



1. Some farmers spray their crops with insecticides to kill pests such as aphids.

Explain the benefits of killing pests.

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2) Describe the results shown in Fig.

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3a) Calculate the percentage loss of forested area in Nigeria between **2000** and **2005**.

Show your working and give your answer to the nearest whole number.

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b) Describe the consequences of deforestation on the animals that live in forests.

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4) The giant quiver tree, *Aloe pillansii*, shown in Fig. , is an endangered species.

These long-lived trees grow in harsh environments. Some populations of *A. pillansii* are found within the Richtersveld National Park, but one population is found just outside on a mountain called Cornell's Kop in southern Africa.



(a) (i) State the genus of the giant quiver tree.

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(ii) Explain why the *A. pillansii* trees on Cornell's Kop represent a population.

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(b) Suggest **three** reasons why the giant quiver tree is an endangered species.

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(c) It was estimated in 2005 that the total number of giant quiver trees in the wild was less than 3000,

which is considered to be very low compared with other tree species.

Explain the risks to a plant species of having very small numbers.

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- (d)** The population of *A. pillansii* trees on Cornell’s Kop was surveyed and photographed At four sites ,
A to D, from 1937 onwards. Researchers took photographs at all four sites in 2004
 And compared them
 with the original photographs.

The results are shown in Table 5.1.

site	date of the original photograph	number of living trees in the original photograph	number of living trees in 2004	number of dead tree stumps	average annual mortality rate /percentage of deaths per year
A	1937	12	4	8	1.0
B	1953	9	5	4	0.9
C	1985	5	3	2	2.1
D	2001	6	5	1	5.6

- (i)** Calculate the percentage decrease in the number of living trees at site **B** from 1953 to 2004.

Show your working and give your answer to the nearest whole number.

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- (ii)** Describe what the analysis of the photographs shows about the population of *A. pillansii* on Cornell’s Kop.

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5.A) Farmers grow crop plants such as wheat to provide food.

(i) State **two** types of natural event that could cause widespread food shortages.

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(ii) The increasing human population is another reason for food shortages.

Explain how the increasing human population contributes to food shortages.

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B) Many farmers grow crop plants as monocultures to improve yields.

Fig. shows a monoculture of wheat.



Describe the impact of large-scale monocultures on the environment.

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6.A) Acid rain has negative effects on many ecosystems.

Describe the negative effects of acid rain on freshwater ecosystems, such as streams, rivers and lakes.

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(b) Two groups of students were asked to investigate the effects of acid rain on the germination of pine tree seeds.

(i) Both groups of students decided to use sulfuric acid rather than hydrochloric acid to represent acid rain in their investigation.

Suggest why.

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(ii) State how the students could have measured the pH of the sulfuric acid.

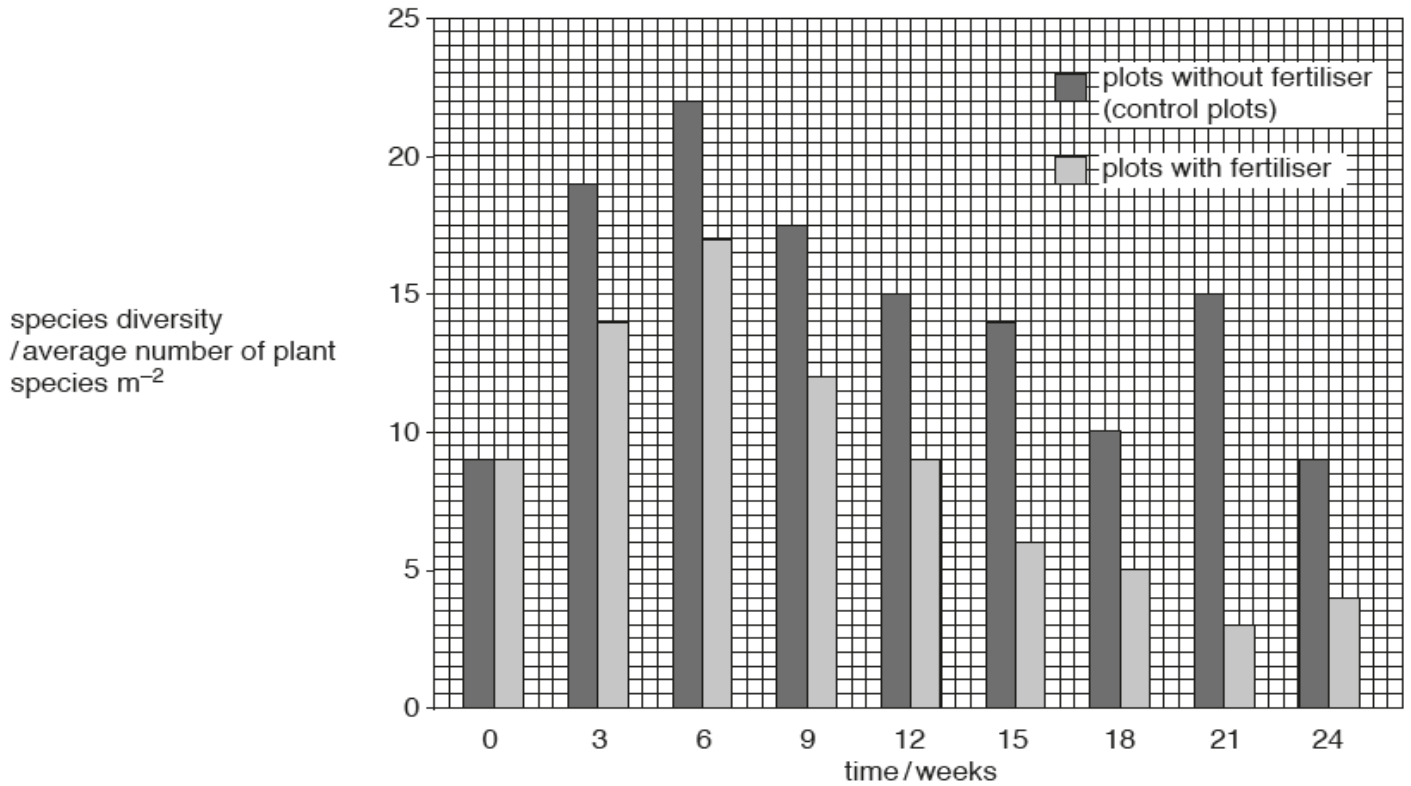
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7A) State the name of the process that occurs when fertiliser washes off land into rivers and causes an algal bloom.

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B) The researchers counted the number of different plant species in each of the plots in the grassland to determine species diversity. Counting started at the beginning of the growing season and was repeated every three weeks.

The average number of plant species in each type of plot is shown in Fig.



Describe the effect of fertiliser on the plant species diversity shown in Fig. 5.1.

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(c) Suggest why some species of plants survive in grassland and others do not.

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8.A) When yeast respire anaerobically, ethanol is released.

Ethanol is a type of sustainable resource that can be produced from a wide range of crops. It can be used as a biofuel.



Table summarises some information about crops that are used to make biofuel.

crop	biofuel produced	energy yield /GJ per ha	optimum growth temperature /°C	optimum annual rainfall range /mm
wheat	ethanol	53–84	24	800–1200
corn	ethanol	63–76	18	360–1000
sugar beet	ethanol	110–122	18	360–1000
sugar cane	ethanol	110–140	28	800–1200
oil palm	oil	150–166	28	1100–2500

- (i) Uruguay has an average temperature range of 12 °C to 24 °C and an average annual rainfall of 1000 mm. Suggest **and** explain which crop would be the **most** suitable crop to grow for producing biofuel in Uruguay.

Use the information in Table 5.1 to justify your choice.

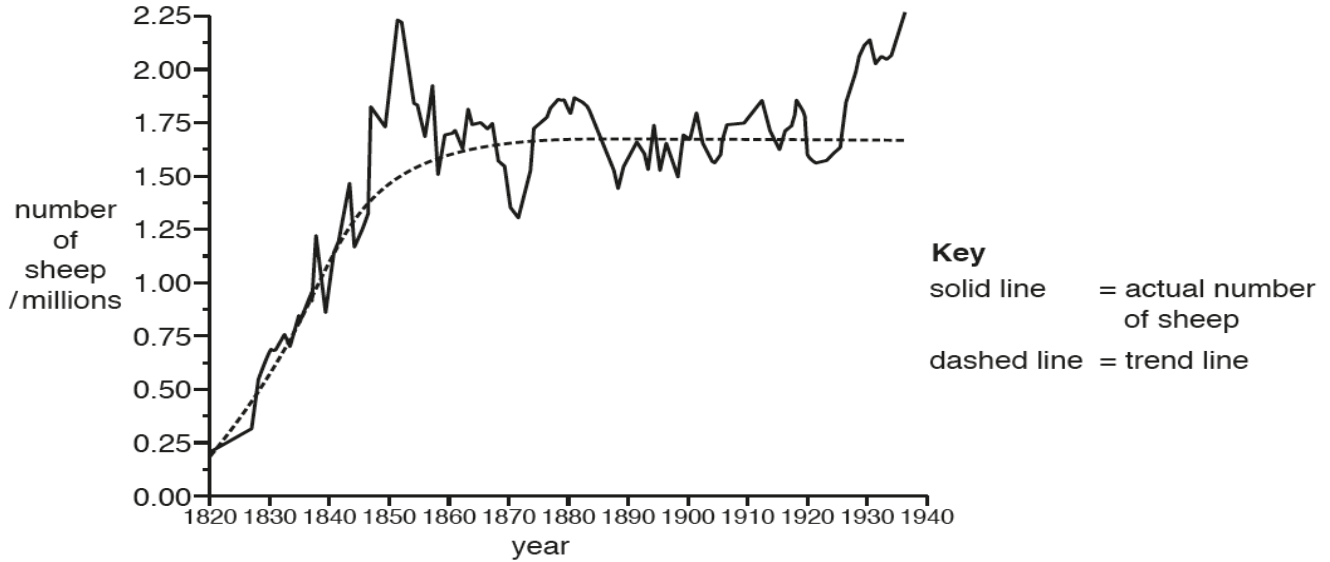
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- (B) Define the term *sustainable development*.

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- 9.A) Tasmania is an island off the south coast of Australia. Sheep were introduced to Tasmania in the nineteenth century.

Fig. shows the population of sheep in Tasmania from 1820 to 1940. The dashed line shows the trend in the population growth.



(a) Describe the **trend** in the population of sheep in Tasmania between 1820 and 1940, using the information in Fig.

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(b) Explain the change in the **trend** of the population that you described in 3(a).

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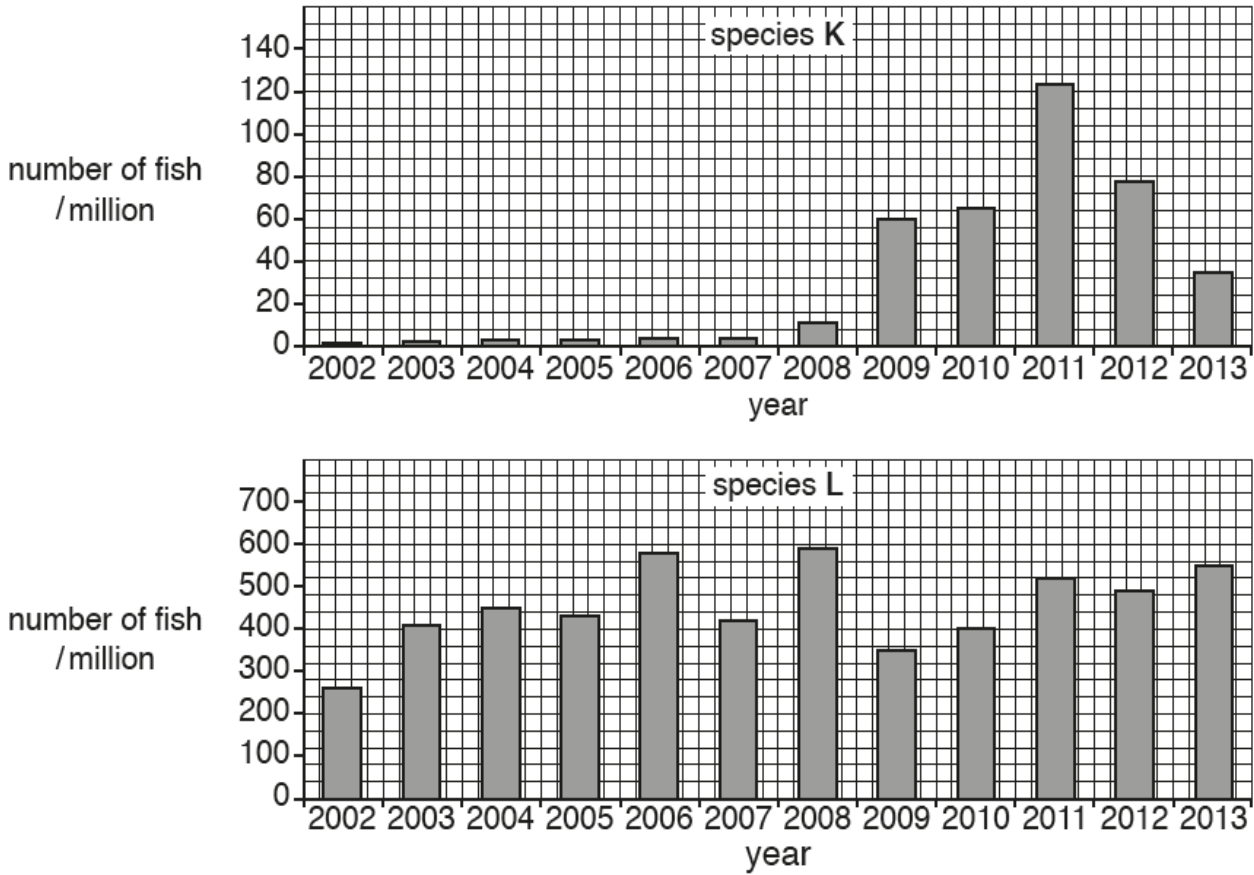
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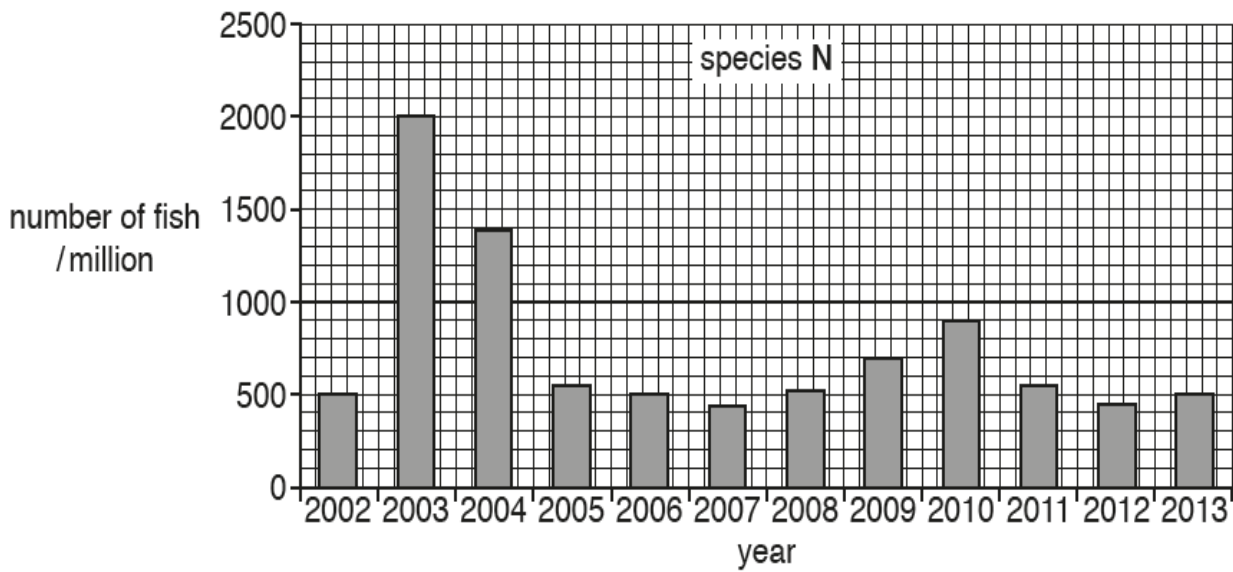
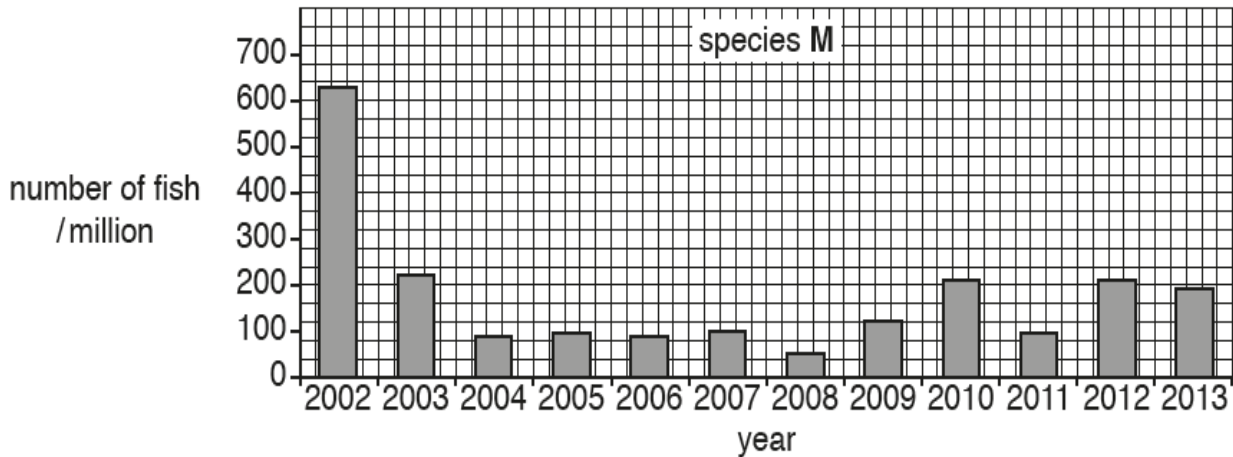
10.A) The Canadian Government were concerned about overfishing at the Grand Banks in the Atlantic Ocean.

As a result, commercial fish stocks were monitored from 2002 until 2013.



The population data for four species of fish are shown in Fig.





(a) Use the information in Fig. to:

(i) state the most abundant fish species in **2002**

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(ii) suggest the fish species that had the most carefully controlled fishing quotas between **2002** and **2013**.

Give a reason for your choice.

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(iii) calculate the percentage increase in species **N** between **2002** and **2003**.



Show your working.

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(b) Overfishing is a possible reason for the decrease of the population of species **M** between 2002 and 2003.

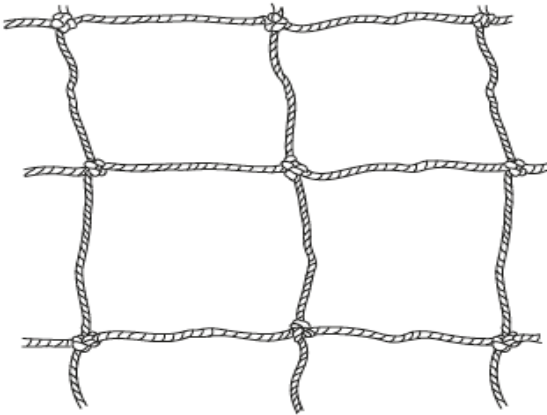
State **two other** reasons that could have caused this decrease.

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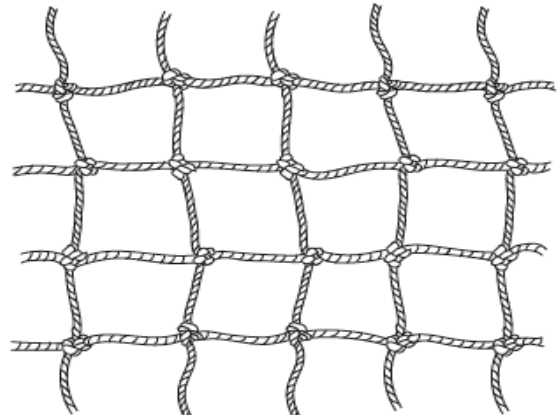
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(c) Overfishing can be reduced by having large holes in fishing nets.

Fig. shows sections of two fishing nets, the drawings are both at the same scale.



fishing net with large holes



fishing net with small holes

(i) Suggest how controlling the size of the holes in fishing nets helps to reduce overfishing.

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(ii) Describe and explain how methods **other** than fishing net hole size, could help to prevent overfishing.

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11.A) A researcher investigated the population growth of fish for fish farming. The researcher stocked a farmer's lake with a small number of these fish and recorded the number of fish over the next five years. The researcher's results showed that the population of fish had increased exponentially.

Use the axes to show the **exponential growth** in the population of fish.

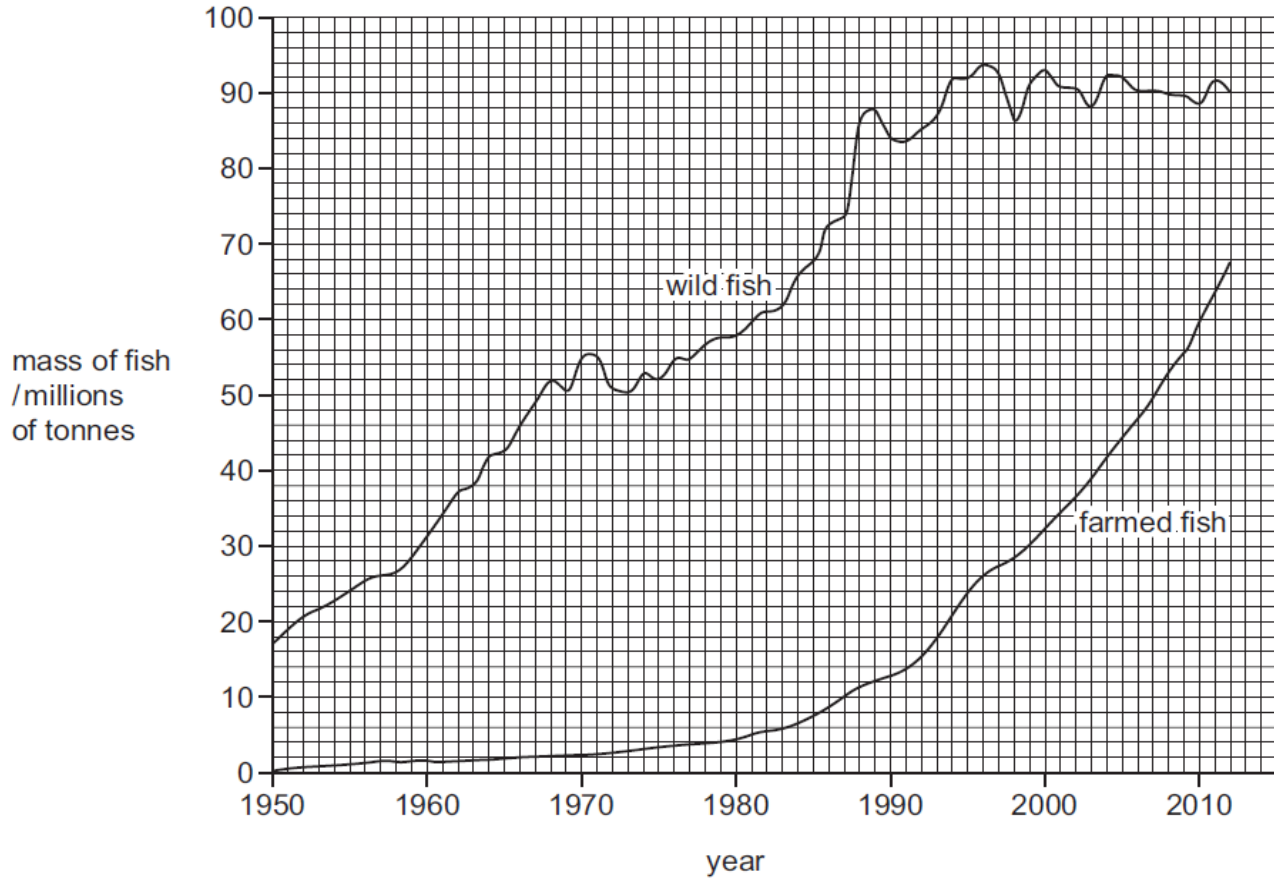
Label the axes and draw a suitable curve.



(ii) Explain why the population of fish increased exponentially.

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B) Fig. shows the total mass of wild fish caught worldwide between 1950 and 2012 and the mass of farmed fish produced worldwide over the same period.



Describe the changes in the mass of **wild fish** caught between 1950 and 2012.

You will gain credit if you use data from Fig.

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(C) It is predicted that wild fish stocks will decrease and become depleted because of overfishing.

Suggest ways in which governments can try to maintain the stocks of wild fish.

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(D) Like fish stocks, forests can be a sustainable resource.

Discuss what is meant by the term *sustainable resource*, using forests as an example.

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12.a) Water entering two sewage works, **A** and **B**, was tested for the presence of four hormones.

The testing was repeated on water that left the sewage works to flow into lake **A** and lake **B**.

The results of the tests on the water samples are shown in Table 5.1.

hormone	concentration of hormones at sewage works / ng per dm ³			
	A		B	
	before sewage treatment	after sewage treatment including ozone and chlorine	before sewage treatment	after sewage treatment including chlorine alone
oestrogen	not measurable	not measurable	0.1	not measurable
synthetic progesterone	8.5	8.0	4.5	4.6
natural progesterone	2.5	2.8	2.4	2.7
testosterone	15.6	3.7	2.7	3.1

Explain which water sample was most polluted with hormones **before** sewage treatment. Use data from Table 5.1 to support your answer.

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b) One reason for treating sewage is to reduce the concentration of hormones in the environment.

(i) Chlorine was used in the sewage treatment of both lakes.



Describe the effect that chlorine had on the hormone concentrations in the water. Use data from Table 5.1 to support your answer.

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(ii) State the main purpose of chlorine in sewage treatment.

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13A) Fig. 5.1 shows an area of forest where some of the trees have been cut down.



(a) Explain the reasons why forests may be cut down as shown in Fig. 5.1.

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B) The loss of forests from parts of the world is assessed by satellite imagery. Table shows data on the forests in Indonesia and Malaysia, two countries in South-East Asia which have large areas of forest.

country	type of forest	area / thousands of hectares			
		1990	2000	2005	2010
Indonesia	natural forest	118 545	95 737	94 158	90 883
Malaysia	natural forest	20 420	19 932	19 317	18 649

(I) Calculate the percentage loss of natural forest in Indonesia between 1990 and 2010.

Show your working and express your answer to the nearest whole number.

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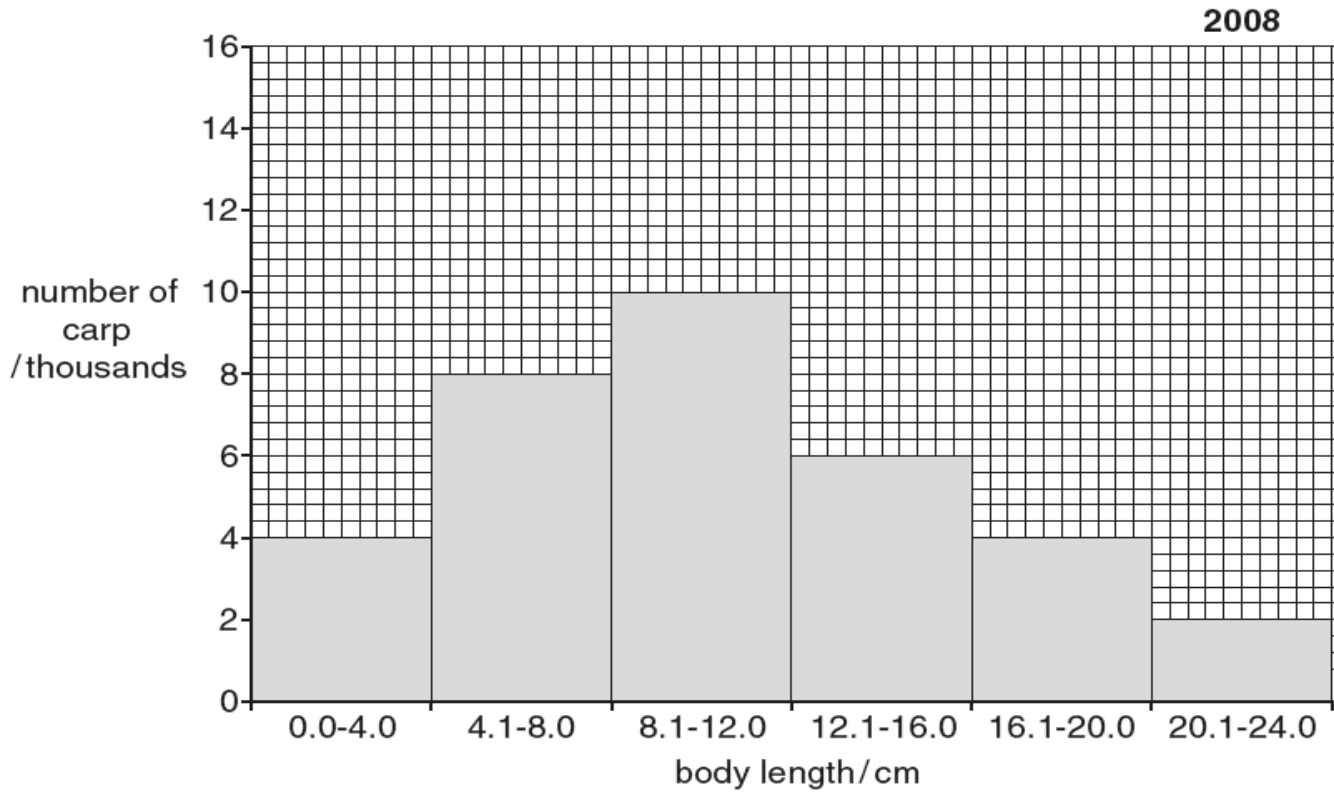
(II) Use the data in Table 5.1 to compare the loss of natural forest in Indonesia with the loss of natural forest in Malaysia.

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(III) Many hectares of natural forest have been cleared in countries such as Malaysia and Indonesia for oil palm plantations. Both countries have also replanted forests to grow timber and other forest products.

Suggest why replanted forests and plantations are **less** useful for conservation than natural forest.

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(a) Define the term *population*.

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(b) Describe the variation in body length of the carp population in **1998**. Use the data in Fig. 2.1 to support your answer.

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(c) The total population of carp in 1998 was 43 000 fish.

(i) Calculate the total population of carp in **2008**.

Show your working.

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(ii) The decrease in the carp population by 2008 was caused by overfishing.

Explain how fish stocks can be sustained.

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15) Wetlands are internationally important ecosystems. The spoon-billed sandpiper, *Calidris pygmaea*, is an endangered species.

Fig shows a spoon-billed sandpiper feeding in a wetland ecosystem. The wetland is a stopover on the bird's long migration from north-east Russia to south-east Asia.

The smaller photograph is a close-up of the bird's legs to show that it has been ringed.





Spoon-billed sandpipers stop to feed at the Rudong mudflats near Shanghai, China.

Putting one or more rings on a bird's leg is a common way to identify individual birds. Spoon-billed sandpipers ringed in Russia have been seen at the Rudong mudflats.

- (a) Suggest why scientists put leg rings on birds, such as the spoon-billed sandpiper.

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