosystem.

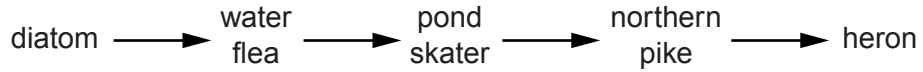


Fig. 2.1

(a) The diatom is an autotroph.

Explain what is meant by the term *autotroph*.

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

(b) Describe the role of the water flea in the food chain shown in Fig. 2.1.

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

(c) Suggest why the heron population is much smaller than the population of the water flea.

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



Fig. 2.2a shows a pond skater walking on the surface of the water.

Fig. 2.2b shows a northern pike.

These are not shown to the same scale.



a



b

Fig. 2.2

Both animals live in northern countries of the world, where temperatures often drop below 0°C.

(d) Describe the importance of water as an environment for the pond skater **and** the northern pike.

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....

.....



- 5 In some ecosystems, certain species fulfil important roles in maintaining biodiversity in communities. These species are often known as keystone species.

The sea otter, *Enhydra lutris*, is found in waters of the northern and eastern coasts of the Pacific, where it occupies a niche as a predator. These coastal waters are rich in kelp communities. Kelp are very large seaweeds that form ‘underwater forests’.

In the 19<sup>th</sup> century the sea otter was hunted for its fur, with the result that populations decreased. A consequence of this reduction in numbers was the disappearance of much of the kelp. Conservation measures in the 20<sup>th</sup> century restored the numbers of sea otters.

Fig. 6.1 shows the food web for this ecosystem.

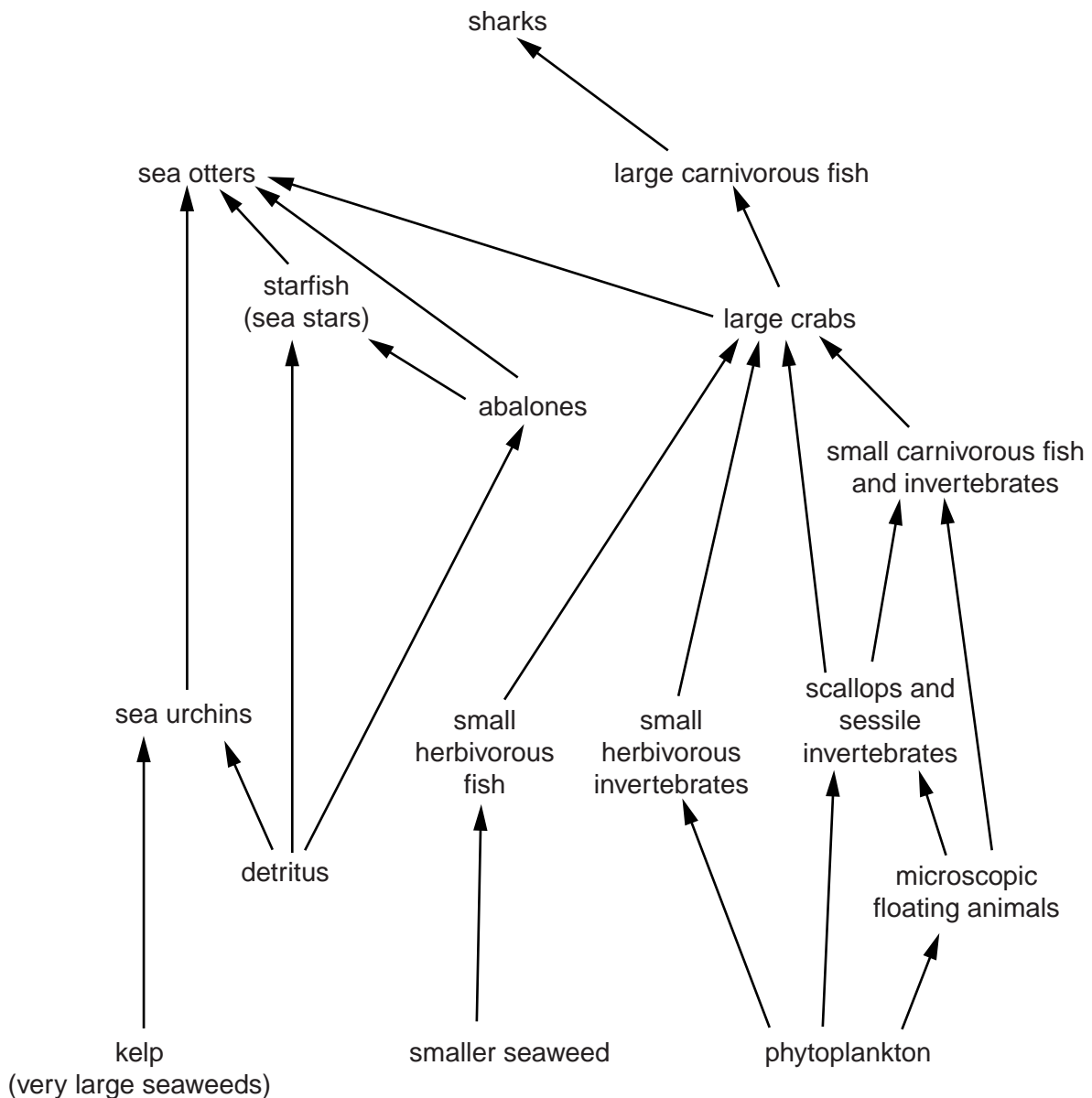


Fig. 6.1

(a) Explain the meaning of the terms *niche* and *community*.

*niche* .....

.....

.....

.....

*community* .....

.....

.....

..... [2]

(b) With reference to the food web in Fig. 6.1, suggest why sea otters are considered to be a keystone species.

.....

.....

.....

.....

.....

.....

.....

.....

.....

..... [4]

(c) Suggest how the efficiency of energy transfer from kelp to sea urchins could be determined.

.....

.....

.....

.....

.....

.....

..... [3]

**6** Read the following passage.

The three-toed sloth, *Bradypus variegatus*, is a very slow-moving mammal found in Central and South America that spends most of its life living in trees.

The thick, long grey fur of the sloth in Fig. 5.1 has a green appearance. Individual hairs of the sloth have grooves in them where water can collect.



**Fig. 5.1**

Research has shown that the green colour is due to the presence of algae living on the sloth's fur, the most common species being *Trichophilus welckeri*. Algae are eukaryotic, photosynthetic organisms.

Many other species of non-photosynthetic eukaryotes, both unicellular and multicellular, have been found living on the sloth's fur. These include different species of roundworms, insects and saprotrophic fungi.

- (a) Explain the ecological terms *population* and *community*, using examples given in the passage.

*population* .....

.....

.....

*community* .....

.....

..... [4]

- (b) Suggest why the sloth and its fur can be described as a small ecosystem.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 7]

7 The Atlantic cod, *Gadus morhua*, is fished for food.

(a) Fig. 8.1 shows the size of the stocks of Atlantic cod between 1968 and 2000.

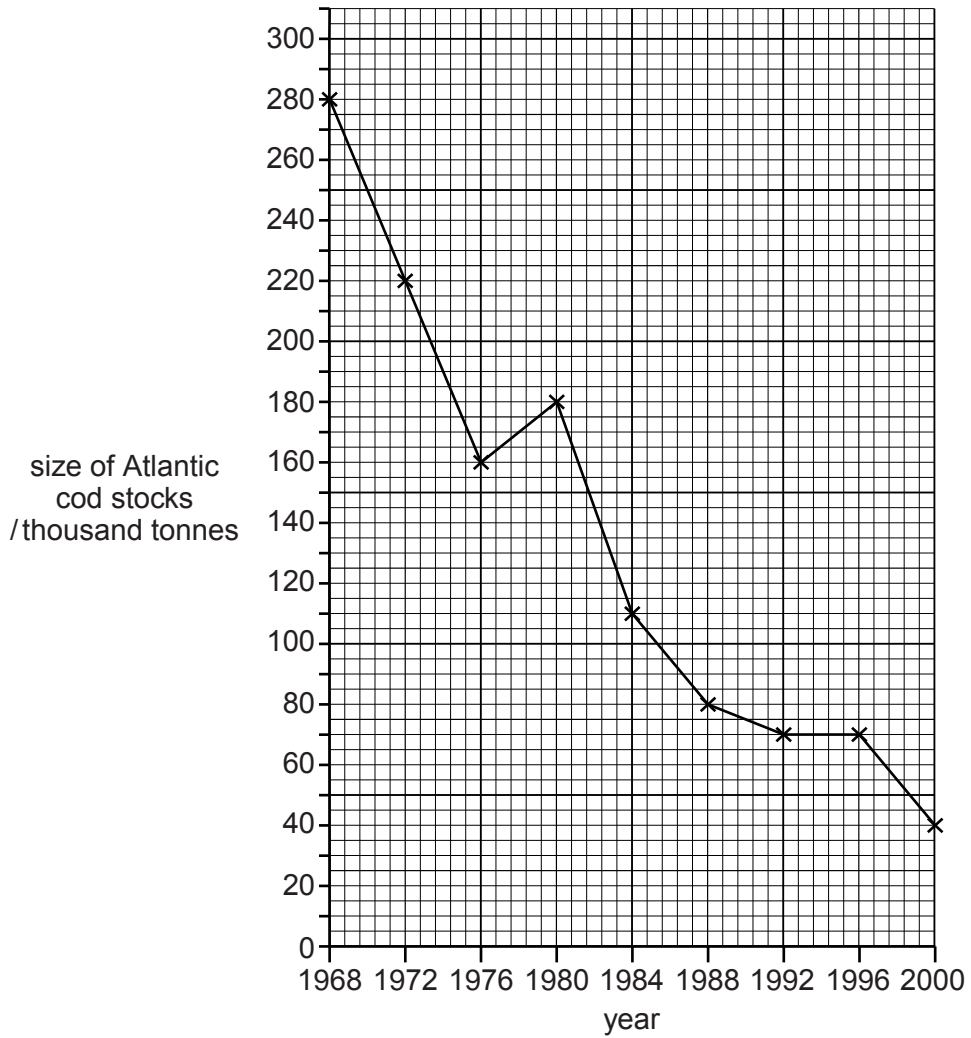


Fig. 8.1

Calculate the overall rate of decrease in size of the stocks of Atlantic cod between 1968 and 2000.

answer ..... tonnes per year [2]

(b) Suggest how the stocks of Atlantic cod may be increased.

.....

.....

.....

.....

.....

.....

.....

.....

..... [3]

[Total: 5]