

Q1.

- 1 The western lowland gorilla, *Gorilla gorilla*, has become an endangered species although it has no known enemies, except humans. Gorillas are herbivorous, feeding on fruit, shoots, tree bark and leaves. Fig. 1.1 shows a western lowland gorilla.



Fig. 1.1

- (a)** Suggest three reasons why the western lowland gorilla has become an endangered species.

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- (b) (i)** Explain how captive breeding programmes in zoos may help in the protection of endangered species, such as the western lowland gorilla.

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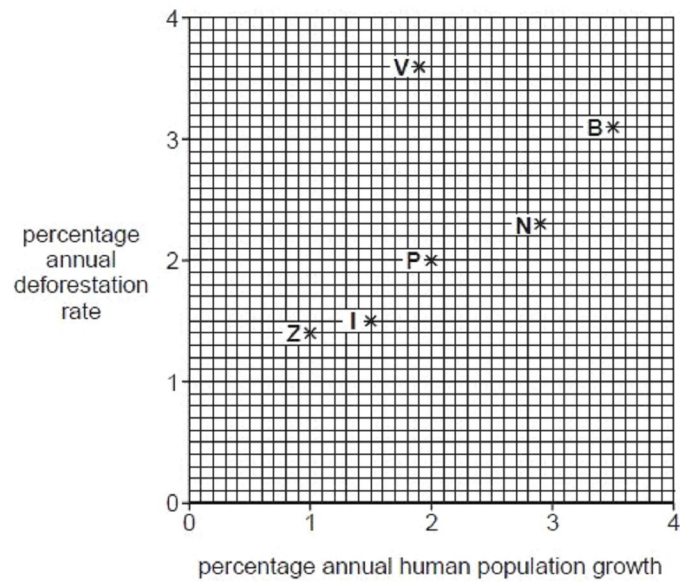
(ii) State two disadvantages of captive breeding programmes.

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2.
..... [2]

[Total: 8]

Q2.

1 (a) Fig. 1.1 shows the relationship between annual deforestation rates and annual human population growth for six countries.



B – Burundi
I – Indonesia
N – Nigeria
P – Philippines
V – Vietnam
Z – Zimbabwe

Describe the relationship shown in Fig. 1.1.

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(b) Over half of the species of plants and animals comprising the biodiversity of the Earth are thought to exist in tropical rainforests.

Ex

(i) Explain the meaning of the term *biodiversity*.

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(ii) Explain the economic reasons for maintaining biodiversity.

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[Total: 8]

Q3.

- 3 (a) The African elephant, *Loxodonta africana*, is a large herbivorous mammal which eats tree leaves. It has the longest gestation period of any land mammal and normally produces one offspring at a time. Its habitat is mainly savannah. B

Suggest how human activities have caused the African elephant to become endangered.

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- (b) The meerkat, *Suricata suricatta*, also lives in the savannah of southern Africa. It is a carnivorous mammal and feeds on insects, worms, snails and other invertebrates. It grows up to 30 cm in length and lives in large family groups in burrows.

Fig. 3.1 shows a meerkat.



Fig. 3.1

With reference to the information given, suggest why the meerkat is less likely than the elephant to become endangered.

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[3]

[Total: 6]

Q4.

- 1 The flatback turtle, *Natator depressus*, is an endangered species that nests on northern Australian beaches.

Fig. 1.1 shows a flatback turtle.

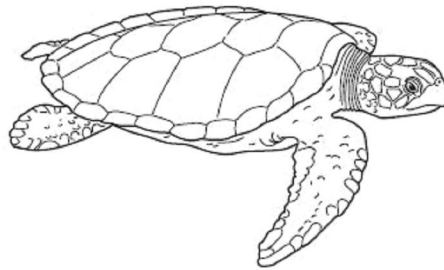


Fig. 1.1

Each female lays approximately 50 eggs per nest, which is a smaller number than all other species of marine turtle. The eggs are buried in the sand and when the hatchlings emerge each has a mass of approximately 43 g. Unlike most marine turtles, flatback turtles spend most of their time in coastal waters. This is where they feed and mate.

Fig. 1.2 shows the numbers of female flatback turtles nesting on a beach in northern Australia between 1993 and 2002.

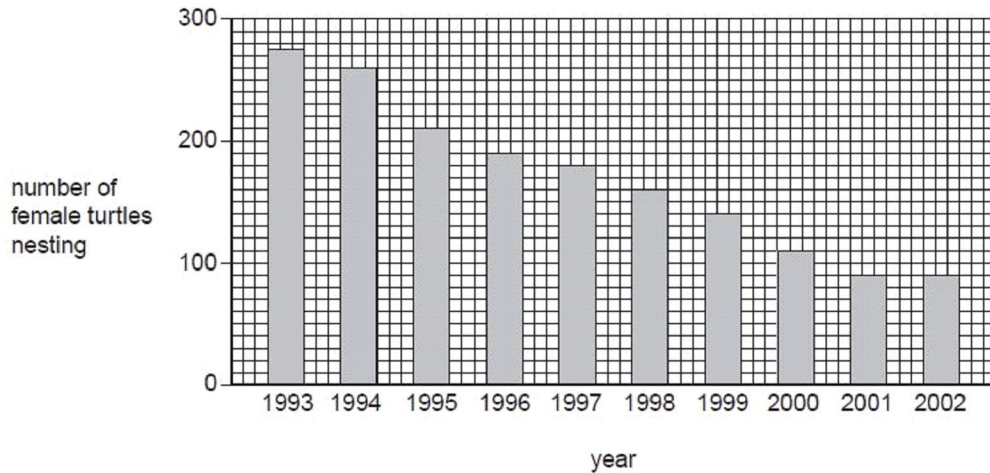


Fig. 1.2

- (a) Calculate the mean **rate** of decrease in the numbers of females nesting between 1993 and 2002.

Show all the steps in your calculation.

Answer..... [2]

- (b) Suggest ways in which the flatback turtle could be protected.

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[Total: 7]

Q5.

- 1 The American crocodile, *Crocodylus acutus*, was classified as an endangered species by the USA in 1975. It is found in estuarine regions of southern Florida.

Fig. 1.1 shows an American crocodile.



Fig. 1.1

The salinity of the water was thought to play a part in the distribution of the American crocodile.

Fig. 1.2 shows the number of American crocodile nest sites in areas with water of varying salinity in southern Florida.

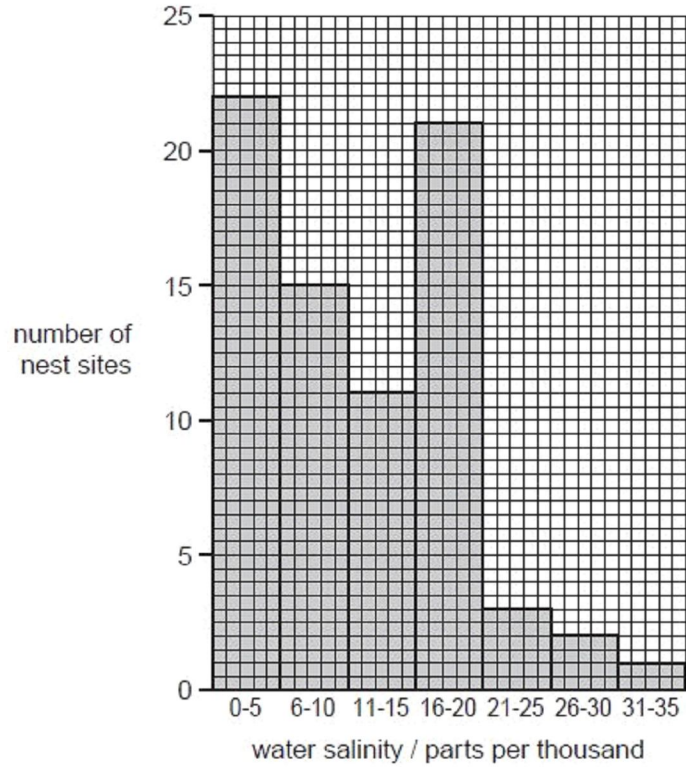


Fig. 1.2

(a) Describe the results shown in Fig. 1.2.

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..... [3]

(b) Much conservation work has been done in the Everglades National Park in Florida, which is a large wetland area. As a result the number of nest sites has increased from 8 in 1975 to 31 in 2000. This has led to a rise in the number of crocodiles. Ex

(i) Calculate the percentage increase in nest sites between 1975 and 2000.

Show your working.

answer% [2]

(ii) Suggest two reasons why the population of crocodiles in the Everglades National Park has increased.

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2.
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[Total: 7]

Q6.

- 1 The polar bear, *Ursus maritimus*, lives in the Arctic regions of the USA, Canada, Norway and Russia. Polar bears move across the Arctic ice sheet to hunt prey such as seals.

Fig. 1.1 shows a polar bear.



Fig. 1.1

The area over which the Arctic ice sheet extends varies throughout the year.

Fig. 1.2 shows the variation in the extent of the Arctic ice sheet for the months of July to November for the years 1979 and 2009.

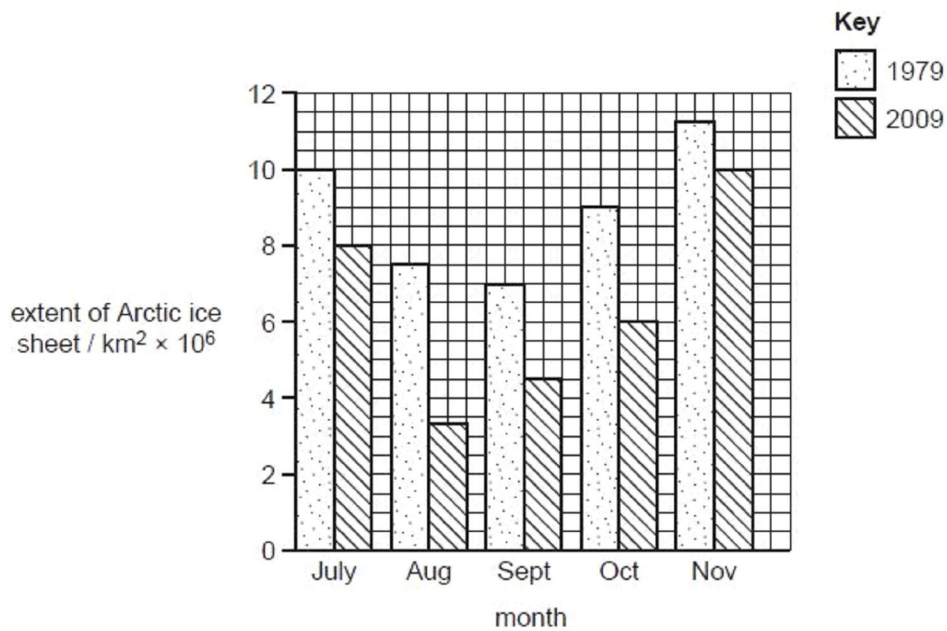


Fig. 1.2

- (a) Calculate the percentage reduction in the area over which the ice sheet extends between 1979 and 2009 **for the month of September**.

Give your answer to the **nearest whole number**.

Show your working.

answer..... % [2]

- (b) In 2008 the government of the USA classified *U. maritimus* as an endangered species because it is under threat of extinction.

Suggest what has caused *U. maritimus* to have become endangered.

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..... [3]

- (c) *U. maritimus* is a eukaryote. Beneficial bacteria, which are prokaryotic cells, live in the gut of *U. maritimus*.

State three differences between the cells of *U. maritimus* and its gut bacteria.

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2.
3. [3]

[Total: 8]

Q7.

- 1 The natterjack toad, *Bufo calamita*, is an endangered amphibian species in the UK. It comes out of hibernation in April and breeds in pools by sand dunes along parts of the UK coast. A young natterjack toad will take about 10 weeks to develop from a fertilised egg. A natterjack toad feeds at night, by running at its prey, mainly insects and worms, on the sand dunes.

Fig. 1.1 shows a natterjack toad.

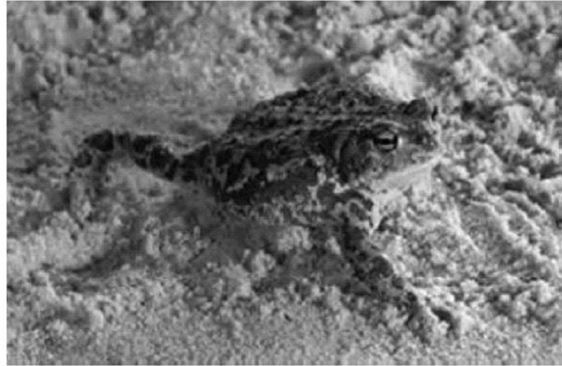


Fig. 1.1

- (a) Suggest what may have caused the natterjack toad to become an endangered species in the UK.

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- (b) Fig. 1.2 shows the number of adult natterjack toads counted from 1989 to 1997 in one area of the UK.

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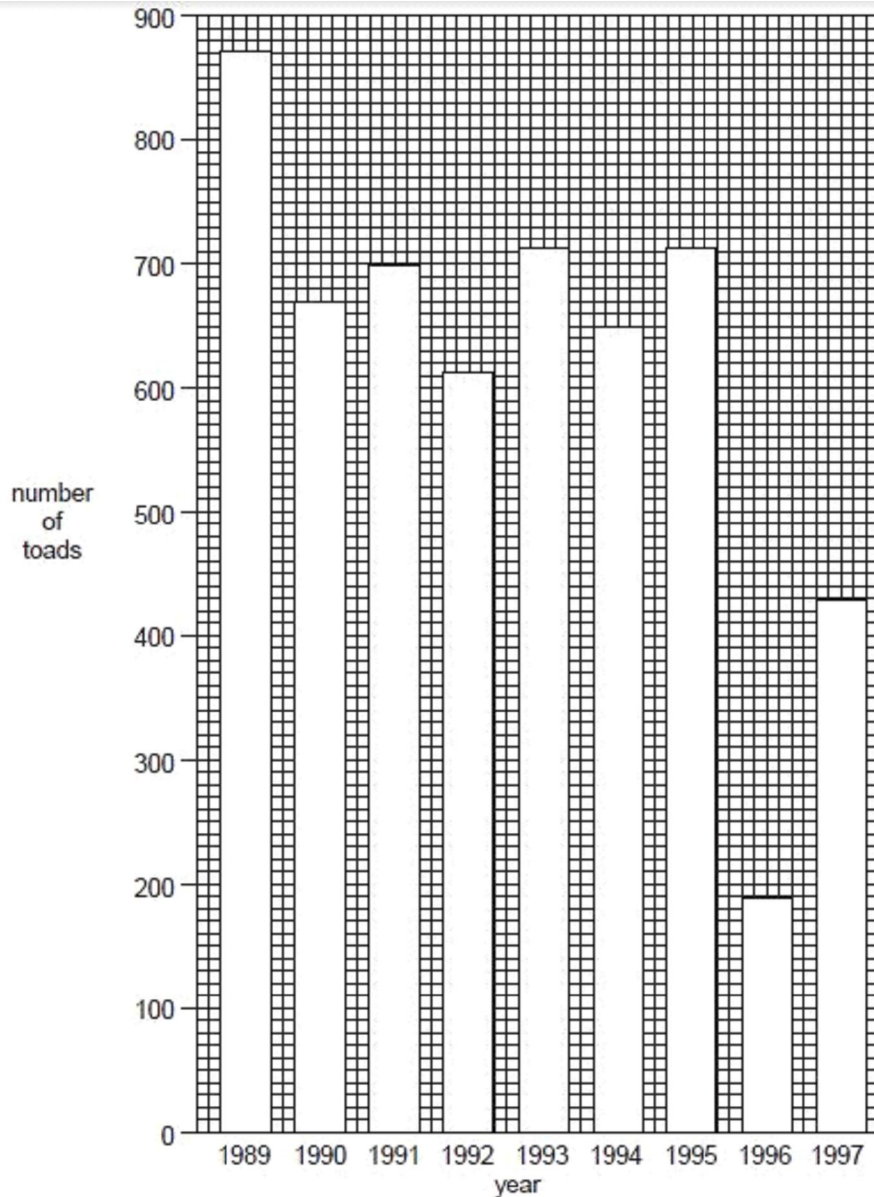


Fig. 1.2

Calculate the mean annual number of adult natterjack toads counted from 1989 to 1997.

Give your answer to the **nearest whole number**.

Show your working.

answer [2]

(c) The natterjack toad is heterotrophic.

(i) Explain what is meant by heterotrophic.

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..... [2]

(ii) Name two kingdoms that are exclusively heterotrophic.

1.
2. [1]

(d) Each year the International Union for the Conservation of Nature and Natural Resources (IUCN) publishes a list of endangered species called the Red List. The Red List has a very high proportion of vertebrates compared to invertebrates.

Suggest **one** reason **why** the Red List has many more vertebrates than invertebrates.

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..... [1]

[Total: 9]

Q8.

- 6 (a) The plant *Rafflesia arnoldii*, which grows in the jungles of South East Asia, is noted for producing the largest flower of all plants.
- The flower is reddish-brown and can grow up to one metre in diameter.
 - The flower gives off a smell similar to rotting flesh to attract flies, which then pollinate it.

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Fig. 6.1 shows a flower of *R. arnoldii*.



Fig. 6.1

R. arnoldii is classified as an endangered species.

Suggest why *R. arnoldii* has become an endangered species.

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[3]

(b) (i) Explain the meaning of the term *biodiversity*.

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(ii) Suggest reasons for maintaining **plant** biodiversity.

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[Total: 8]

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Q9.

6 (a) The Millennium Seed Bank is located in the UK. So far it has successfully stored seeds from 10% of the world's wild plant species.

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(i) Suggest the benefits to humans of conserving plant species.

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(ii) In the wild, seeds may be subjected to conditions that can be hostile to successful germination and growth.

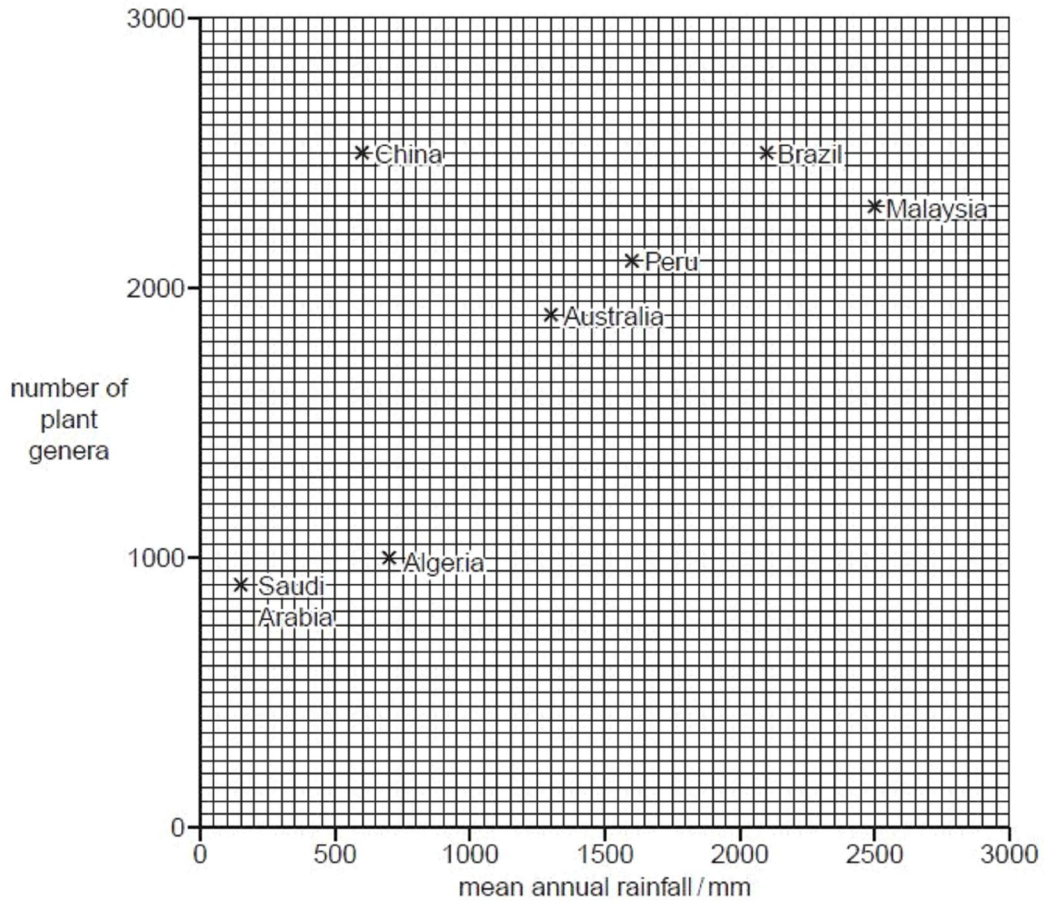
Suggest how the seeds should be stored in the seed bank to keep them viable for future use.

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.....[1]

(b) Plant biodiversity varies throughout the world and is dependent on many factors, particularly climate.

E

Fig. 6.1 shows the relationship between the number of plant genera and the mean annual rainfall in seven countries.



(i) Describe the relationship between the number of plant genera and the mean annual rainfall in these seven countries.

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..... [2]

(ii) Suggest what other climatic factors, apart from rainfall, affect plant biodiversity.

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[Total: 8]

Q10.

- 1 Fig. 1.1 shows two unicellular organisms, **P** and **R**. These organisms are members of **different** kingdoms.

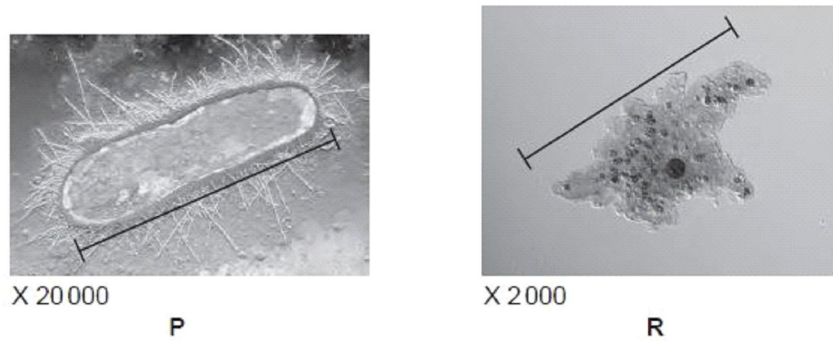


Fig. 1.1

- (a) Calculate the actual sizes, in μm , of **P** and **R**, as shown by the lines on Fig. 1.1.

Show your working.

P μm

R μm [3]

- (b) Identify the kingdom to which each organism belongs. Write your answers in the table below. [1]

- (c) Complete the table by listing five features which distinguish **P** from **R**.

One has been completed for you. [5]

	unicell P	unicell R
kingdom
features	1 cell wall present	cell wall absent
	2
	3
	4
	5
	6

[Total: 9]

Q11.

2 Fig. 2.1 shows part of a tropical rainforest.

Tropical rainforests have a high biodiversity.

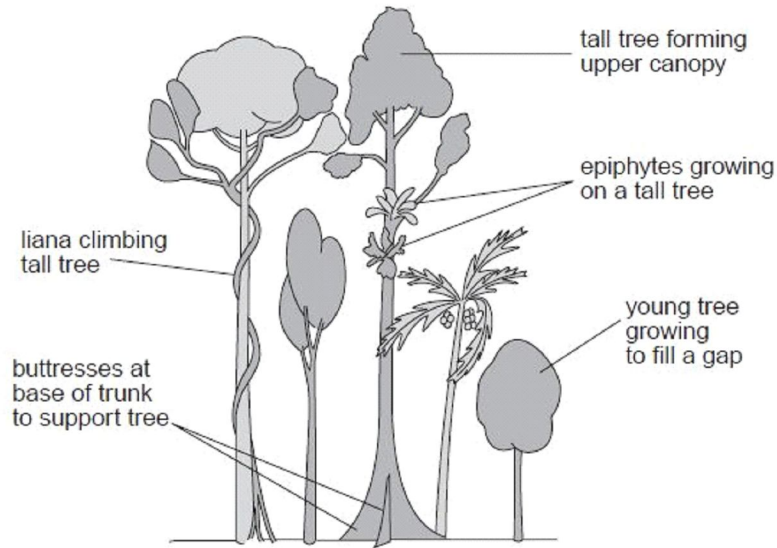


Fig. 2.1

(a) Explain what is meant by *biodiversity*.

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(b) Suggest why tropical rainforests have a high biodiversity of animal species.

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(c) Discuss why it is important to maintain biodiversity.

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[Total: 9]

Q12.

1 The African hunting dog, *Lycaon pictus*, is a carnivore which hunts in packs in areas of East Africa.

Fig. 1.1 shows an African hunting dog.



Fig. 1.1

- (a) The African hunting dog has cells that are eukaryotic while bacteria have cells that are prokaryotic.

Describe the differences between eukaryotic and prokaryotic cells **with respect to their DNA**.

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- (b) In some parts of East Africa *L. pictus* is becoming an endangered species.

Suggest reasons why *L. pictus* is becoming an endangered species.

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- (c) One way of protecting *L. pictus* is to create conservation areas.

Describe two **other** methods of conserving endangered species such as *L. pictus*.

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[Total: 7]

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Q13.

- 1 (a) The squirrel monkey, *Saimiri sciureus*, of Costa Rica has become an endangered species.

Fig. 1.1 shows a squirrel monkey.



Fig. 1.1

Explain what is meant by the term *endangered species*.

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- (b) Discuss possible ways in which the squirrel monkey could be protected.

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[Total: 6]

Q14.

1 All living organisms are divided into five kingdoms.

The table below lists some features possessed by living organisms and some processes that they carry out.

Place a tick or a cross in the table to indicate the presence or absence of the feature or process in any or all members of the kingdom.

The first row has been done for you.

feature or process	kingdom				
	Prokaryotae	Protoctista	Fungi	Plantae	Animalia
80s ribosomes	x	✓	✓	✓	✓
cell walls contain chitin					
circular DNA					
endoplasmic reticulum					
most species unicellular					
autotrophic					
heterotrophic					

[6]

[Total: 6]

Q15.

- 1 The Great Lakes, in North America, lie between the USA and Canada. A survey of birds of the Lake Ontario area has shown the relative abundance of birds between 1995 and 2005.

Table 1.1 shows the feeding habits and the relative change in numbers of some of the birds in the survey.

Table 1.1

name	feeding habit	percentage change in numbers between 1995 and 2005
mallard <i>Anas platyrhynchos</i>	amphibia, plants	+10.0
tree swallow <i>Tachycineta bicolor</i>	flying insects	-6.2
blue-winged teal <i>Anas discors</i>	aquatic insects, molluscs, plants	-12.3
pied-billed grebe <i>Podilymbus podiceps</i>	amphibia, aquatic insects, fish	-15.9
black tern <i>Chlidonias niger</i>	aquatic insects, fish, flying insects	-18.7

- (a) Using the information in Table 1.1 suggest reasons for the changes in numbers of these birds.

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[4]

(b) An ecosystem that has a wide range of species has a high biodiversity.

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Explain the benefits of maintaining biodiversity.

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[4]

[Total: 8]

Q16.

1 (a) A 50-year study of marine animal biodiversity in the coastal waters of Canada was carried out.

The percentage decrease in the number of marine animal species between 1950 and 2000 is shown in Fig. 1.1.

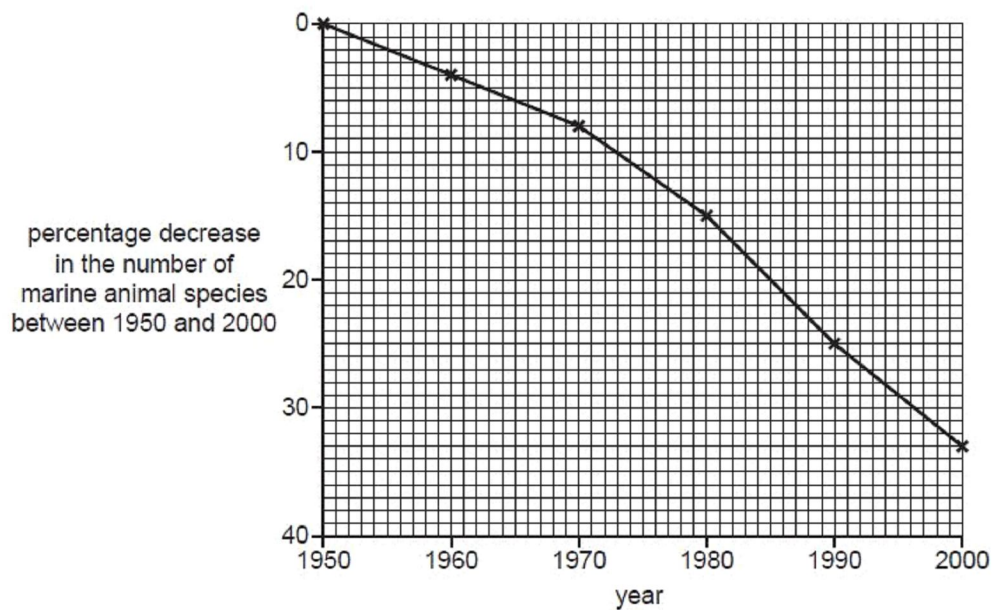


Fig. 1.1

Suggest explanations for the decrease in the number of marine animal species between 1950 and 2000.

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(b) Explain what is meant by the term *biodiversity*.

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(c) Discuss the benefits of maintaining the biodiversity of a marine ecosystem, such as that in the coastal waters of Canada.

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[Total: 8]

Q17.

- 1 The Ethiopian wolf, *Canis simensis*, is a member of the Canidae family of carnivores.

Fig. 1.1 shows an Ethiopian wolf.



Fig. 1.1

- (a) Ethiopian wolves evolved from an ancestor similar to the grey wolf that crossed into Northern Africa from Europe about 100 000 years ago.

They live in the alpine grasslands and heathlands at, or above, 3000m altitude in Ethiopia.

State the most likely type of speciation that led to the evolution of the Ethiopian wolf.

.....[1]

- (b) A population of Ethiopian wolves is called a pack.

Heterozygosity has been found to be low in all of the packs of Ethiopian wolves that have been studied.

Suggest why the heterozygosity may be low in Ethiopian wolf packs.

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.....[2]

- (c) The Ethiopian wolf is classified as an endangered species by the International Union for the Conservation of Nature and Natural Resources (IUCN). It publishes an annual list of endangered species called the Red List.

Complete Table 1.1 to summarise four of the main reasons, with further explanation, as to why the Ethiopian wolf has become an endangered species.

Table 1.1

reason	explanation
	an activity that accompanies human expansion and reduces the size of the wolf habitat
rabies, a lethal viral disease of wolves	
	a human activity to control wolves, considered to be pests
	the result of wolves breeding with domestic dogs

[4]

- (d) According to the Red List, the number of endangered mammal species in 2007 was 349 and in 2008 was 448.

Calculate the percentage increase in endangered mammal species between 2007 and 2008.

Give your answer to the **nearest whole number**.

Show your working.

answer% [2]

[Total: 9]

Q18.

- 1 The Bengal Tiger, *Panthera tigris tigris*, is an endangered mammalian species of Southern Asia. It lives mostly in a forest habitat.

Fig. 1.1 shows a Bengal Tiger.



Fig. 1.1

- (a) Table 1.1 shows the relationship between available forest habitat and Bengal Tiger numbers between 1970 and 2010.

Table 1.1

year	forest habitat remaining compared to 1970 (%)	Bengal Tiger numbers
1970	100	37 000
1980	79	27 000
1990	42	12 000
2000	26	3 600
2010	18	1 400

Calculate the percentage decrease in the number of Bengal Tigers between 1970 and 2010.
Give your answer to the **nearest whole number**.

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answer % [2]

(b) Suggest methods to conserve the Bengal Tiger.

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(c) The Bengal Tiger belongs to the kingdom Animalia. State **two** differences between members of the kingdom Animalia and the kingdom Plantae.

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[Total: 8]

Q19.

- 7 Corals are simple marine animals and usually exist in colonies of thousands of individuals.

Fig. 7.1 shows a coral colony.



Fig. 7.1

Corals absorb calcium carbonate from the sea to build their skeletons, which help to form large coral reefs. Coral reefs provide a home for about 25% of known fish species and have the highest biodiversity of any marine ecosystem.

- (a) Corals, although they are animals, are sometimes mistaken for members of the plant kingdom.

State **two** ways in which corals differ from plants.

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.....[2]

- (b) Outline what is meant by the term *ecosystem*.

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- (c) Coral reefs are at risk of damage due to human activities. All the coral reefs in three regions were classified as being at low, medium or high risk of damage.

Table 7.1 shows the areas of coral reef at risk of damage in these three regions.

Table 7.1

region	area of coral reef at risk of damage / 1000 km ²			percentage of coral reef at high risk of damage
	low	medium	high	
Caribbean Sea	9	8	7	29
Indian Ocean	20	15	10	
Pacific Ocean	60	30	9	

- (i) Complete Table 7.1, giving your answers to the nearest whole number. [1]

- (ii) Suggest how human activities could damage coral reefs.

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[3]

[Total: 8]

Q20.

- 8 (a) The tiger, *Panthera tigris*, is classified as an endangered species by the International Union for the Conservation of Nature and Natural Resources (IUCN). The IUCN publishes an annual list of endangered species called the Red List.

Fig. 8.1 shows the number of tigers in the wild between 1900 and 2010.

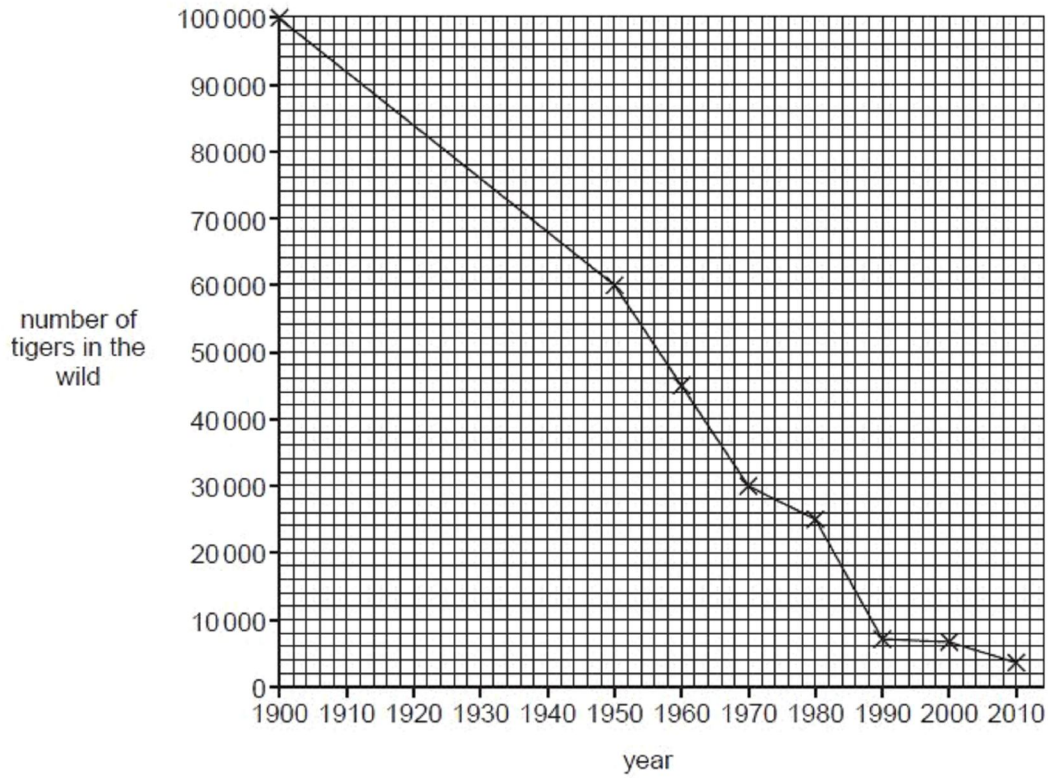


Fig. 8.1

Calculate the overall rate of decrease in number of tigers between 1900 and 2010.

Give your answer to the **nearest whole number**.

answer tigers per year [2]

(b) Describe the reasons why a **named** species has become endangered.

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[4]

[Total: 6]

Q21.

8 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.

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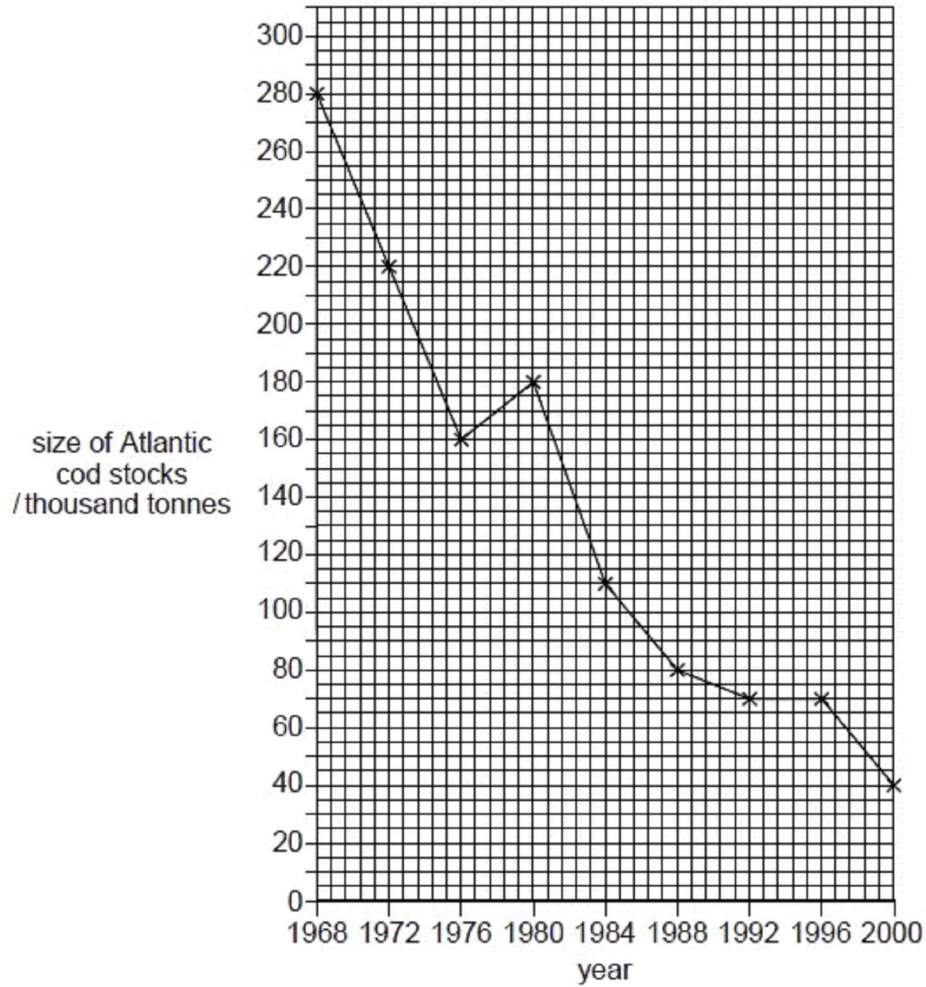


Fig. 8.1

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.

Exa
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[Total: 5]

Q22.

7 The Venus fly trap, *Dionaea muscipula*, is a carnivorous plant. It has traps which catch insects.

Each trap consists of a pair of modified leaves joined by a midrib of hinge cells. The modified leaves have touch-sensitive hairs. If two hairs are touched within 20 seconds, or the same hair is touched twice in rapid succession, the trap closes.

(b) *D. muscipula* grows naturally in a small region in eastern USA. Fires that destroy much of the vegetation occur in this region. Three sites in this region where there had been fires were identified and investigated.

- Site 1 had experienced a fire 2 years before.
- Site 2 had experienced a fire 10 years before.
- Site 3 had experienced a fire 30 years before.

Preliminary observations suggested that over the course of time following a fire, the biodiversity of plants had increased. However, the abundance of Venus fly trap plants had decreased and so had the light intensity available to them. There was also a decrease in the nitrogen that the plants absorbed from insects as a proportion of all the nitrogen they obtained from their environment.

Name an ecological or statistical method to measure:

(i) the abundance of *D. muscipula* at each site

..... [1]

(ii) plant biodiversity at each site

..... [1]

(iii) the strength of the relationship between light intensity and the proportion of nitrogen absorbed from insects, after taking measurements from a large number of plants.

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[Total: 8]

Q23.

4 (a) List three reasons why it is important to conserve endangered plant species.

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(b) The tree *Vatica guangxiensis* is an endangered species. Only three wild populations exist, all in south-western China. Conservation of this species began in the 1980s. Conservation methods included attempts to preserve the habitat of the wild populations and the establishment of a fourth population in the Xishuangbanna Tropical Botanical Garden.

In 2002, the genetic diversity of each of the four populations was assessed. This was done by testing samples of DNA from a number of individuals.

- Twenty different regions of DNA were investigated, using electrophoresis.
- For each population, the percentage of samples that showed differences in the DNA structure, shown by different bands on the DNA 'fingerprint', was calculated.
- This figure was recorded as the percentage of polymorphic bands.

The greater the percentage of polymorphic bands, the greater the genetic diversity in the population.

Table 4.1 shows the results.

Table 4.1

population	number of individual plants sampled	percentage of polymorphic bands
wild population A	27	38.53
wild population B	30	31.60
wild population C	10	27.27
population in the botanic garden	28	30.74

- (i) With reference to Table 4.1, compare the genetic diversity of the population of *V. guangxiensis* in the botanic garden with the genetic diversity of the three wild populations.

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- (ii) Suggest explanations for the relatively low percentage of polymorphic bands recorded in wild population C.

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- (iii) Explain why high genetic diversity is important for a species.

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- (iv) The Xishuangbanna Tropical Botanical Garden is located only tens of kilometres from the habitats of the wild populations of *V. guangxiensis*.
Suggest how this may help with the long-term conservation of this species.

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- (c) Seed banks also have an important role in the conservation of endangered plant species.

- (i) Explain why storing seeds may be a more successful method of conservation than maintaining a population of growing plants.

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- (ii) Suggest why a sample of each type of seed stored in a seed bank is germinated every few years.

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[Total: 15]

Q24.

- 2 The endangered Californian condor, *Gymnogyps californianus*, is the largest flying bird in North America. Condors feed on dead bodies of large mammals, such as cattle and deer. Fig. 2.1 shows the Californian condor.



Fig. 2.1

The population of these condors fell to just 22 in 1982 and this led to the California Condor Recovery Program (CCRP), a captive breeding programme, being set up in different zoos in the United States and Mexico.

Owing to the success of the captive breeding programme there are now over 300 condors. Many of these have been released as part of the programme.

- (a) Outline the advantages of captive breeding programmes such as CCRP.

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(b) Suggest why animals in captive breeding programmes may not always breed successfully.

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.....[2]

(c) When animals that have been bred in captivity are released, their survival rate is low.

Suggest **two** reasons why many of these animals are unable to survive in the wild.

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.....[2]

(d) Bullets containing lead are commonly used by hunters. Hunting for pleasure means that hunters often leave the killed animals, such as deer, bears and antelopes, in the area where they have been shot.

Suggest why this is a threat, rather than an advantage, to the Californian condor.

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.....[1]

[Total: 9]

Q25.

1 (a) Describe what is meant by the term *biodiversity*.

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

(b) Explain why tropical rainforest is considered to have a very high **ecological** importance.

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

In Mexico, coffee is an important crop. Coffee trees grow well in areas in which tropical rainforest is found and so the planting of coffee plantations frequently means that rainforest is destroyed.

Table 1.1 shows four different coffee-growing systems that are used in Mexico and also the results of a survey into the number of different bird species found in each system.

(c) With reference to Table 1.1,

(i) explain the reasons for the pattern shown by the numbers of bird species in systems **A**, **B**, **C** and **D**;

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

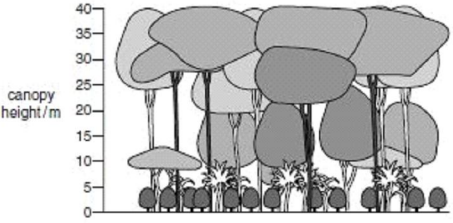
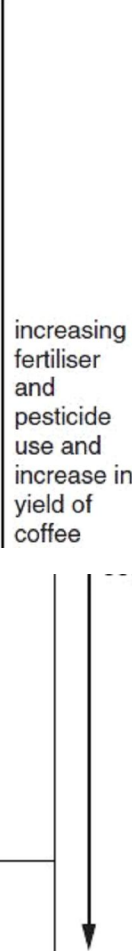
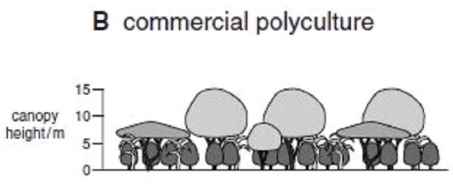
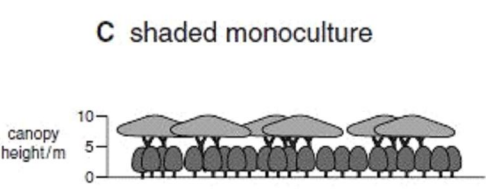
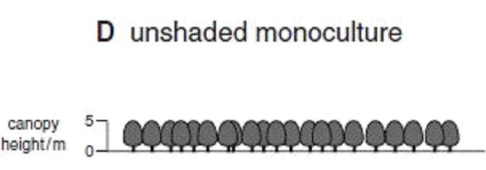
(ii) suggest reasons for the greater yield of coffee from system **D** than from system **A**;

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

(iii) suggest why more pesticides are used in system **D** than in the other systems.

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

Table 1.1

coffee-growing system		mean total number of bird species per unit area
<p>A traditional polyculture or 'coffee garden'</p>  <p>coffee and many other useful species grown beneath the original forest trees</p>	184	<p>increasing fertiliser and pesticide use and increase in yield of coffee</p> 
<p>B commercial polyculture</p>  <p>original forest trees removed and replaced with a mixture of other tall trees such as rubber; coffee and other crops grown beneath them</p>	106	
<p>C shaded monoculture</p>  <p>original forest trees removed and replaced with a single species of leguminous trees; only coffee trees grown beneath them</p>	50	
<p>D unshaded monoculture</p>  <p>original forest trees removed; coffee trees grown alone</p>	9	

- (d) In the shaded monoculture system, system C, the shade is usually provided by a single species of the leguminous tree *Inga*. This tree has nodules containing *Rhizobium* on its roots.

Explain why coffee trees grown in this system require much lower inputs of fertiliser than when grown in the unshaded monoculture system, system D.

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

- (e) With reference to Table 1.1 and your own knowledge of the conservation of tropical rainforest, describe **international** measures that could be taken to conserve biodiversity in the coffee-growing areas of Mexico.

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

[Total: 15]

Section B

1.

- 9 (a) Explain the need to maintain biodiversity in an ecosystem such as a tropical rainforest. [7]
- (b) Discuss the advantages and the disadvantages of captive breeding programmes for mammals. [8]

[Total: 15]

2.

- 9 (a) It has been stated that the kingdom Protocista can be described as a very diverse group of organisms that share only a few common features.
- Discuss the ways in which members of the kingdom Protocista are similar to each other and ways in which they differ. [7]
- (b) With reference to any **named** species of plant or animal, explain why this species is considered to be endangered **and** outline the reasons that have caused it to become endangered. [8]

[Total: 15]

3.

- 9 (a) Describe the main features of an organism belonging to the **plant** kingdom. [8]
(b) Describe the methods used to conserve endangered **animal** species. [7]

[Total: 15]

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