

1 Desert plants are adapted for survival in a dry climate.

(a) Joshua trees live in deserts.



By nyenyec [CC BY-SA 3.0], via Wikimedia Commons

Joshua trees have two different types of root:

- a system of shallow roots spread out over a large area
- roots about 1 m in diameter, shaped like bulbs, deep in the soil.

Explain the advantage to the Joshua tree of having:

(i) shallow roots spread out over a large area

(2)

(ii) large, bulb-like roots deep in the soil.

(1)

(b) Creosote bushes also live in deserts.



By Sue in az (Own work) [Public domain], via Wikimedia Commons

The leaves of creosote bushes:

- are covered with a layer of wax
- fold together during the day.

Explain how the leaves of the Creosote bush help it to survive in deserts.

(3)

(Total 6 marks)

2

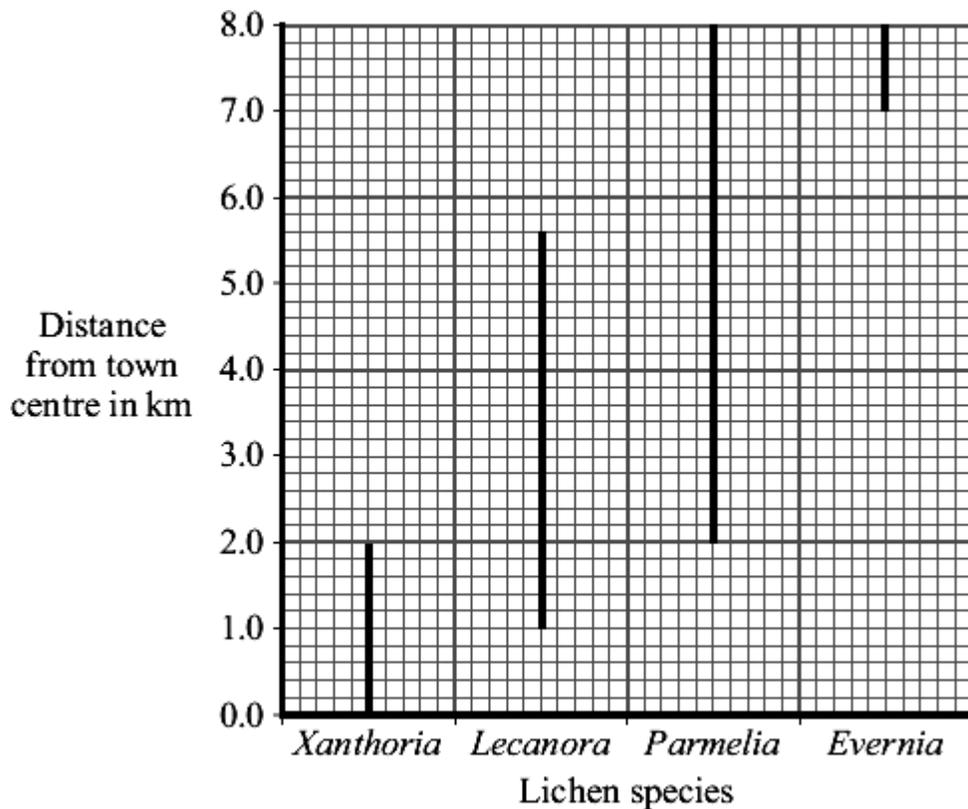
Lichens are sensitive to the amount of sulfur dioxide in the atmosphere. They are used as indicator species for the amount of air pollution. Air pollution is generally higher in town centres than in the countryside.

Students investigated the relationship between lichen species and distance from a town centre.

- On a map, they drew a transect (line) from the centre of the town to the countryside.
- They examined sites every 200 metres along the transect (line).
- At each site, they recorded the lichen species growing on trees and walls up to a height of 2 metres.

The graph shows their results.

The lines on the graph indicate the range of each lichen species.



(a) Give **one** way in which the students could have obtained more accurate results.

(1)

(b) (i) Which lichen species was found over the greatest range?

(1)

(ii) Which lichen species grows only in the least polluted air?

(1)

(c) One student concluded 'You can tell how much sulfur dioxide there is in the air by the amount of *Lecanora* growing'.

Give **two** reasons why this is **not** a valid conclusion.

1. _____

2. _____

(2)

(Total 5 marks)

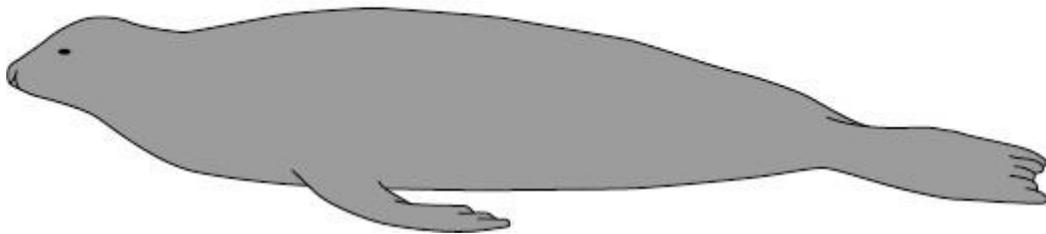
3

Seals are adapted for life in the sea.

Use information from the drawings to answer the questions.

This drawing shows seal **X**.

Seal X



(a) Give **two** ways in which seal **X** is adapted for swimming.

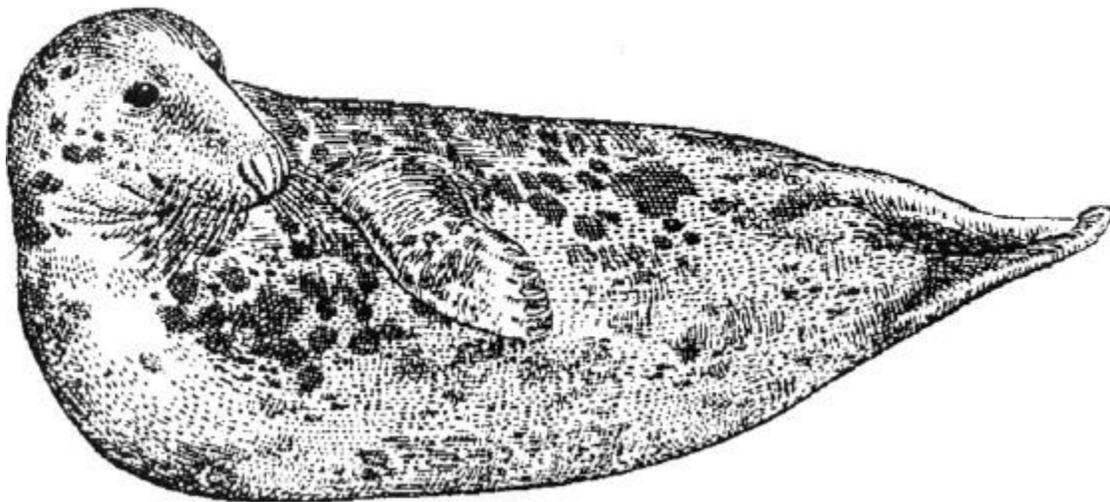
1. _____

2. _____

(2)

(b) This drawing shows seal Y, drawn to the same scale as seal X.

Seal Y



Seal Y lives in much colder seas than seal X.

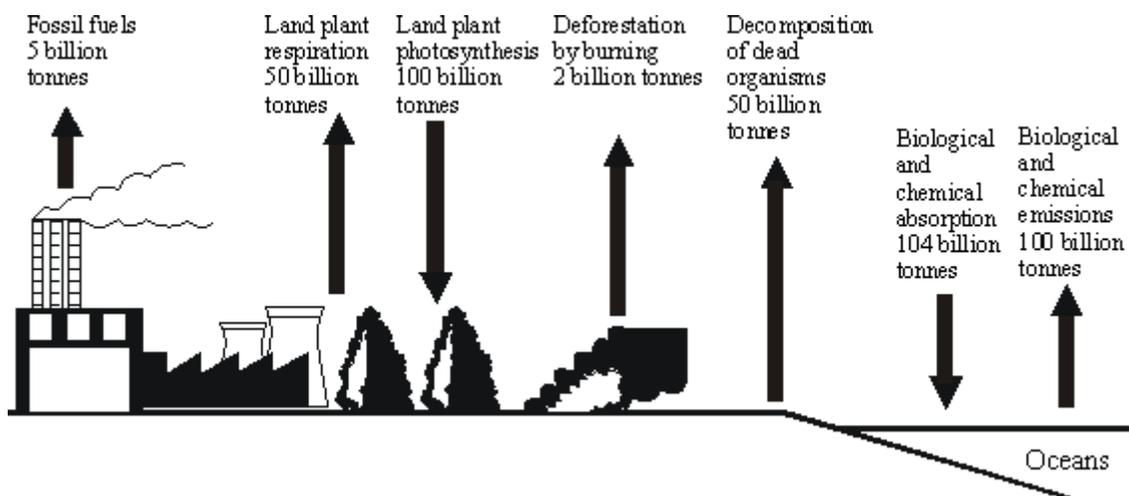
Explain **one** way in which seal Y is adapted for surviving in cold seas.

(2)

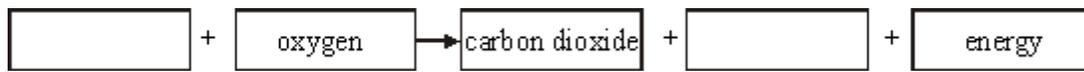
(Total 4 marks)

4

The diagram below shows the mass of carbon involved each year in some of the processes in the carbon cycle.



(a) Complete the equation for plant respiration.



(2)

(b) (i) Calculate the mass of carbon removed from the atmosphere each year. (*Show your working.*)

Answer _____ billion tonnes

(1)

(ii) Calculate the percentage of this total which is removed by the photosynthesis of land plants. (*Show your working.*)

Answer _____%

(2)

(iii) Calculate the net gain of carbon by the atmosphere in one year. (*Show your working.*)

Answer _____ billion tonnes

(2)

(Total 7 marks)

5

Squirrels live mainly in woodland. There are two types of woodland in Great Britain: coniferous woodland containing trees such as Scots pine and Norway spruce, and broad-leaved woodland containing trees such as Hazel, Beech, Oak, Sycamore and Sweet chestnut.

The red squirrel is a native species, the grey squirrel was introduced at the beginning of this century. Since the introduction of the grey squirrel, the red squirrel has largely disappeared from broad-leaved forests in England.

(a) Suggest **two** factors which might have caused the fall in the population of red squirrels.

1. _____

2. _____

(2)

(b) The drawing gives information about the two types of squirrel.

HOW THEY DIFFER	
RED	GREY
Weight: ¾ lb	Weight: 1½ lb
Appearance: tufted ears and chocolate coat in winter; chestnut in summer.	Appearance: ears not tufted, silver-grey coat in winter, yellow-brown in summer
Habitat: favours large coniferous forest.	Habitat: favours broadleaved woodland and can colonise hedgerows.
The red has a shy, retiring nature and spends 70% of time in the forest canopy.	A natural showman and acrobat, the grey spends only 14% of time in the canopy.

FOODS THE REDS LIKE... AND THOSE THEY DON'T						
Scots pine cone	Hazel nuts	Norway spruce cone	Beech mast	(Oak) acorns	Sycamore	Sweet chestnut
						

Up to six times as many grey squirrels as red can populate broadleaved woodlands, while red squirrels can match the density of greys only in coniferous forests

Using **only** information given above, suggest **two** reasons why the population of grey squirrels has risen whereas the population of red squirrels has fallen.

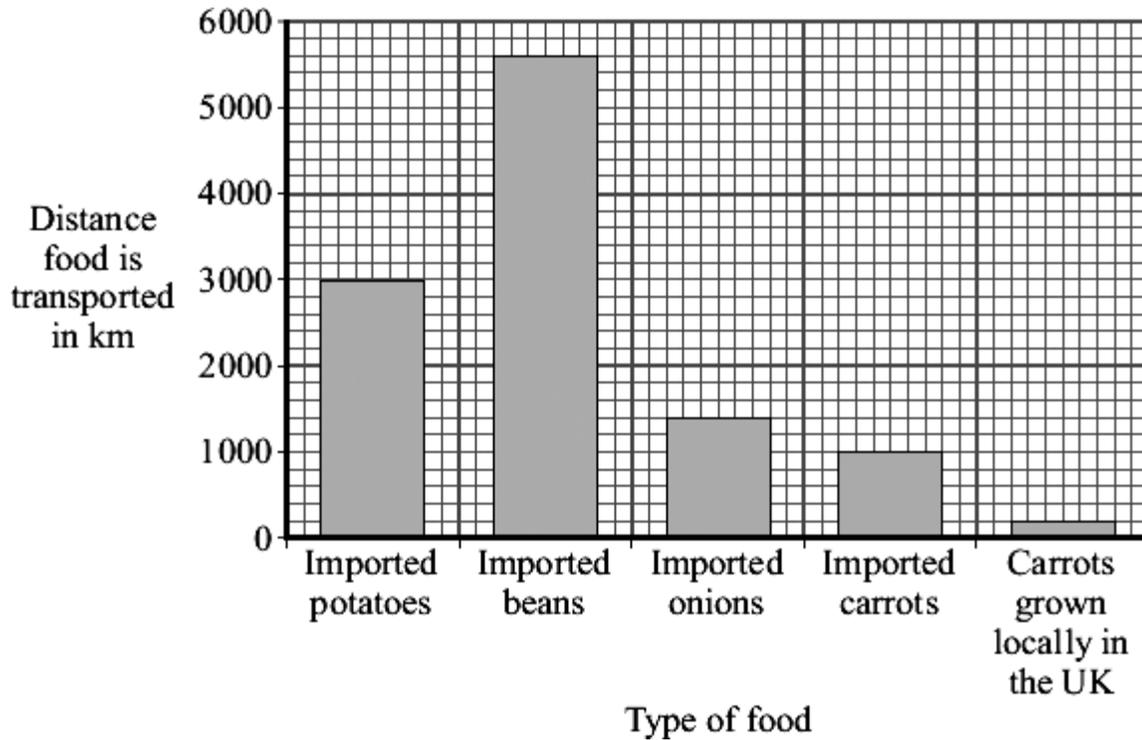
1. _____

2. _____

(2)
(Total 4 marks)

- 6 Some people are concerned about the distance that food is transported between the grower and the supermarket.

The bar chart shows the distances for some foods.



- (a) Both imported carrots and carrots grown locally in the UK can be bought in supermarkets all year round.

How many times further are imported carrots transported than carrots grown locally in the UK?

Show clearly how you work out your answer.

_____ times

(1)

- (b) Many of the beans sold in supermarkets in the UK are grown in Kenya, a tropical country in Africa.

Beans grow faster in Kenya than they do in the UK.

Suggest and explain **one** reason why.

Reason _____

Explanation _____

(2)

- (c) Many people believe that we should buy locally produced food instead of food imported from abroad.

Explain how this would help the environment.

(2)

(Total 5 marks)

7

The gemsbok is a large herbivore that lives in herds in desert areas of South Africa. Gemsboks feed on plants that are adapted to living in dry conditions. There are not many rivers, lakes or ponds that can provide drinking water for the animals. The desert areas are hot during the day but cool at night. As the air cools at night it becomes moist, and the plants absorb the moisture.



(a) A few lions live in the desert areas. They hunt and feed on the gemsboks.

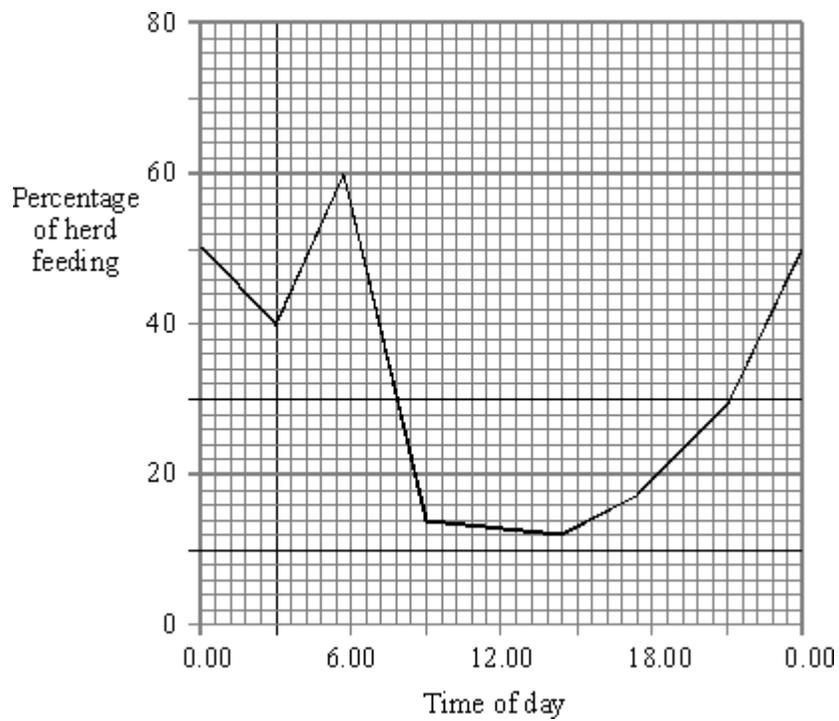
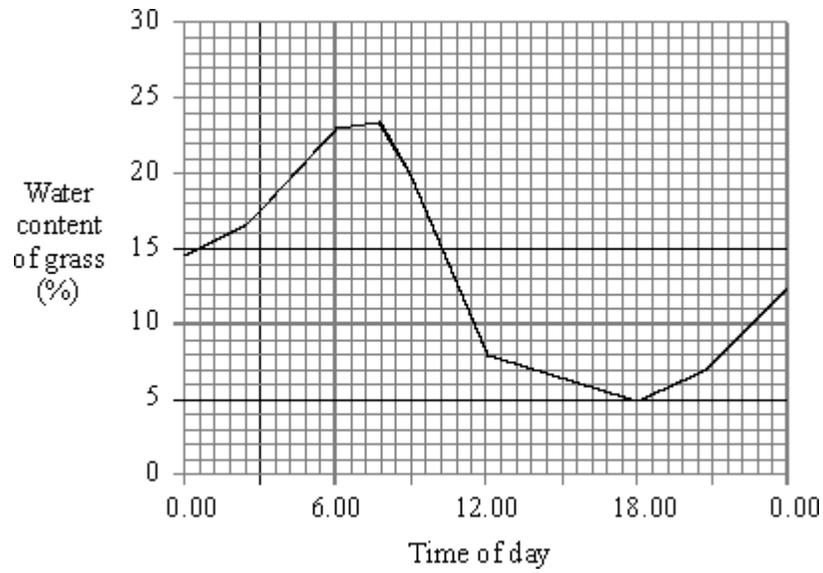
Use information from the drawing of the gemsbok to suggest **two** ways in which it could avoid being killed by lions.

1. _____

2. _____

(2)

- (b) The graphs show the water content of the desert grass and the times of day that the gemsboks feed.



- (i) Describe how the water content of the grass changes during the day.

(1)

(ii) Suggest why the water content of the grass changes.

(1)

(c) (i) Between which times of day are more than 25% of the herd feeding?

_____ and _____

(1)

(ii) Suggest an advantage to the gemsbok of feeding mainly at these times.

(2)

(Total 7 marks)

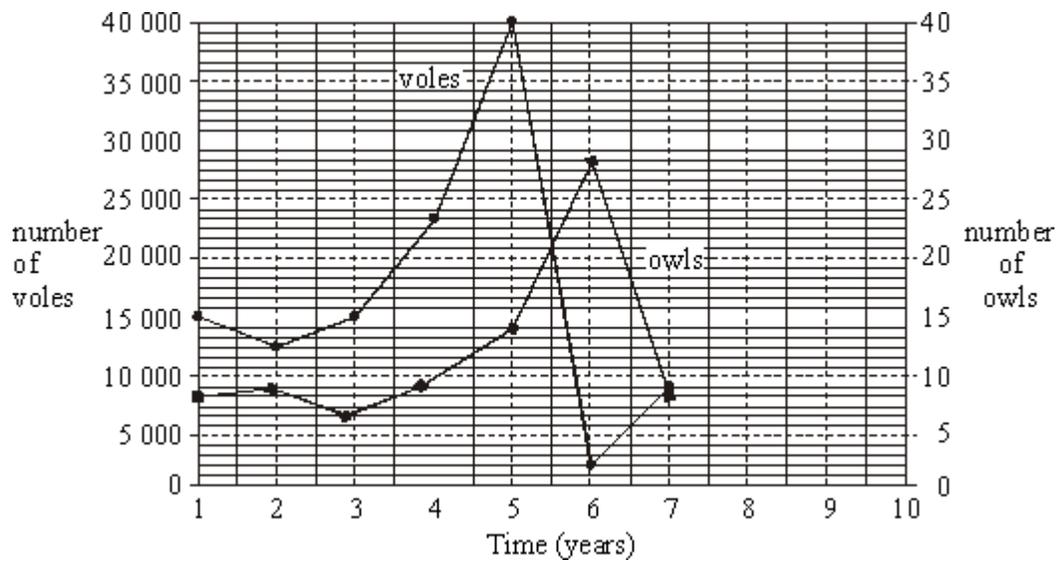
8

The table shows the results of a ten-year study of the owls and voles in a forest.

YEAR	NUMBER OF VOLES (TO THE NEAREST THOUSAND)	NUMBER OF OWLS
1	15 000	8
2	12 000	9
3	15 000	7
4	23 000	9
5	40 000	14
6	2 000	28
7	9 000	8
8	19 000	9
9	10 000	14
10	8 000	16

The data for years 1 - 7 have been plotted on the grid below.

(a) Complete the graph by plotting the data for years 8 - 10.



(2)

(b) (i) What is the main factor which limits the size of the owl population?

(1)

(ii) Suggest **two** reasons other than owl predation, for the large fall in the numbers of voles between years 5 and 6.

1. _____

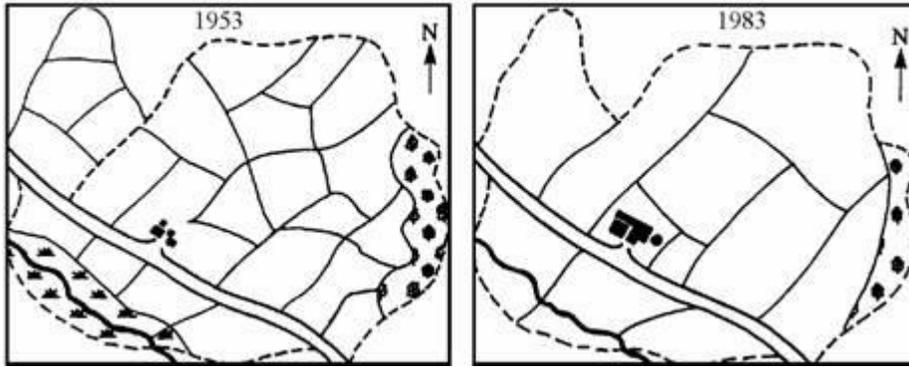
2. _____

(2)

(Total 5 marks)

9

The drawings show changes to a farm between 1953 and 1983.



Key

Hedges	—
Boundary	- - -
River	~~~~~
Buildings	■ ■
Trees	⊙ ⊙
Marsh	▲ ▲ ▲

The fields on the farm are separated by hedges.

(i) Give **two** major changes which were made to the land on this farm between 1953 and 1983.

1. _____

2. _____

(2)

(ii) How would these changes affect the number of wild animals which live on the farmland?

Explain your answer.

(2)

(Total 4 marks)

10

The photograph shows a musk ox.



Photograph supplied by iStockphoto/Thinkstock

The musk ox lives in the Arctic. An adult musk ox is 2.5 m long and 1.4 m high at the shoulder. Adults usually have a mass of about 400 kg.

Use this information and information from the photograph to explain **two** ways in which a musk ox is adapted for survival in the Arctic.

(a) (i) Adaptation 1 _____

(1)

(ii) How this adaptation helps the musk ox to survive in the Arctic.

(1)

(b) (i) Adaptation 2 _____

(1)

(ii) How this adaptation helps the musk ox to survive in the Arctic.

(1)

(Total 4 marks)

11 Animals in a habitat compete with each other.

(a) Give **two** factors for which animals may compete.

1. _____

2. _____

(2)

(b) The photographs show a mule deer and a white-tailed deer.



Mule deer

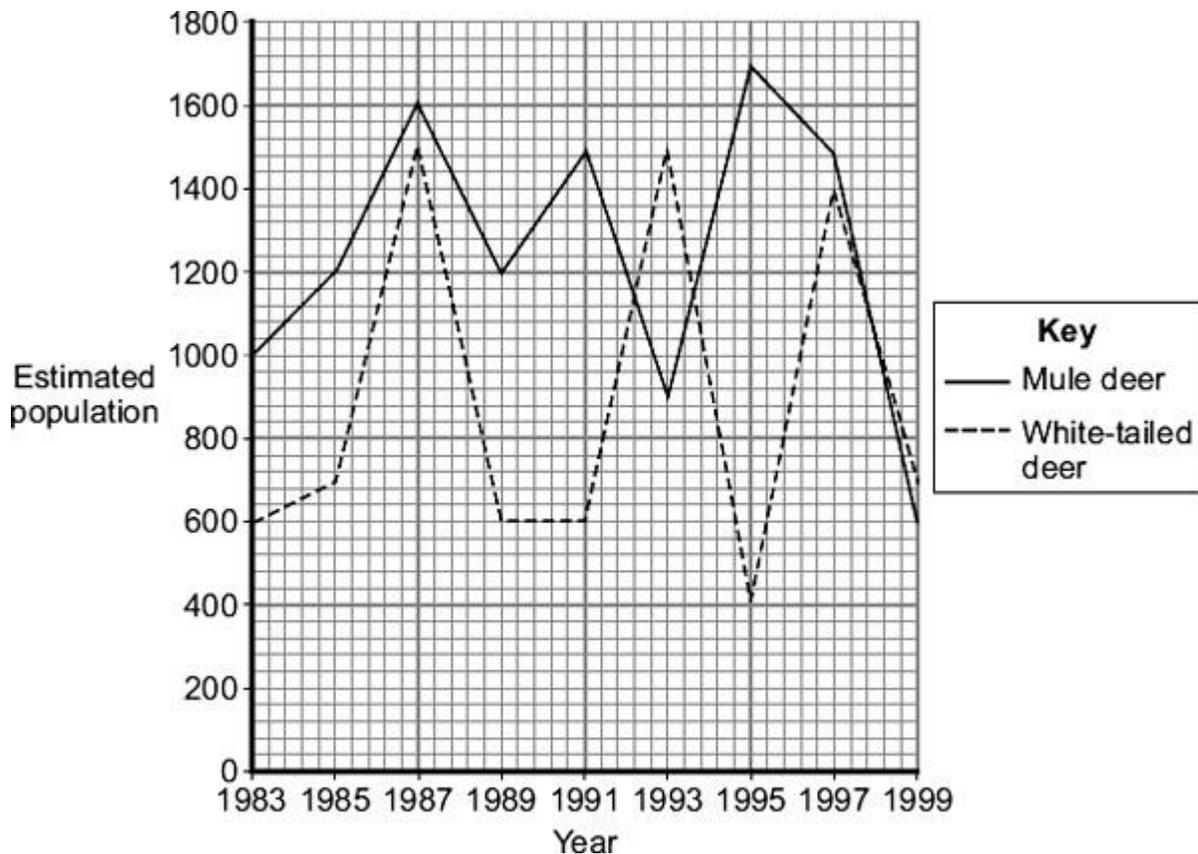


White-tailed deer

Mule deer by Dcrjsr (Own work) [CC-BY-3.0], via Wikimedia Commons. White-tailed deer by Clay Heaton (Own work) [CC-BY-SA-3.0], via Wikimedia Commons

Mule deer and white-tailed deer live together in the same national park in the USA.

The graph shows changes in the populations of the two deer species between 1983 and 1999.



(i) Describe the changes in the population of white-tailed deer between 1991 and 1995.

(2)

(ii) Use information from the graph to suggest an explanation for changes in the population of white-tailed deer between 1991 and 1995.

(2)

(Total 6 marks)

Mark schemes

- 1** (a) (i) increased water uptake
ignore nutrients / food
allow quicker water uptake
allow collects water over larger area 1
- (after) rain
accept ideas in terms of more successful competitor 1
- (ii) water storage **or** stability **or** safety from predators
ignore absorption of water from soil 1
- (b) reduces water loss / evaporation
accept reduces transpiration
allow stops water loss 1
- wax protects plant **or** reflects heat **or** keeps plant cool **or** unpalatable
ignore reflects light 1
- folding reduces surface area **or** folding reduces warming
*accept enclosed stomata **or** less exposure of stomata **or** increased humidity **or** less water concentration gradient*
allow prevents burning
ignore less likely to be damaged 1
- 2** (a) any **two** from:
- shorter distance between samples
ignore repeat investigation /measurements
 - sample to greater height
 - specify the size of each site
ignore longer transect 1
- (b) (i) Parmelia 1
- (ii) Evernia 1

[6]

(c) any **two** from:

- Lecanora does not extend over whole range of transect / does not grow everywhere /does not grow in town centre / does not grow in countryside
- Lecanora grows in a range of sulfur dioxide concentrations **or** Lecanora only grows in limited range of sulfur dioxide concentrations **or** Lecanora lives over large range of sulfur dioxide concentrations
- other factors eg different pollutant might also influence growth of Lecanora
- sulfur dioxide / pollutant concentration was not measured
ignore Lecanora does not give accurate measure of sulfur dioxide concentration
- amount of Lecanora not measured

2

[5]

3

(a) any **two** from:

- streamlined / smooth
allow description eg long and thin ignore slimy / oily skin unless qualified
- flippers
*allow fins **or** webbed feet*
- flattened / long / large / powerful tail
tail must be qualified to gain credit

2

- (b) **1** mark for each adaptation and **1** mark for its correct linked advantage

correct advantage mark can be awarded if adaptation is attempted but not awarded the mark

eg

fat / blubber (1)

ignore skin / fur

insulates (1)

allow keeps warm

or

large mass to area ratio **or** small area to mass ratio (1)

ignore large body unqualified

allow volume for mass

heat loss reduced (1)

ignore keeps warm

2

[4]

4

- (a) glucose/sugar water

for 1 mark each

2

- (b) (i) 204

for 1 mark

1

- (ii) 49 **gains 2 marks**

(incorrect answer, but correct method gains 1)

2

- (iii) 3 **gains 2 marks**

(incorrect answer, but correct method gains 1)

2

[7]

5

- (a) 2 of e.g. competition for food competition for space disease

2

- (b) e.g. greys eat greater range of food greys larger – more effective competitors

2

[4]

6 (a) 5 1

(b) any **one** from:

allow in either section

- more light

allow more sun / sunnier

- warm(er) / hot

- more water / lot of rain

1

increased / more photosynthesis

allow in either section

allow more biomass / carbohydrate / named (made)

*do **not** allow food*

allow enzymes / metabolism faster

NB for 2 marks this must be linked to heat

to gain 2 marks more / increased must be mentioned at least once

1

(c) less pollution / named pollutant eg carbon dioxide / 'fumes' / emissions

allow examples of effect of less pollution

eg less global warming / less acid rain

allow any relevant environmental effect

eg imported diseases

1

less fuel used / less transport / named transport

ignore 'less distance' / importing

allow 'less distance travelled' / 'lesstravel'

allow smaller carbon footprint once only for either mark

1

[5]

7 (a) long / pointed horns **and** for defence
long legs **and** to run away *reject strong / powerful legs*
long legs **and** to kick predator
tall **and** can see predators a long distance away but accept
eyes on side of head **and** to see predator approaching
large ears **and** to hear predators approaching
pattern **and** for camouflage any
two for 1 mark each

2

- (b) (i) fall in morning / day and rise at night or any reasonable
for 1 mark
description of whole pattern for one mark 1
- (ii) loss due to evaporation or transpiration in day / absorbed from air
at night / when cool
for 1 mark 1
- (c) (i) 19.30 – 20.30 **and** 07.30 – 08:30
for 1 mark 1
- (ii) highest moisture content in grass
 needs water in desert conditions / response to shortage of drinking water
 sensible reference to less chance of predation
any two for 1 mark each 2

[7]

- 8** (a) 1 mark for each correct set of plots
for 1 mark each 2
- (b) (i) number of voles/amount of food
for 1 mark 1
- (ii) e.g. increased number of owls
 new disease
for 1 mark each 2

[5]

- 9** (i) fewer hedges
 marsh drained
 less woodland/trees
 more farm buildings
any 2 for 1 mark each 2
- (ii) fewer
 e.g. fewer habitats
for 1 mark each 2

[4]

10 1 mark for each adaptation and **1** mark for its correct **linked** advantage

fur / long hair / thick coat (1)

for insulation / reduces heat loss (1)

allow keeps warm for insulation point

large body / large mass / small (1) SA:V ratio

ignore layer of fat

retains heat / loses less heat (1)

ignore keeps warm

short legs (1)

reject short (height) / small (height)

reduces surface area / heat loss (1)

ignore keeps warm for this point

small ears (1)

reduces surface area / heat loss (1)

ignore keeps warm for this point

horns (1)

defence (1)

large shoulders (1)

to move through snow (1)

[4]

11 (a) any **two** from:

- food / feeding

ignore water

- mates / mating

- territory / space / land / shelter / nesting sites

ignore homes / place to live / habitat / resources

- status (within group)

2

- (b) (i) rises to 1480 to 1500
or rises by 880 to 900
or rises until 1993

ignore incorrect figures if 1993 given

1

falls to 400 to 440 **or** falls by 1040 to 1100

*if neither mark gained then allow 1 mark for rise followed by fall **or** fell by 160 to 200*

1

- (ii) rises because: -
less competition from mule deer
or mule deer population falling
or fewer mule deer

ignore reference to food / breeding

ignore reference to predation / disease

1

falls because: -
more competition from mule deer
or mule deer population rising
or more mule deer

ignore more / less suited to environment

if neither mark gained then correct reference to competition gains 1 mark

1

[6]