1 Swallows and swifts migrate between Britain and South Africa every year.

(a) **Photograph 1** shows a swallow.

Photograph 1

Swallows can fly very quickly.

Use information from the photograph to give **one** way in which the swallow is adapted for flying very quickly.

.....

.....

(1)

(b) **Photograph 2** shows swifts.

Photograph 2

Swallows and swifts both feed on flying insects.
They both spend the summer in Britain and then migrate to South Africa in the autumn.

Suggest **one** reason why swallows and swifts do not stay in Britain in the winter.

.....

.....

(1)

(c) The table gives data about swallows and swifts.

	Swallows	**Swifts**
Arrival date in Britain	April	Early May
Leaving date from Britain	October	Early August
Food	Flying insects	Flying insects
Height at which the birds feed	Near ground level	Up to 350m above ground level
Times at which birds feed	Mainly when it is light	Almost 24 hours per day

(i) There is very little competition between swallows and swifts for food.

Use information from the table to suggest **two** reasons for this.

1 .....

.....

2 .....

.....

(2)

(ii) Swallows and swifts do compete for some factors.

Suggest **one** of these factors.

.....

.....

(1)

(Total 5 marks)

2 The drawing shows a poison-dart frog.

(a) The poison-dart frog moves mainly by jumping.

Use information from the drawing to suggest **one** way in which this frog is adapted for jumping.

.....

.....

(1)

(b) Use the information below to suggest how the poison-dart frog is adapted for survival.

- This poison-dart frog is bright blue in colour.
- Animals that eat poison-dart frogs become very sick.

.....

.....

(1)

(Total 2 marks)

3 Copper compounds are found in water that has drained through ash from power stations. Invertebrate animals are used to monitor the concentration of copper compounds in water. First, scientists must find out which invertebrate animals can survive in a range of concentrations of copper compounds.

This is how the procedure is carried out.

- Solutions of different concentrations of a copper compound are prepared.
- Batches of fifty of each of five different invertebrate species, **A**, **B**, **C**, **D** and **E**, are placed in separate containers of each solution.
- After a while, the number of each type of invertebrate which survive at each concentration is counted.

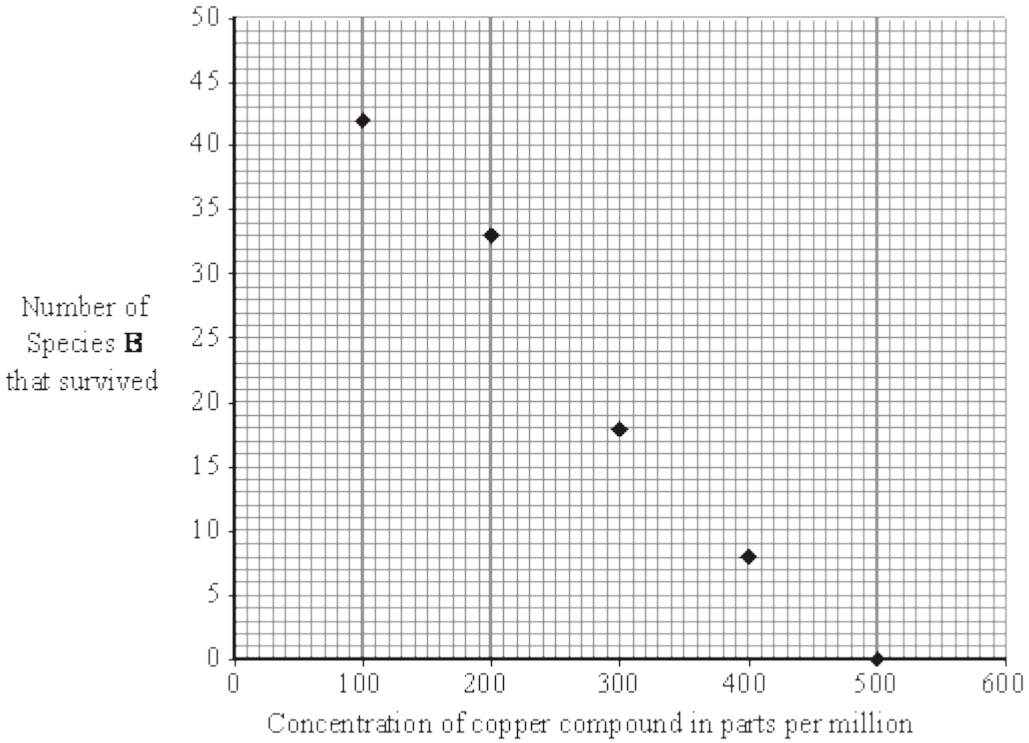
(a) Give **two** variables that should be controlled in this investigation so that the results are valid.

1 .....

2 .....

(2)

(b) The graph below shows the results for species **B**.

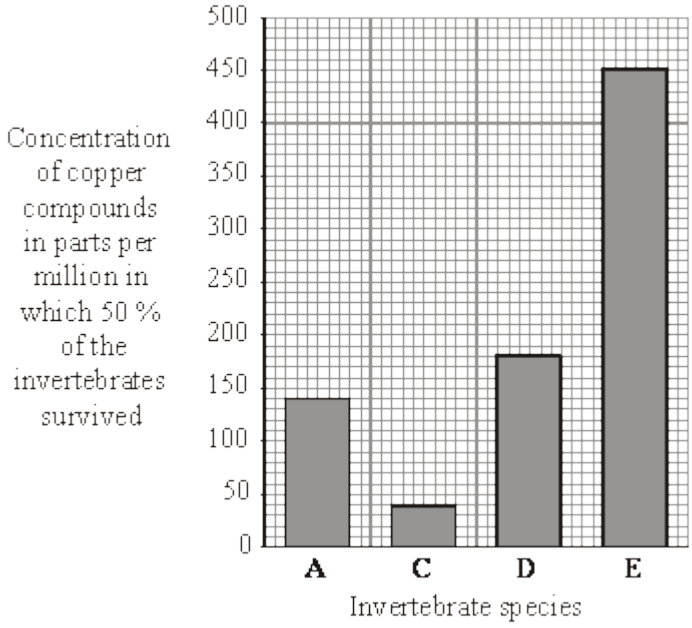


Use the graph to find the concentration of copper compounds in which 50% of Species **B** survived. To obtain full marks you must show clearly on the graph how you obtained your answer.

Concentration ..... parts per million

(2)

(c) The graph below shows the results of the tests on the other four invertebrate species.



www.tutorzone.co.uk

(i) Which species, **A**, **C**, **D** or **E**, is most sensitive to the concentration of copper in the water?

.....

Give the reason for your answer.

.....

.....

(1)

(ii) It is often more convenient to use invertebrates rather than a chemical test to monitor water for copper.

Suggest **one** explanation for this.

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.....

.....

(2)

(Total 7 marks)

4 The photograph shows a sand gazelle.

The sand gazelle lives in the Arabian Desert where temperatures often reach 45 °C.

(a) The sand gazelle feeds only at dawn and at dusk. At other times it stays in the shade.

Suggest how this helps the animal to conserve water.

.....

.....

.....

.....

(2)

(b) During the dry season, the sand gazelle's liver and heart shrink in size. This reduces the amount of oxygen that the body needs.

Suggest how needing less oxygen helps the animal to conserve water.

.....

.....

.....

.....

(2)

(Total 4 marks)

5 The drawing shows a kangaroo rat.

This rat lives in hot, dry deserts.

(a) Explain how each of the following features helps the kangaroo rat to survive in a hot, dry desert.

(i) It does not produce urine.

.....

.....

(1)

(ii) It lives in a burrow during the day, but comes out at night to search for food.

.....

.....

(1)

(iii) Its feet and its tail each have a large surface area.

.....

.....

(1)

(b) The kangaroo rat does **not** sweat.

Explain why **not** sweating could be dangerous for the animal.

.....

.....

(1)
(Total 4 marks)

6 Organisms have adaptations that enable them to survive in extreme conditions.

(a) The photograph shows an arctic fox.

This fox lives in the arctic, where it is very cold.

Suggest **two** ways in which the arctic fox is adapted for life in very cold conditions.
Explain how each adaptation helps the arctic fox to survive in very cold conditions.

Adaptation 1 .....

.....

How this adaptation helps the arctic fox to survive in very cold conditions.

.....

.....

.....

Adaptation 2 .....

.....

How this adaptation helps the arctic fox to survive in very cold conditions.

.....

.....

.....

(4)

(b) The photograph shows an antelope that lives in a sandy desert.

The antelope is prey to large cats such as cheetah.

Suggest **two** adaptations that help this antelope to avoid being killed by predators.
Explain how each adaptation helps the antelope to avoid being killed by predators.

Adaptation 1 .....

.....

How this adaptation helps the antelope to avoid being killed by predators.

.....

.....

.....

Adaptation 2 .....

.....

How this adaptation helps the antelope to avoid being killed by predators.

.....

.....

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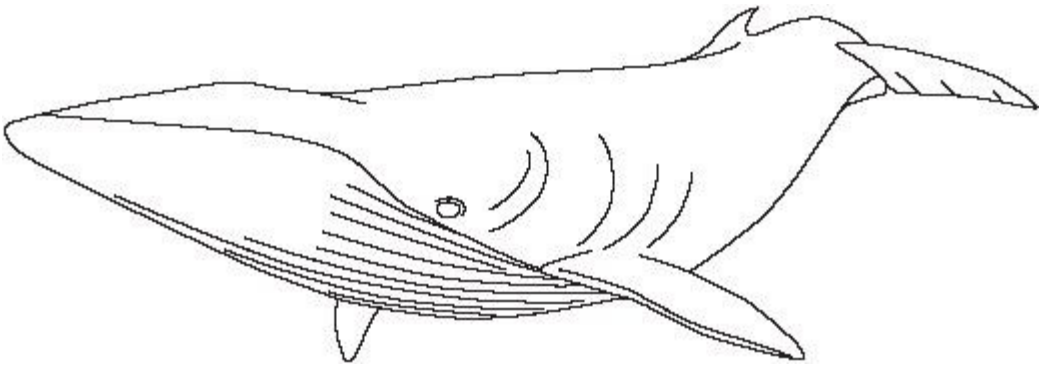
(4)
(Total 8 marks)

7

(a) **Figure 1** shows a minke whale. Whales live in the sea.

Figure 1



Write down **two** ways in which the body of the whale is adapted for swimming.

1 .....

.....

2 .....

.....

(2)

(b) **Figure 2** shows the skeleton of a minke whale.

Figure 2

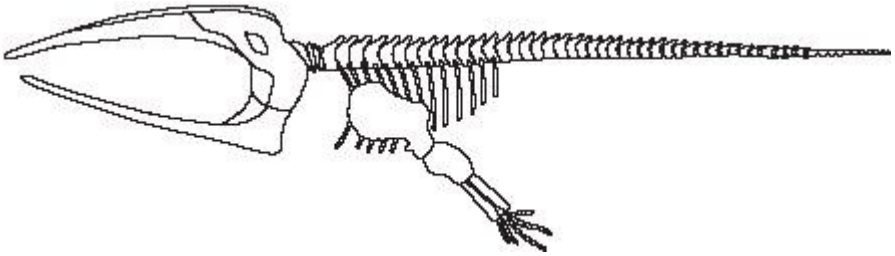
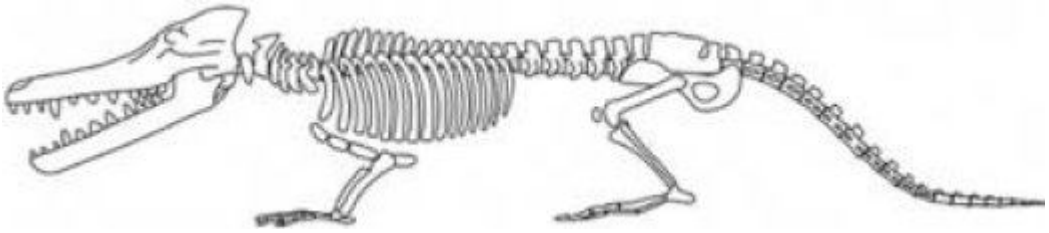


Figure 3 shows the fossil skeleton of an extinct whale.

Figure 3



Hans G Thewissen/ The Thewissen Lab

(i) Apart from size, give **two** differences between the skeleton of the minke whale and the fossil skeleton of the extinct whale.

1 .....

.....

2 .....

.....

(2)

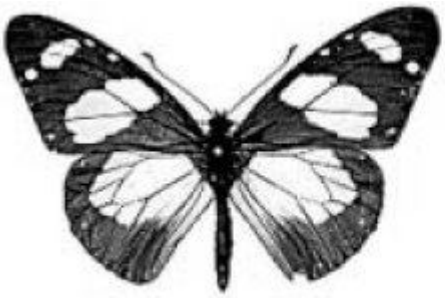
(ii) In each of the sentences below, draw a ring around the correct answer.

Life on Earth first developed more than three | billion / million / thousand | years ago.

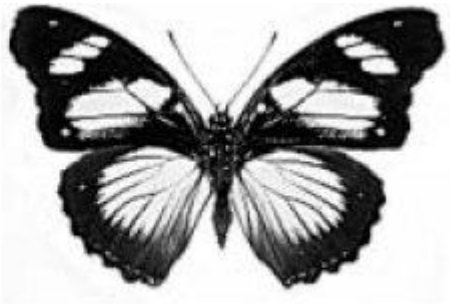
Fossils | disprove / give evidence for / prove | the theory of evolution.

(2)
(Total 6 marks)

8 The drawings show two different species of butterfly.



Amauris



Hypolimnas

- Both species can be eaten by most birds.
- *Amauris* has a foul taste which birds do not like, so birds have learned not to prey on it.
- *Hypolimnas* does **not** have a foul taste but most birds do not prey on it.

(a) Suggest why most birds do **not** prey on *Hypolimnas*.

.....

.....

.....

.....

(2)

(b) Suggest an explanation, in terms of natural selection, for the markings on the wings of *Hypolimnas*.

.....

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.....

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.....

.....

(3)
(Total 5 marks)

9 Animals and plants are adapted in different ways in order to survive.

(a) Plants may have to compete with other plants.

(i) Name **two** things for which plants compete.

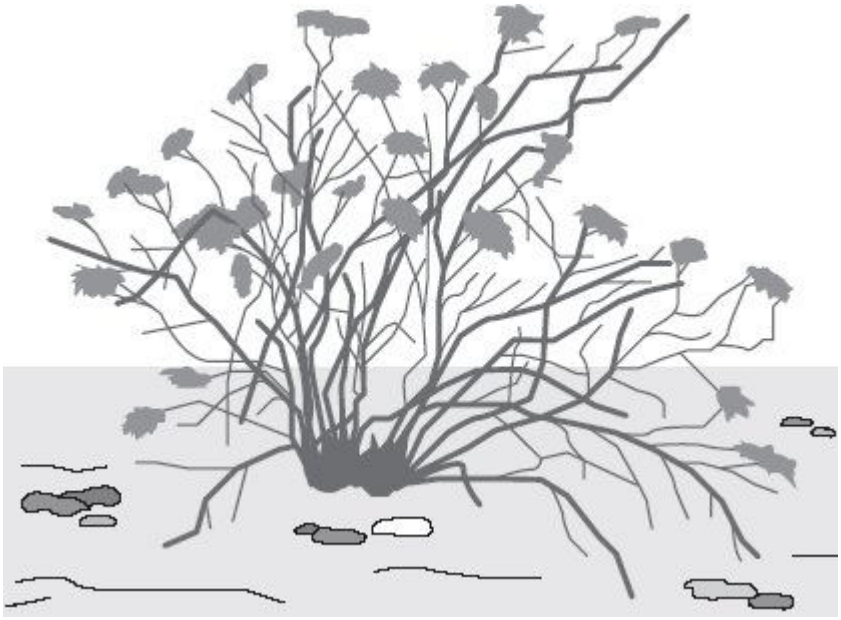
1 .....

2 .....

(2)

(ii) The drawing shows a creosote bush.

This bush lives in a desert.



The creosote bush produces a poison that kills the roots of other plants.

How does this poison help the creosote bush to survive in the desert?

.....

.....

(1)

(b) The photograph shows an insect called a katydid.

The katydid is preyed on by birds.

How does the appearance of the katydid help it to survive?

.....

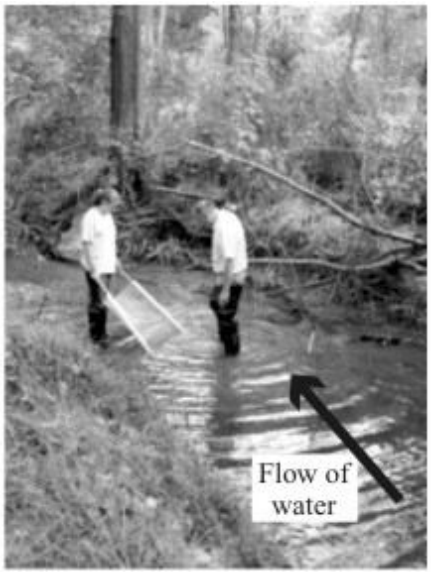
.....

.....

.....

(1)
(Total 4 marks)

10 Invertebrate animals are used to monitor pollution in streams. The photograph shows scientists collecting a sample of invertebrates from a stream.



Reproduced with the permission of John Graham

This is the method that they use.

- A 1 m^2 area of the bed of the stream is marked out.
- A net 1m wide is held by one person on the downstream side of the marked-out area.
- The other person uses their boots to gently move stones in this area of the stream bed. They do this for three minutes. This dislodges invertebrates which are then caught in the net.
- The invertebrates are then identified and counted.

(a) Name **two** control variables (variables which must be kept the same) in this investigation.

1. .....

2. .....

(2)

(b) Suggest **two** reasons why the results from a sample might not be accurate.

1. .....

.....

2. .....

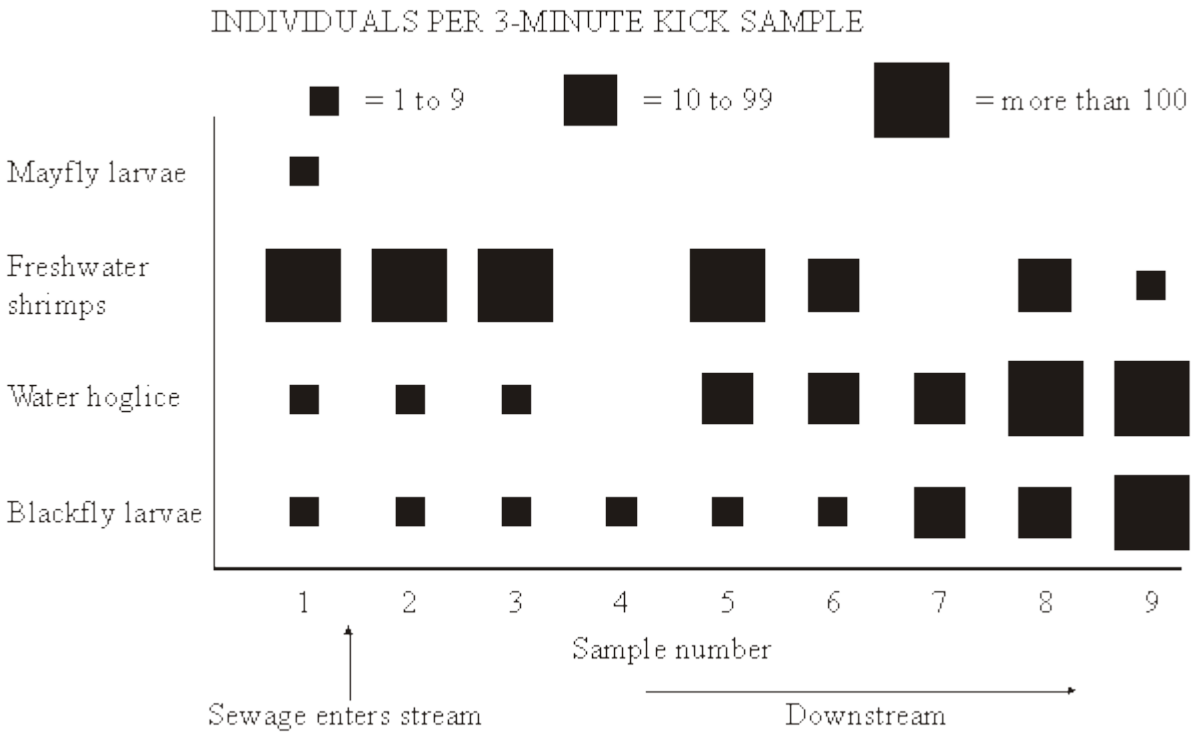
.....

(2)

The technique described above was used to investigate the effect of sewage on stream invertebrates.

- Sample 1 was taken upstream of the point where the sewage entered the stream.
- Samples 2–9 were taken at regular intervals downstream of the sewage inflow.

The graph shows the results.



(c) What was the range of the number of blackfly larvae that could be found in sample 7?

.....

(1)

(d) Describe, as fully as you can, how the number of water hoglice changed downstream from where sewage entered the stream.

.....

.....

.....

.....

(2)

(e) Which of the four invertebrates is the best indicator species for water which is **not** polluted by sewage?

.....

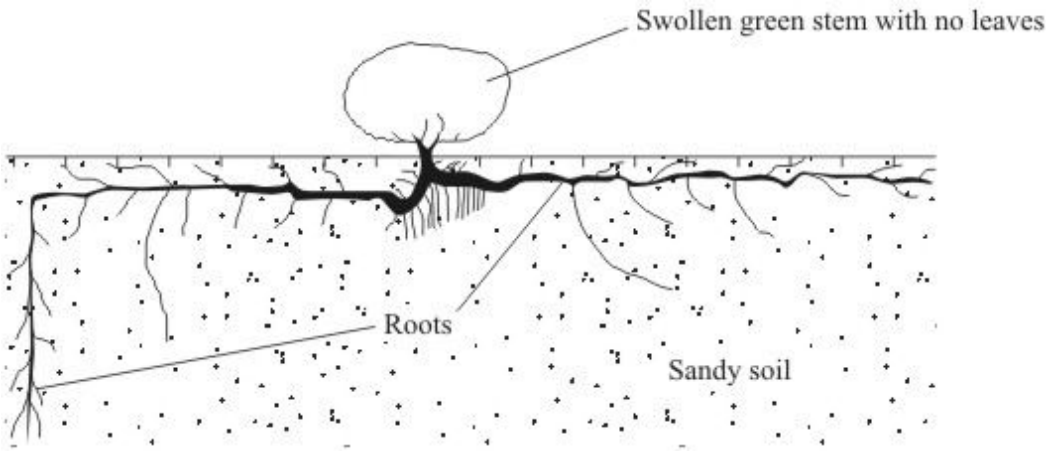
Give the reason for your answer.

.....

.....

(2)
(Total 9 marks)

11 The drawing shows a bean caper plant.



The bean caper plant lives in hot desert conditions.

Explain two ways in which the bean caper is adapted for life in a hot desert.

Adaptation 1 .....

.....

How this adaptation helps the bean caper to survive

.....

.....

Adaptation 2 .....

.....

How this adaptation helps the bean caper to survive

.....

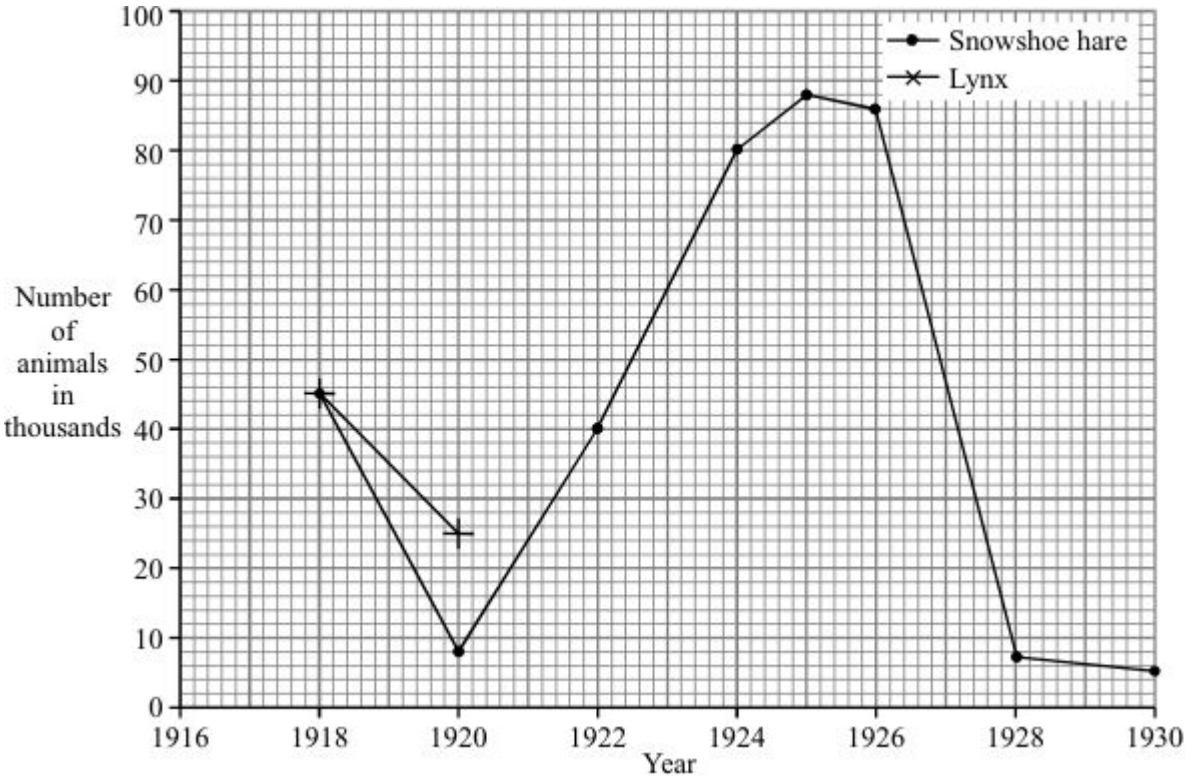
.....

(Total 4 marks)

12 The lynx is a wild cat which lives in Canada. The table shows the number of lynx trapped in a part of Canada in certain years.

Year	Number of lynx in thousands
1918	45
1920	25
1922	10
1924	20
1926	40
1928	50

The snowshoe hare is another wild animal found in Canada. The graph shows the number of snowshoe hares trapped in the same years. The lynx eats the snowshoe hare.



(a) Draw a graph of the data in the table. The first two points have been plotted for you.

(2)

(b) From your graph, predict how many lynx were trapped in 1925.

..... thousand

(1)

(c) Use the information to answer the following.

(i) What would you expect to happen to the number of lynx trapped in 1930? Draw a ring around your answer.

rise **fall** **stay the same**

(1)

(ii) Give a reason for your answer to part (c)(i).

.....

.....

(1)

(d) The lynx is a predator. What is a predator?

.....

.....

(1)
(Total 6 marks)

13 The table compares some features of a polar bear and the Malayan sun bear. The polar bear lives in the Arctic where the climate is cold. The Malayan sun bear lives in warm tropical forests.

	Polar bear	**Malayan sun bear**
Colour of fur	White	Black
Thickness of fur in cm	5	2
Thickness of fat layer under skin in cm	11	1
Surface area compared to body size	Low	High

Use information from the table to explain how the polar bear is better adapted than the Malayan sun bear for survival in arctic conditions.

To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.

.....

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.....

(Total 5 marks)

14 A selective herbicide (a type of pesticide) can be used to kill weeds growing among crop plants.

The table shows the result of adding different amounts of a selective herbicide to a rice crop.

Herbicide added in kg per hectare	Amount of rice produced in tonnes per hectare	Percentage cover of weeds
0.0	50	85
1.7	70	32
3.4	76	24

(a) As more herbicide is applied, what happens to:

(i) the amount of rice produced;

.....

(1)

(ii) the percentage cover of weeds?

.....

(1)

(b) Suggest **two** reasons why rice does not grow well when there are a lot of weeds present.

1 .....

.....

2 .....

.....

(2)

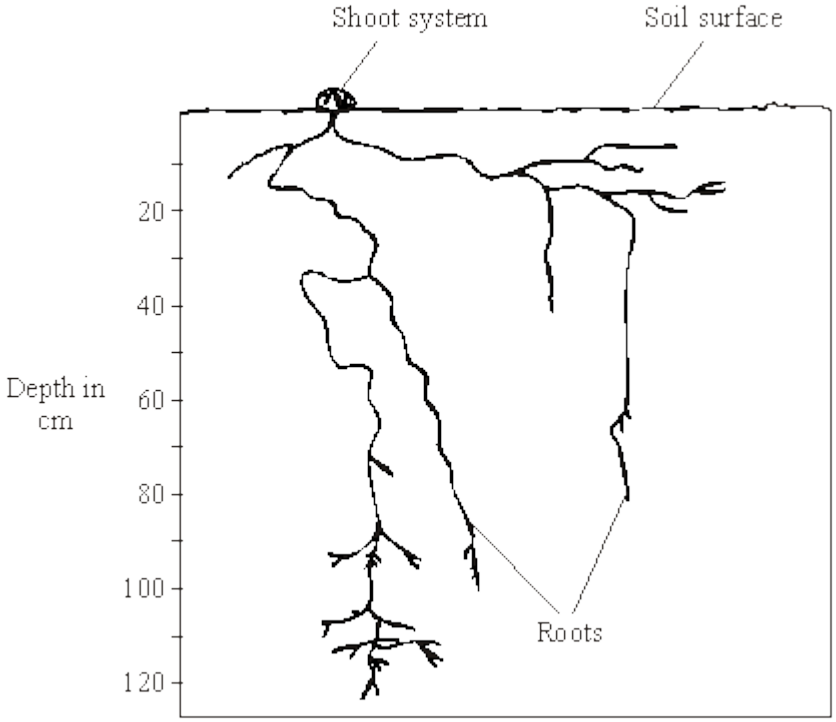
(c) Suggest **one** possible danger of spraying crops with pesticides.

.....

.....

(1)
(Total 5 marks)

15 The diagram shows the desert plant, *Fredolia.*



Describe and explain **three** adaptations of *Fredolia,* which you can see in the diagram, that help it to survive in dry conditions.

1 .....

.....

2 .....

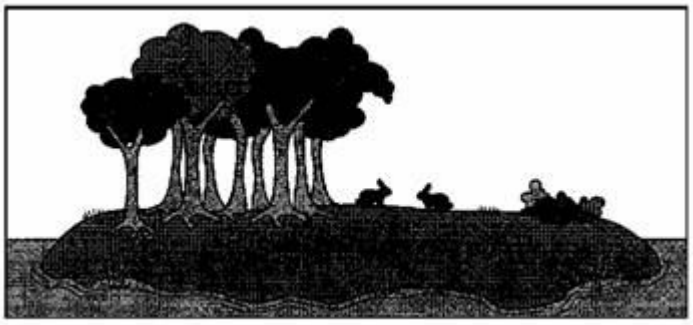
.....

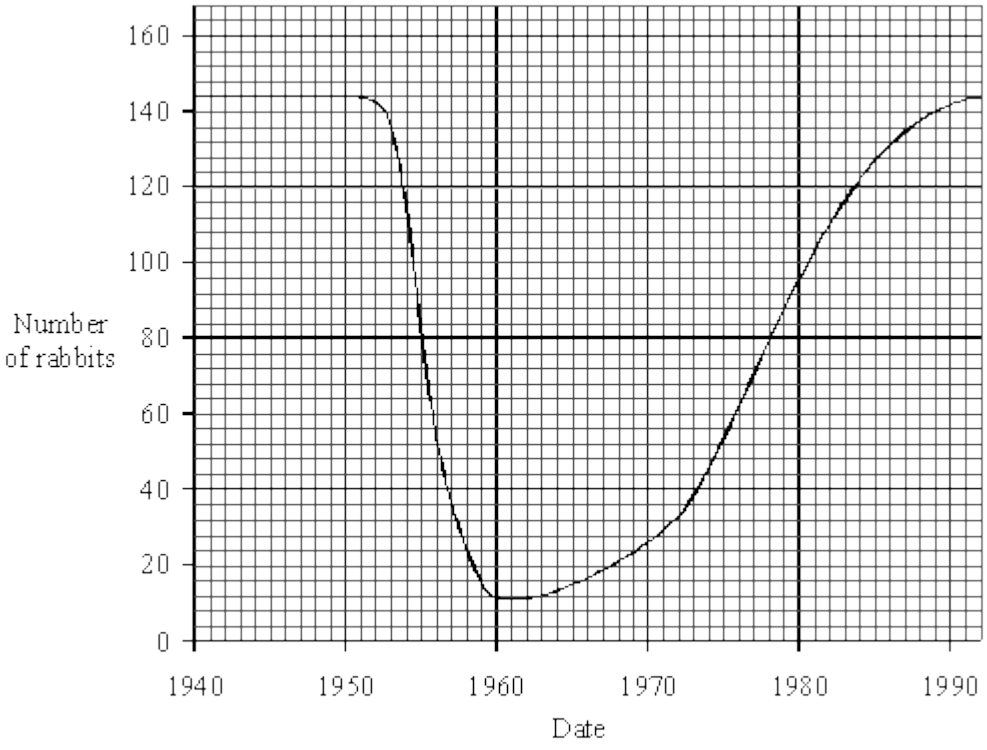
3 .....

.....

(Total 3 marks)

16 A population of rabbits lived on a small island. The graph shows their population over the last 50 years.





(a) (i) How many rabbits were there on the island in 1950?

.....

(1)

(ii) Give **one** year when there were 88 rabbits on the island.

.....

(1)

(b) (i) Calculate the decrease in rabbit population between 1950 and 1960.

.....

(1)

(ii) Suggest a reason why the rabbit population fell in these years.

.....

(1)

(c) The most rabbits on the island is always about 140. Suggest a reason for this.

.....

.....

(1)
(Total 5 marks)

17 Animals and plants are adapted to live in their environment.

(a) Explain how these adaptations help animals keep warm in cold conditions.

(i) A thick fur coat

.....

.....

(2)

(ii) A thick layer of fat beneath the skin

.....

.....

(2)

(iii) A large body

.....

.....

(2)

(b) Lots of animals are *camouflaged.* What does *camouflaged* mean? Give **one** advantage of being *camouflaged.*

.....

.....

.....

(2)

(c) Describe **two** different ways that plants could be adapted to survive in dry conditions like a desert.

.....

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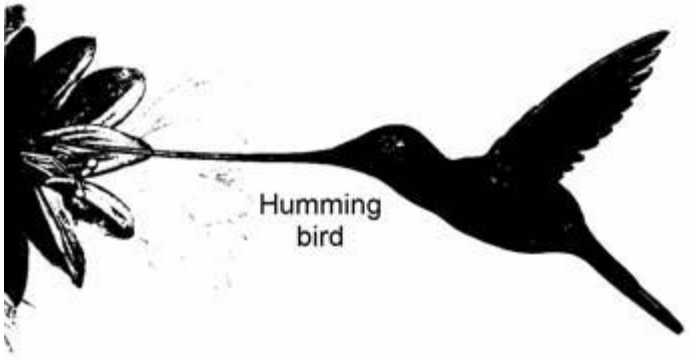
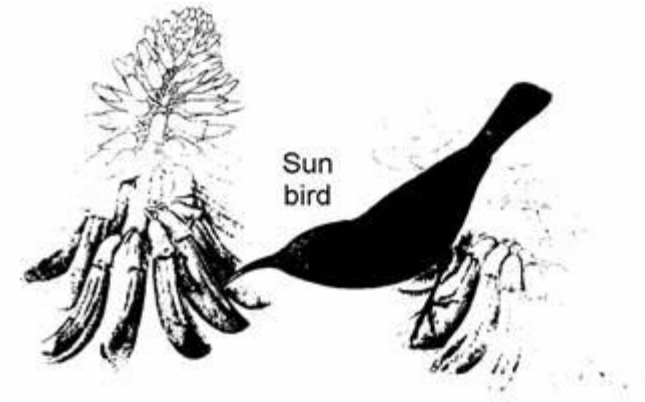
.....

.....

(2)
(Total 10 marks)

18 The drawings show a humming bird and a sun bird feeding.





Both of these birds feed on nectar which is a sugary liquid found inside flowers.

Use the information from the drawings to answer the following questions.

(a) Describe, as fully as you can, how the humming bird is adapted for feeding on nectar.

.....

.....

.....

.....

(2)

(b) The sun bird has a different method of obtaining nectar.

Describe, as fully as you can, how the sun bird is adapted for feeding on nectar.

.....

.....

.....

.....

(2)
(Total 4 marks)

19 The table below shows what some of the living things in a wood do at different times of the year.

Organism	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sep	Oct	Nov	Dec
Oak tree												
Hazel (bush)												
Primrose (plant)												
Bluebell (plant)												
Squirrel (mammal)												
Owl (bird)												

	In leaf
	In flower
	Mating season
	Rearing young

Use information from the table to help you to answer the following questions.

(i) For how many months are there leaves on the oak trees? .....

(1)

(ii) There are no leaves on the oak tree for the whole of one season. Which season is this?

.....

(1)

(iii) Suggest **one** change in the environment which might cause oak trees to lose their leaves.

.....

.....

(1)

(iv) Bluebells live on the floor of the wood. Explain why it is an advantage to the bluebells to produce leaves in February rather than later in the year.

.....

.....

.....

.....

(2)

(v) When do the owls mate? .....

(1)

(vi) Explain **one** advantage to the owls of rearing their young in summer rather than in winter.

.....

(1)

(Total 7 marks)

20 (a) One food chain in the wood is:

Hazel tree nuts → squirrels → owls

(i) What does this food chain tell us?

.....

.....

(2)

(ii) Which **one** of the organisms in the food chain is a producer?

.....

(1)

(iii) This year the hazel bushes have produced very few nuts.

Explain, as fully as you can, how this might affect the populations of:

1. squirrels;

.....

.....

.....

.....

2. owls.

.....

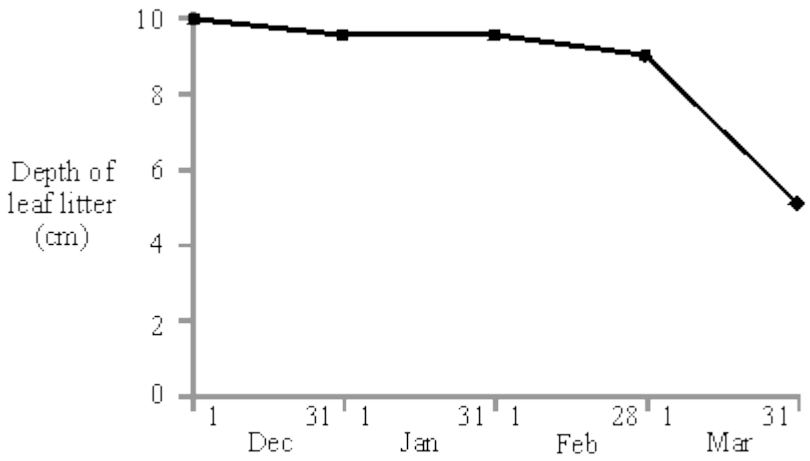
.....

.....

.....

(4)

(b) An area of the floor of the wood 1 m² was fenced off so that animals could not reach it. The graph below shows the depth of leaf litter (dead leaves) inside the fence over the next few months.



Explain, as fully as you can,

(i) why the depth of the leaf litter decreased;

.....

.....

.....

(1)

(ii) how this decrease happened.

.....

.....

.....

(1)

(iii) In which month does leaf litter disappear fastest? Explain why.

.....

.....

.....

.....

(2)
(Total 11 marks)

The drawings and text for this question are based on an article from The Independent newspaper.

Some of Britain's rarest wild flowers are likely to make a come-back thanks to an EC set-aside regime in which 15 per cent of arable land has been taken out of production.

As a result of this set-aside, shepherd's needle, pheasant's eye, corn gromwell, corn cockle, spreading hedge parsley and corn mouse tail are now thriving once again. They were once common in and around cereal fields and were even regarded as weeds, but were swept to near extinction by the intensification of agriculture after the Second World War. Their small, pale flowers are hardly seen. These plants cannot compete in fields where modern cereal crops are cultivated. Nor, however, do they flourish in semi-natural or wild habitats where nature is left to its own devices. They need farmland which is lightly tilled and cut once a year.

Dr Nick Sotherton, lowland research manager with the Game Conservancy Council, says that these species will flourish under the new rotational set-aside regime, in which farmers are compensated for taking land out of production in an attempt to end crop surpluses.

EC agriculture ministers are meeting to decide how much land should be used for rotational set-aside – in which a field is taken out of production for just one year before being replanted – and how much should be set-aside permanently. The ultimate set-aside is a wood, and Britain is seeking a forestry option.

The Game Conservancy Council says that the rotational scheme can benefit ground nesting birds as well as rare flowers that will not be helped by longer-term set-aside. But Richard Knight of the Wildlife Advisory Group, says "Non-rotational is better because it gives flora and fauna a chance to get well established".

"Intensification of agriculture" has led to the creation of artificial ecosystems.

(a) Explain how the creation of artificial ecosystems may have led to the near-extinction of the plants seen in the picture above.

.....

.....

.....

.....

.....

.....

(4)

(b) What would you recommend to ministers meeting to decide a policy involving rotational set-aside and permanent set-aside? Explain the reasons for your answer.

.....

.....

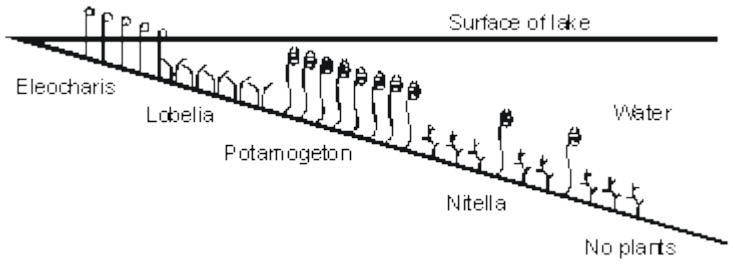
.....

.....

.....

(4)
(Total 8 marks)

22 This is a diagram of a belt transect showing the major types of plants growing on the bottom of a lake.



(a) Suggest, and explain, **two** reasons why a much smaller population of Nitella plants is found amongst the Potamogeton plants than further down in the lake.

1. .....

.....

.....

.....

2. .....

.....

.....

.....

(4)

(b) Describe how you would use the belt transect technique to measure the abundance and distribution of plants which live on the bottom of a shallow lake.

.....

.....

.....

.....

.....

.....

(3)
(Total 7 marks)

23 Professor John Lawton researches into the problem of controlling the spread of bracken. Bracken is a fern which threatens upland farms, partly because it poses a health risk to people and animals.

Professor Lawton is waiting for government permission to release the Conservular caterpillar which feeds on the bracken.

The Secretary of State has to decide whether the Conservular caterpillar can be released.

The article printed below describes some of the problems faced by the Secretary of State.

David the caterpillar to bracken's Goliath

Yorkshire farmer Maurice Cottrill has just forked out £500 to have a helicopter hover over his land and spew out gallons of chemicals aimed at destroying one of the most pervasive and dangerous weeds known to man – bracken. In a little box in a laboratory near Ascot, Berkshire, lies a tiny caterpillar which could have done the job for nothing.

Whether or not that caterpillar and thousand of its chums will ever be let loose on the massive carpet of bracken that is sweeping over Britain at the rate of 53 square kilometres a year has to be decided by the Secretary of State for the Environment.

Weed control through the release of imported insects has never been tried in Britain before. If the Secretary of State permits the experiment, the caterpillar is in for the feast of its life, because five years of painstaking research have proved that bracken is its only food. However, is that the full story? Will the beast stop there, or will it go on, wreaking unforeseen devastation. Can scientists predict what will happen when imported insects are released into the wild?

Bracken is poisonous – more than 20 000 sheep and 1 000 cattle suffer poisoning each year. Its spores are carcinogenic, posing a threat to hill walkers. Bracken costs a depressing £4m a year to control while rendering useless grazing land valued at £5m annually. "Bracken is one factor which is leading to hill farming becoming uneconomic", says the director of the Ramblers Association. "We are worried about that because, the more uneconomic hill farms become, the more prospect there is of the forestry industry taking over."

The National Farmers Union are concerned about the consequences of the caterpillar getting out of control. What if it started consuming garden ferns? What if it loved potatoes? On the other hand, the caterpillar might help to preserve important uplands where wildlife flourishes when bracken is kept at bay. However, the experiment takes the scientists into unknown territory.

World-wide, 94 species of weeds have been controlled by biological releases involving 215 types of animal in 50 countries. Professor Lawson says that approximately one-third have achieved effective control and the remainder have failed.

Upland farms are artificial ecosystems, created and maintained mainly for the rearing of sheep and cattle. These farms are being threatened by the spread of bracken. Up to now the only treatment for bracken has been to use herbicides.

Use the article to explain, as fully as you can, what advice you would give the Secretary of State.

Explain the arguments for and against that lead to your decision.

You will **not** receive marks for simply copying extracts from the article.

(Total 8 marks)

24 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.

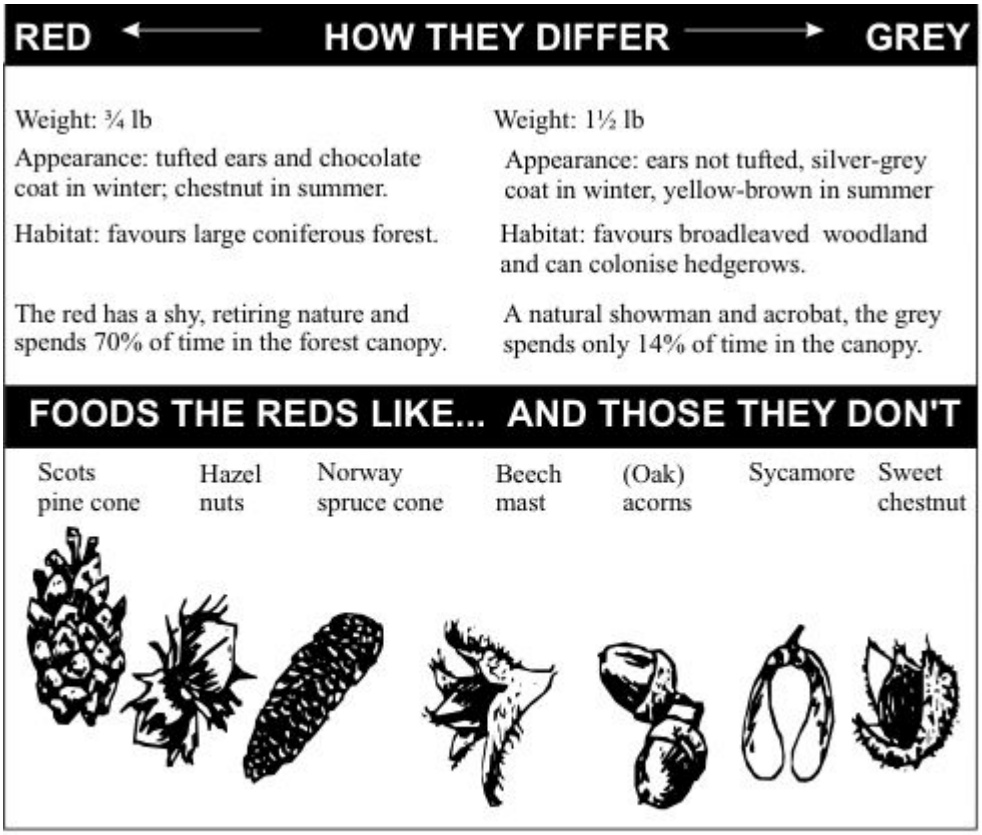
(a) Suggest **two** factors which might have caused the fall in the population of red squirrels.

1 .....

2 .....

(2)

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



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 .....

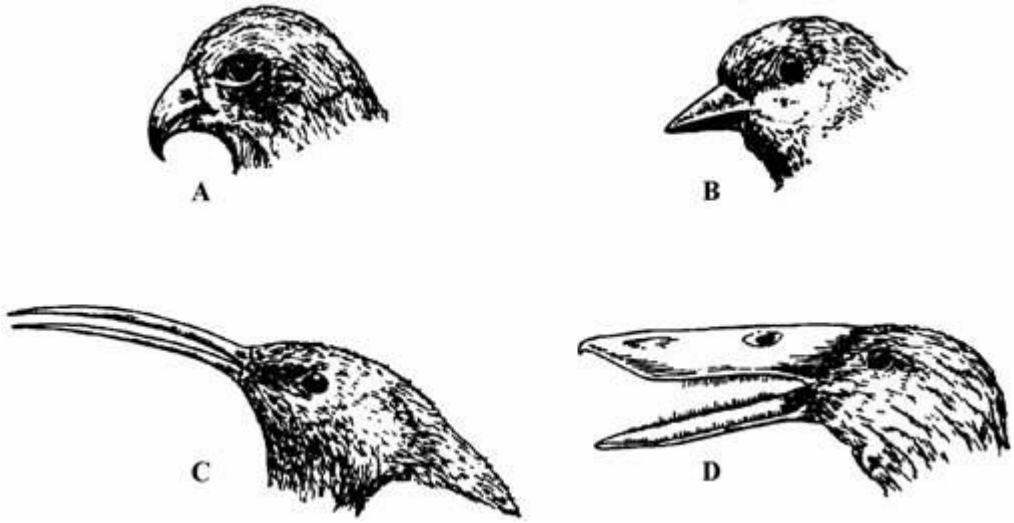
.....

2 .....

.....

(2)
(Total 4 marks)

25 The drawings show the heads of four birds, not drawn to scale. The birds feed in different ways.

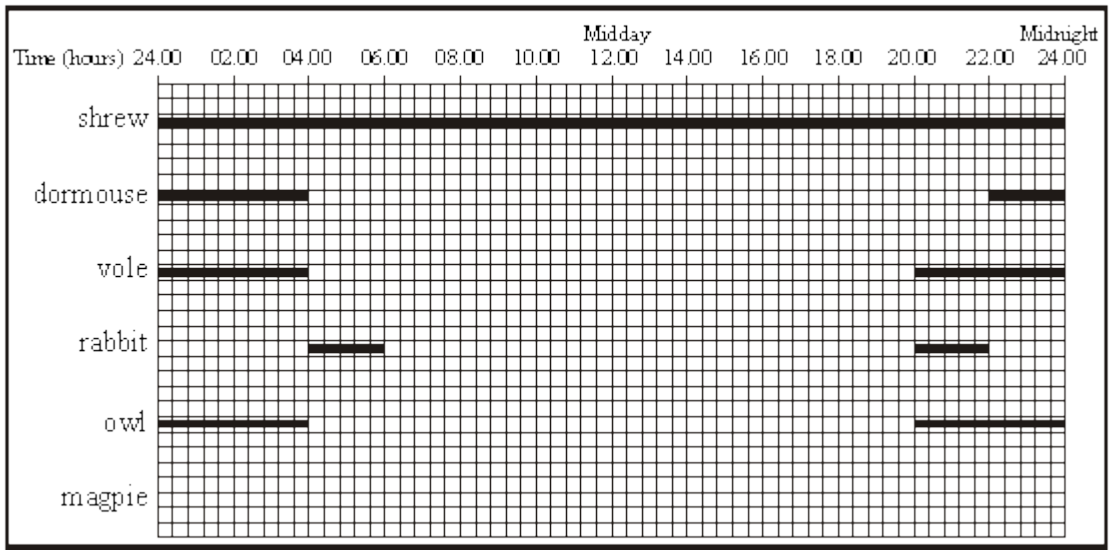


Which of the birds, A, B, C or D, is best adapted for:

1. tearing flesh .....
2. finding insects in cracks in the ground .....
3. crushing fruit .....
4. sieving small animals from mud? .....

(Total 4 marks)

26 The chart is about some of the animals which live in a forest. It shows the time of day when they search for food.



(a) The dormouse searches for food from 22.00 until 04.00 hours.

When does the owl search for food? .....

(1)

(b) The magpie searches for food from 06.00 until 20.00 hours.

Add this information to the diagram.

(1)

(c) The vole searches for food only between 20.00 and 04.00 hours.

Suggest an explanation for this.

.....

.....

.....

.....

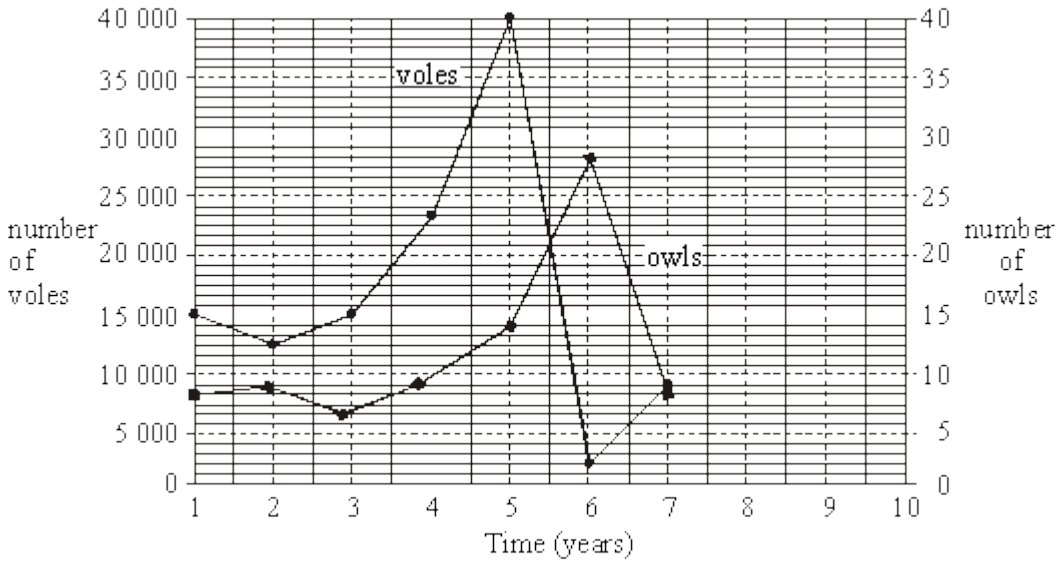
(2)
(Total 4 marks)

27 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 .....

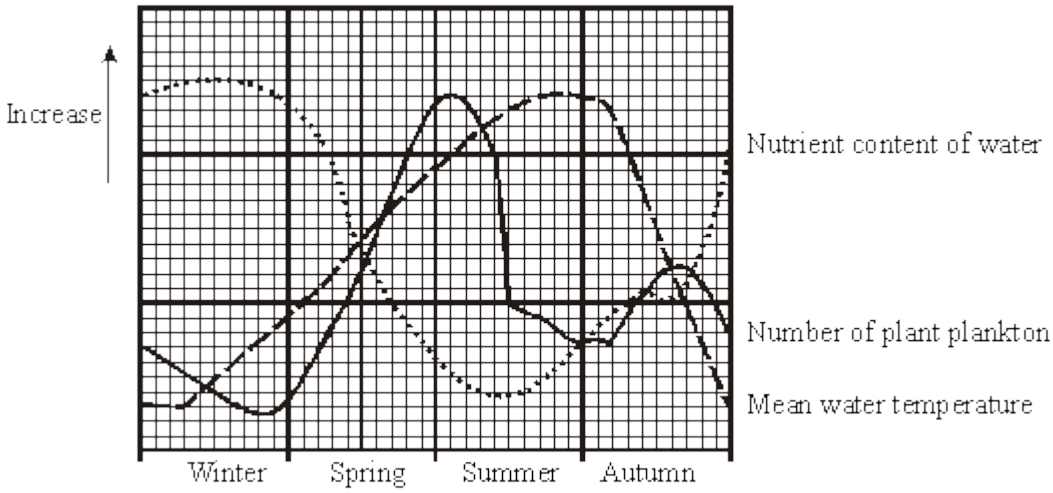
.....

2 .....

.....

(2)
(Total 5 marks)

28 Plant plankton are aquatic microscopic organisms that photosynthesise. The graph shows the numbers of plant plankton in the North Sea at different times of the year.



Use the data and your knowledge of photosynthesis and growth to explain:

(a) why numbers of plant plankton were low in winter but increased rapidly during the spring,

.....

.....

.....

.....

.....

.....

(3)

(b) the reduction in numbers of plant plankton in the early summer.

.....

.....

.....

.....

(1)

(Total 4 marks)

29 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 .....

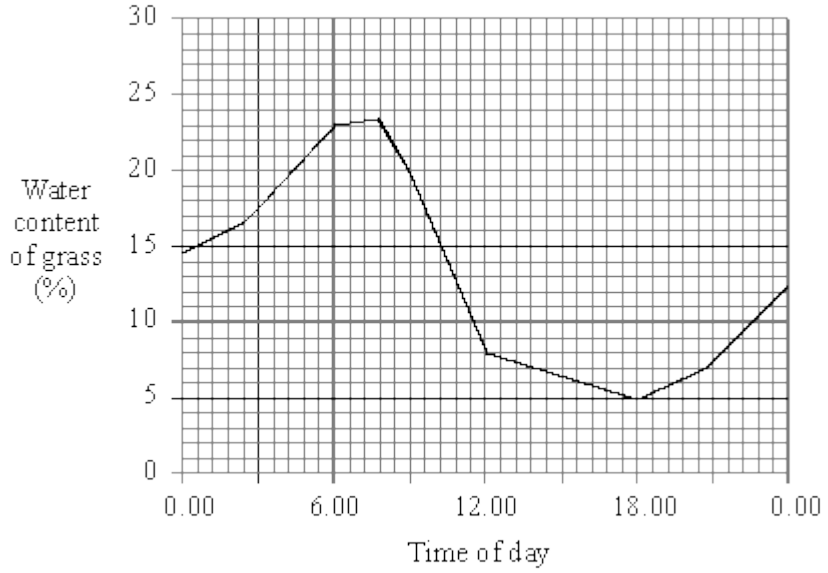
.....

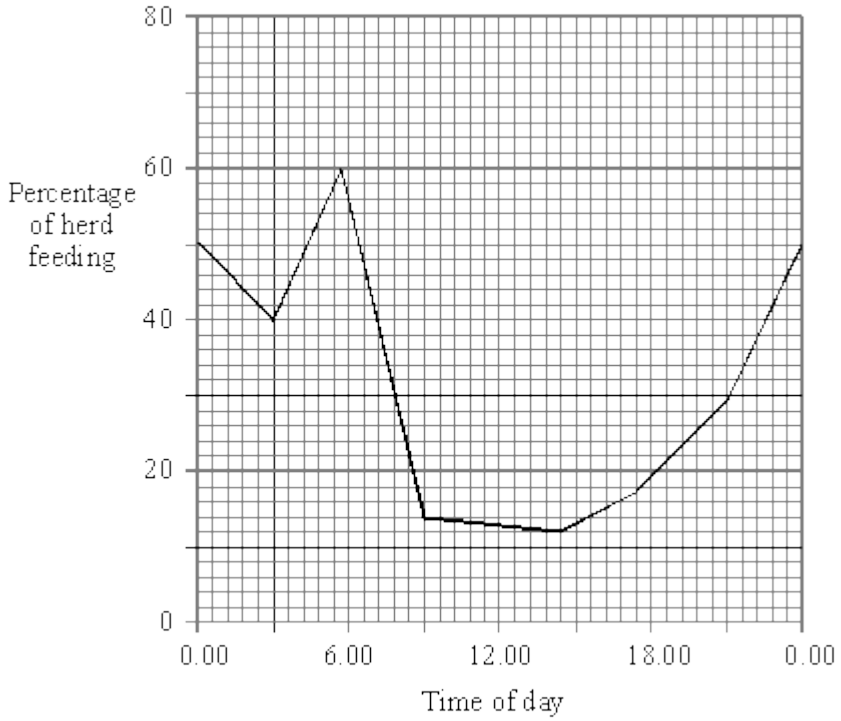
2 .....

.....

(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)

30 Read the passage.

Glutton up a gum tree

Along the banks of the Cygnet River on Kangaroo Island, the branches of the dying gum trees stretch out like accusing fingers. They have no leaves. Birds search in vain for nectar-bearing flowers.

The scene, repeated mile upon mile, is an ecological nightmare. But, for once, the culprit is not human. Instead, it is one of the most appealing mammals on the planet – the koala. If the trees are to survive and provide a food source for the wildlife such as koalas that depend on them, more than 2000 koalas must die. If they are not removed the island's entire koala population will vanish.

Illegal killing has already started. Worried about soil erosion on the island, some farmers have gone for their guns. Why not catch 2000 koalas and take them to the mainland? "Almost impossible," says farmer Andrew Kelly. "Four rangers tried to catch some and in two days they got just six, and these fought, bit and scratched like fury."

Use the information from the passage and your own knowledge and understanding to give the arguments for and against killing koalas to reduce the koala population on Kangaroo Island.

.....

.....

.....

.....

.....

.....

.....

(Total 4 marks)

31 Read the passage.

Glutton up a gum tree

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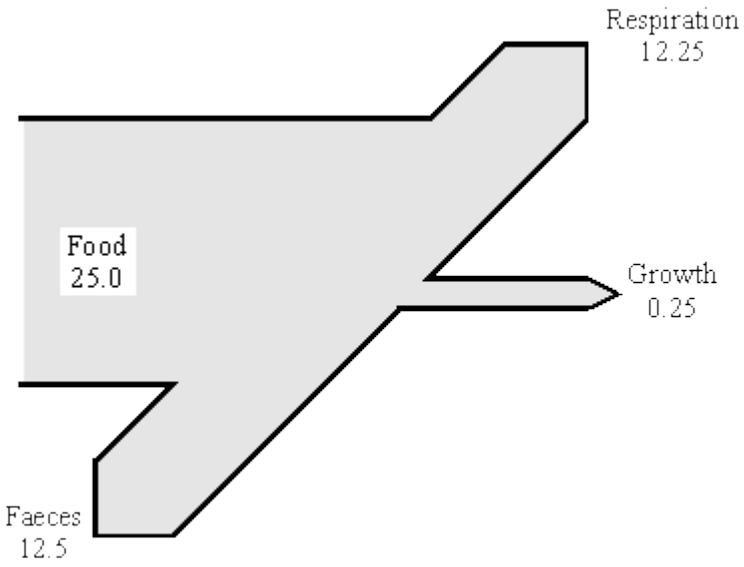
The diagram shows the flow of energy through a koala.
The numbers show units of energy.



(i) Calculate the percentage of the food intake which is converted into new tissues for growth.
Show your working.

..... %

(2)

(ii) Give **three** different ways in which the koala uses the energy released in respiration.

1 .....

.....

2 .....

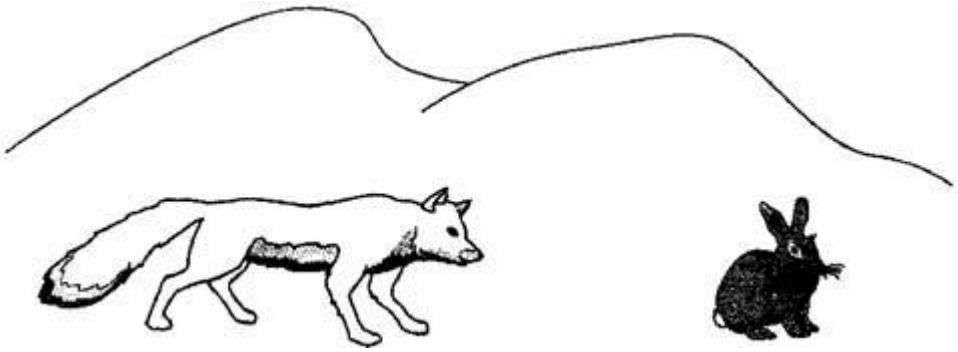
.....

3 .....

.....

(3)
(Total 5 marks)

32 The Arctic fox is a predator that feeds mainly on small mammals. The Arctic fox is adapted to live in the cold conditions of the snow-covered Arctic.



The Arctic fox has thick, white fur.

Give **two** ways in which the fur helps the Arctic fox to survive.

1 .....

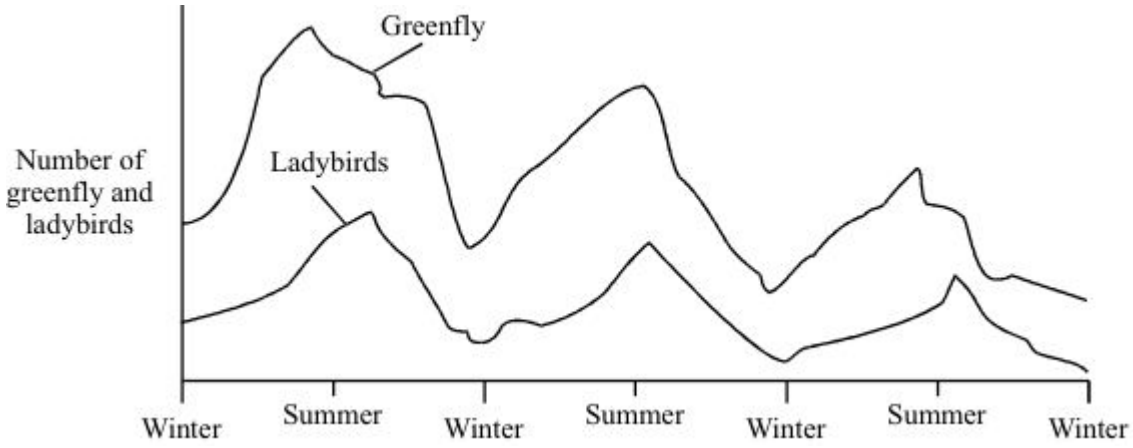
.....

2 .....

.....

(Total 2 marks)

33 Greenfly feed on rose bushes. Ladybirds (predators) feed on these greenfly. The graph shows how the population of greenfly and ladybirds in a garden change over a period of three years.



(a) *To gain full marks in this question you should write your ideas in good English. Put them into a sensible order and use the correct scientific words.*

Describe what happened to the population of greenfly over the three years.

.....

.....

.....

.....

.....

.....

.....

.....

(3)

(b) Give **one** factor that limits the number of ladybirds.

.....

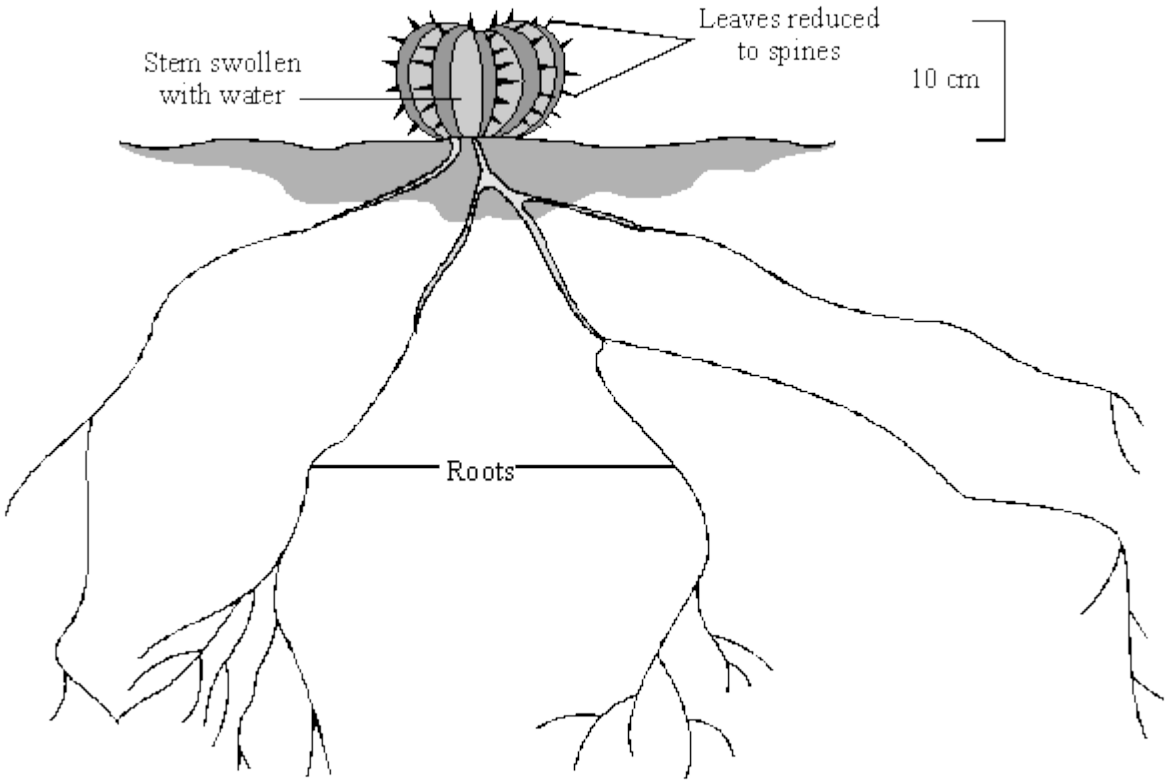
.....

(1)
(Total 4 marks)

34 The concentration of carbon dioxide in the Earth's atmosphere is rising.

The rise in carbon dioxide concentration may cause more of the Earth's surface to become desert.

The drawing shows a plant that is adapted to life in a hot, dry desert.



Suggest **two** ways in which the structure of the plant helps it to survive in a hot, dry desert.

1 .....

.....

2 .....

.....

(Total 2 marks)

35

Camels can live in hot deserts.

Read the following information.

- A camel has big, flat feet.
- A camel's hump is where fat is stored.
- The fat from a camel's hump can be broken down to form carbon dioxide and water.
- A camel has no layer of fat under the skin.
- A camel can go at least two weeks without water.
- A camel can drink large amounts of water in one go.
- A camel has long eyelashes and long hair around the openings to its ears.

(a) Give **one** way that the camel is well adapted to living where there is sand.

.....

(1)

(b) Suggest why the camel does **not** need a layer of fat under its skin.

.....

(1)

(c) Give **two** reasons why the camel can go at least two weeks without drinking any water.

1 .....

.....

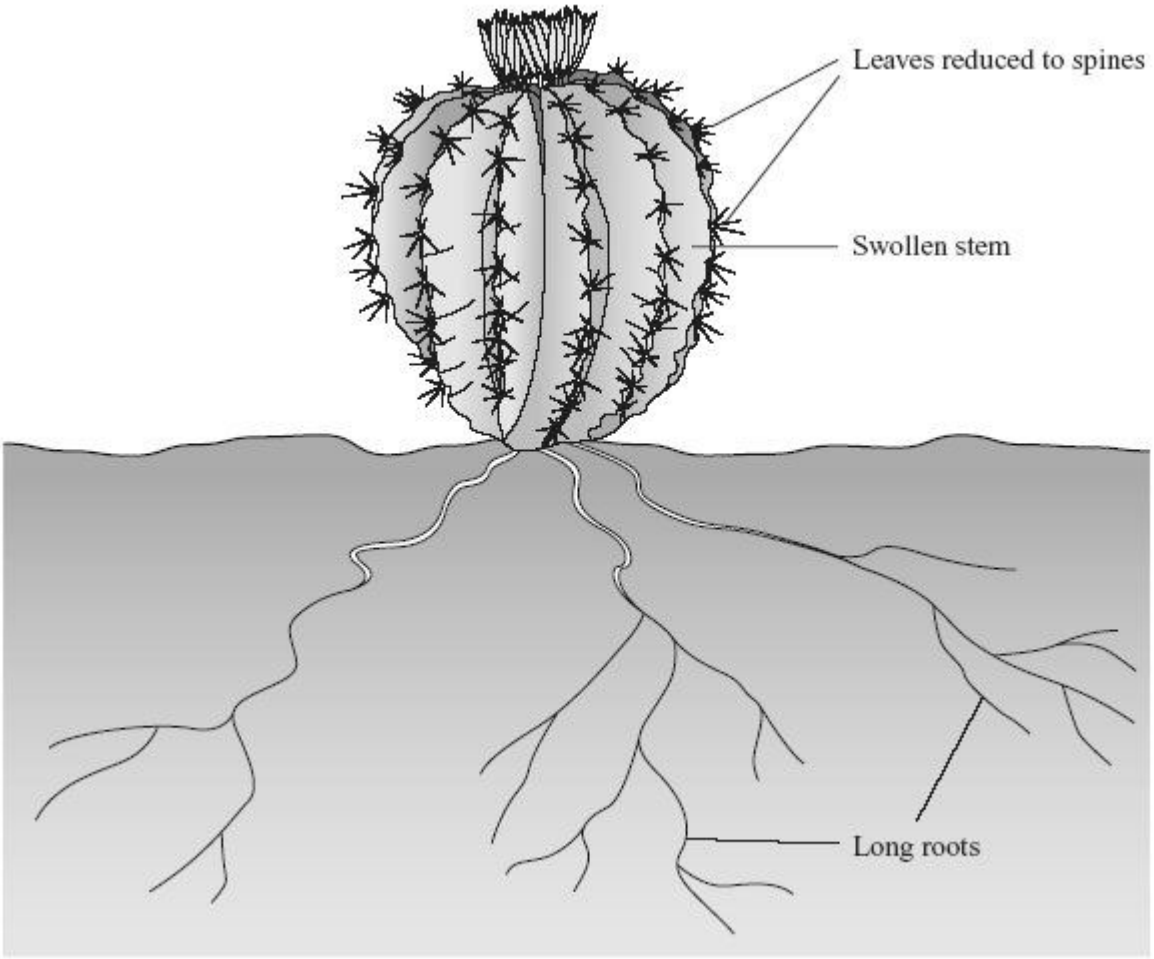
2 .....

.....

(2)

(Total 4 marks)

36 The drawing shows a plant that is adapted to life in a hot, dry desert.



(a) Which labelled part of the plant helps it to get the water it needs?

.....

.....

(1)

(b) The stem of the plant is covered by wax.
How does this help the plant to survive?

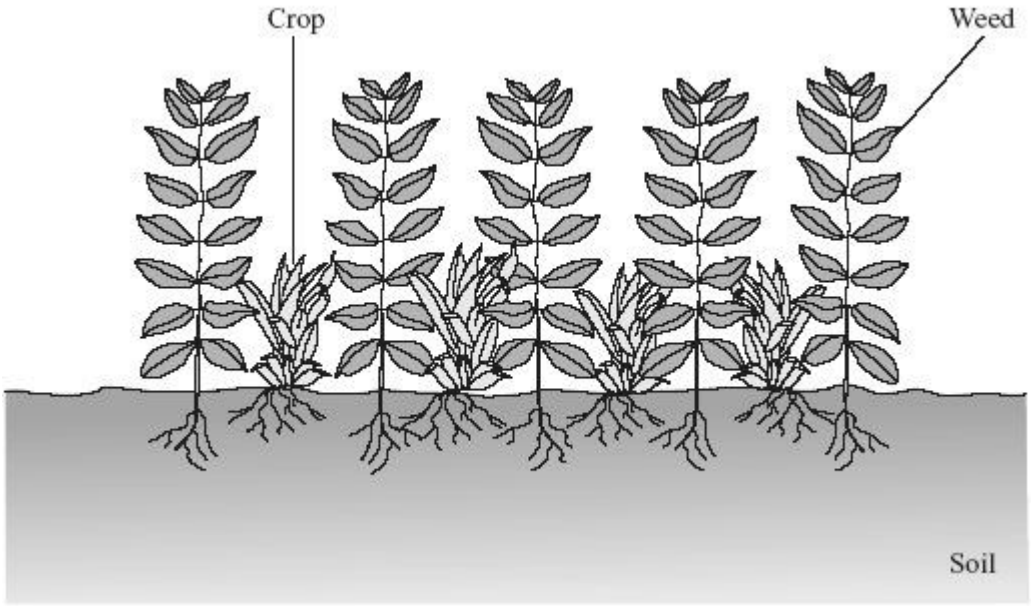
.....

.....

(1)
(Total 2 marks)

37

Farmers need to get rid of weeds because they can stop crops growing well.



(a) Write down **three** things that crops and weeds compete for.

1 .....

2 .....

3 .....

(3)

(b) Complete this sentence by crossing out the **two** words that are wrong in the box.

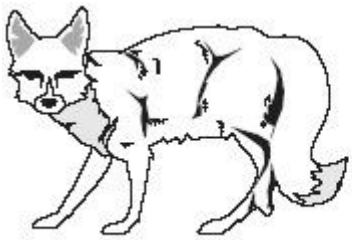
Chemicals that are used to kill weeds are called

fertilisers
herbicides
pesticides

.

(1)
(Total 4 marks)

38 The drawings show an arctic fox and a fennec fox.



Arctic fox

Fennec fox

(a) The arctic fox lives in cold, snowy conditions.

Explain how each of the following helps the arctic fox to survive in these conditions.

1 Long, thick fur

.....

.....

2 A white coat

.....

.....

(2)

(b) The fennec fox lives in hot deserts.

Explain how each of the following helps it to survive in hot conditions.

1 Very large ear flaps

.....

.....

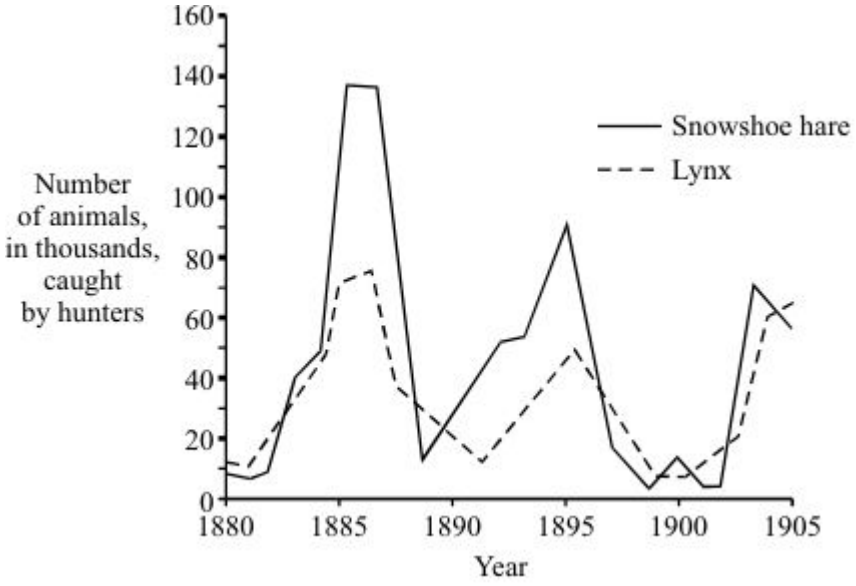
2 Hairs on the soles of its feet

.....

.....

(2)
(Total 4 marks)

39 The graphs give information, from a hundred years ago, about the size of the population of snowshoe hares and lynx, which live in northern Canada. Snowshoe hares are herbivores. Lynx are carnivores and prey on snowshoe hares.



(a) Give **three** factors which can affect the size of the snowshoe hare population.

1. .....

2. .....

3. .....

(3)

(b) The graph for numbers of lynx shows a similar cycle to that of the snowshoe hares. The peaks for lynx usually occur about a year later than the peaks for the snowshoe hares. Suggest why.

.....

.....

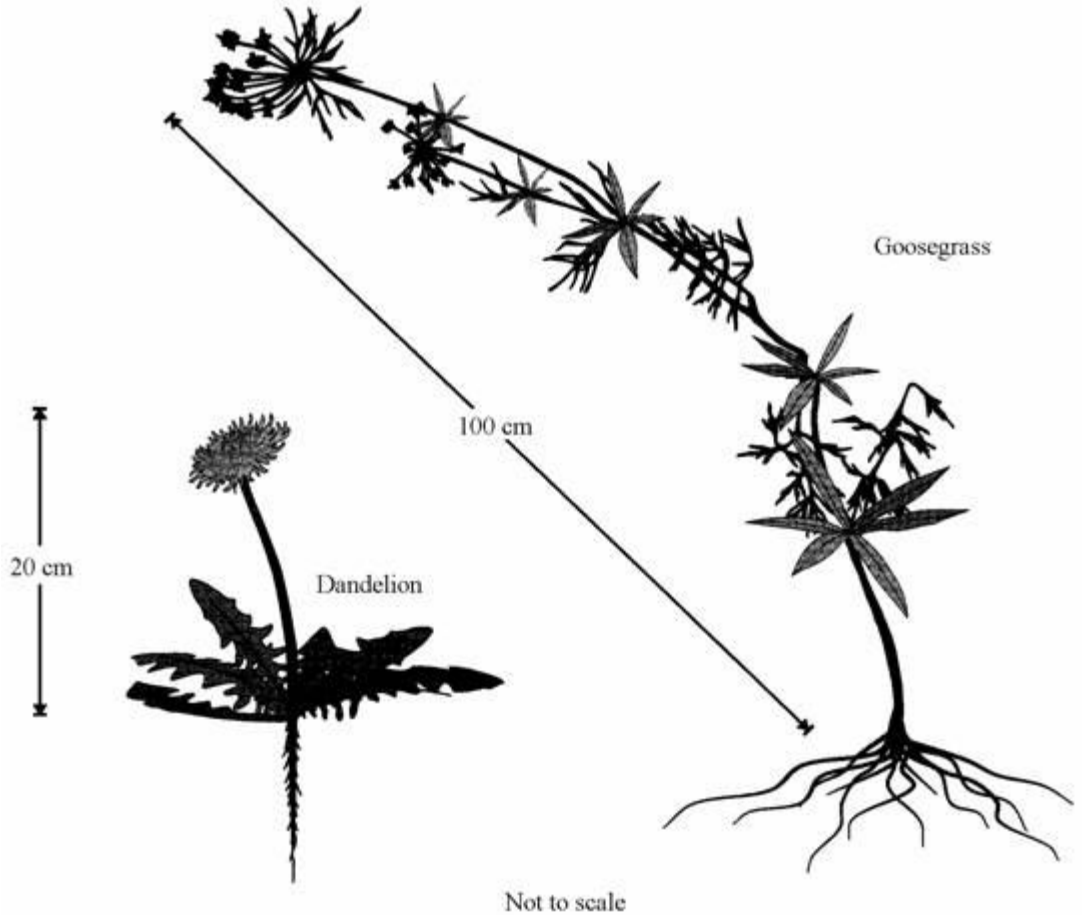
.....

.....

(2)

(Total 5 marks)

40 Dandelions have become adapted to live in lawns and grass areas where animals graze. Goosegrass, however, has become adapted to live alongside hedgerows and cannot survive being mown.



(a) Use the information in the drawings to suggest **one** advantage of each of the following adaptations.

(i) Dandelion leaves lie flat on the ground.

.....

.....

(1)

(ii) A dandelion has a thick tapered root.

.....

.....

(1)

(iii) Goosegrass stems are long.

.....

.....

(1)

(iv) Goosegrass roots are thin and very long.

.....

.....

(1)

(b) Dandelions and goosegrass are different species of plants.

(i) What name is given to the unit of inheritance which controls one particular characteristic of a plant or animal?

.....

(1)

(ii) Why would you be unlikely to succeed if you tried to breed a new species of plant by crossing a dandelion with goosegrass?

.....

.....

(1)

(c) Animals as well as plants have become adapted to live in different environments.

State **one** way a polar bear has become adapted to living in the Arctic, and the reason for the adaptation.

.....

.....

.....

.....

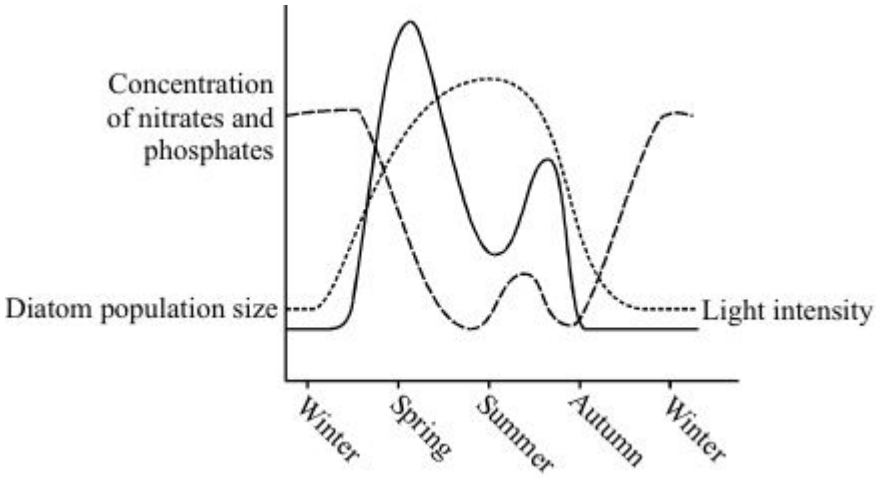
(2)
(Total 8 marks)

41 A food chain in the North Atlantic Ocean is:

diatoms → small fish → large fish

The graphs show how over a year:

- the population size of diatoms in the North Atlantic varies;
- the light intensity alters;
- the concentration of nitrate and phosphate minerals alters.



(a) Explain why the light intensity is a major factor in controlling the numbers of diatoms.

.....

.....

.....

(2)

(b) (i) Suggest **two** reasons why the population of diatoms decreases between spring and summer.

1. .....

.....

2. .....

.....

(2)

(ii) Give **two** reasons why the population of diatoms decreases in autumn.

1. .....

.....

2. .....

.....

(2)

(c) Use the information on the graph to suggest what change causes the number of diatoms to increase in the late summer. Give a reason for the change.

.....

.....

.....

(2)

(Total 8 marks)

42 Compare the efficiency of these two food chains.

Food chain **A** grain → humans

Food chain **B** grain → bullocks → humans

In your answer, make **full use** of the following data.

Food	Consumer	Percentage of available energy transferred as useful energy
Grain	Human	9%
Grain	Bullock	12%
Bullock	Human	10%

One kilogram of grain has 80 000 kJ of available energy.

.....

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.....

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.....

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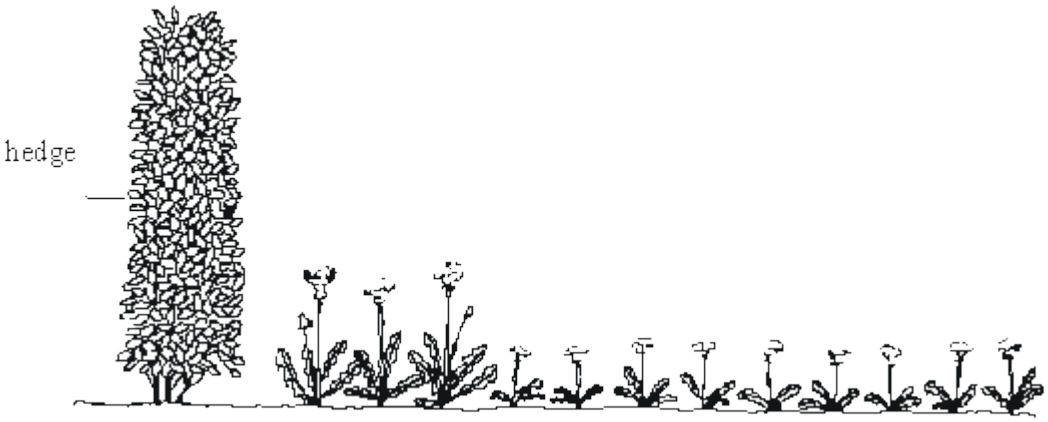
.....

.....

(Total 4 marks)

43



Two students were surveying dandelions in a field. They noticed that the dandelions by the hedge were taller than the others.

One student suggested that the differences in height could have been caused by the different conditions in the field.

(a) (i) Was he correct? .....

Give reasons for your answer.

.....

.....

.....

(2)

(ii) Explain how you could test to see if his answer was correct.

.....

.....

.....

.....

(2)

(b) The hedge was cut down and removed.

What would happen to the height of the dandelions after some time?

.....

Explain your answer. .....

.....

.....

(2)
(Total 6 marks)

44

Tree on its own

Trees inside a wood

The drawing above shows the shapes of trees grown on their own and inside a wood.

(a) Write down **two** differences you can see between the tree grown on its own and those growing inside a wood

1 .....

.....

2 .....

.....

(2)

(b) Trees inside the wood have to compete with each other for the things which they need to grow.

List **three** things for which the trees compete.

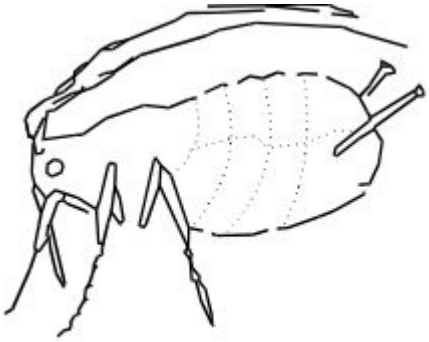
1. .....

2. .....

3. .....

(3)
(Total 5 marks)

45 The greenfly is an insect which is eaten by ladybirds.



Greenfly

(a) (i) What do we call animals, like the ladybird, which hunt and kill other animals for food?

.....

(1)

(ii) What do we call animals, like the greenfly, which are eaten by other animals?

.....

(1)

(b) What would happen to the number of ladybirds if the numbers of greenfly suddenly dropped?

.....

(1)

Give a reason for your answer.

.....

.....

(1)

(c) Suggest **two** factors, other than the number of ladybirds, which could affect the number of greenfly.

1. .....

2. .....

(2)

(Total 6 marks)

46 A particular species of snail has a shell which may be pink, yellow or brown. It may also be plain or have bands running round it.

The snails are eaten by song thrushes.

Explain why snails with plain brown shells are the most common in hedgerows.

.....

.....

.....

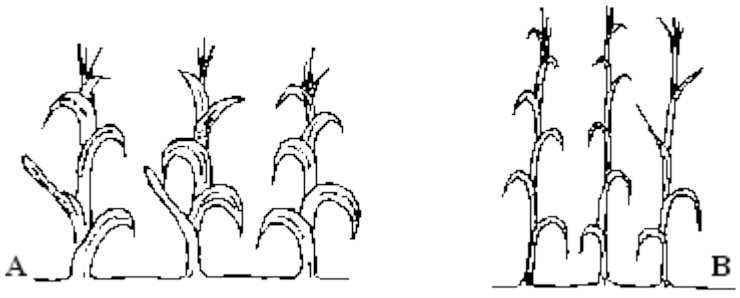
.....

.....

.....

(Total 4 marks)

47 The diagrams show maize plants grown from seeds sown at different distances from each other.



(a) Write down **two** differences you can see between plants A and B.

1. .....

.....

2. .....

.....

(2)

(b) The differences are caused by competition between the maize plants.

The maize plants are competing for **light**. The maize plants are also

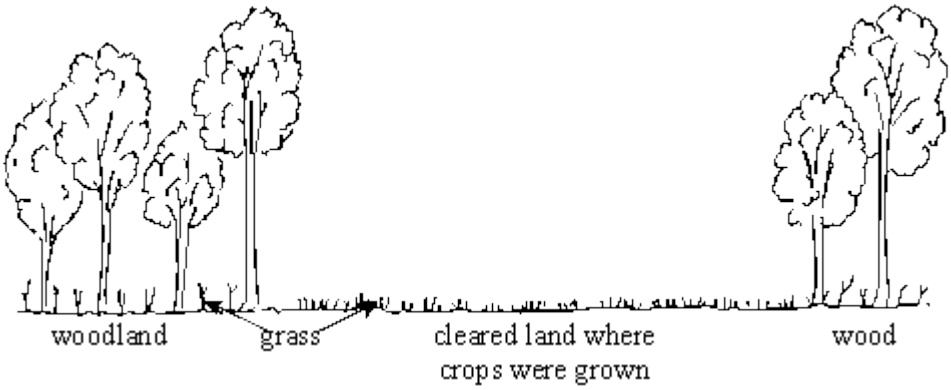
competing for .....

and .....

(2)

(Total 4 marks)

48 In some developing countries woodland is cut down and burned. The ash acts as fertiliser. Crops are grown for three years. The land is then left as it is too poor to grow any more crops.



(a) In the original woodland trees and plants died and grew for hundreds of years. When cleared the land grew crops for only three years. Explain this difference in as much detail as you can.

.....

.....

.....

.....

(3)

(b) What could farmers do to make crops grow on the cleared land for more than three years?

.....

.....

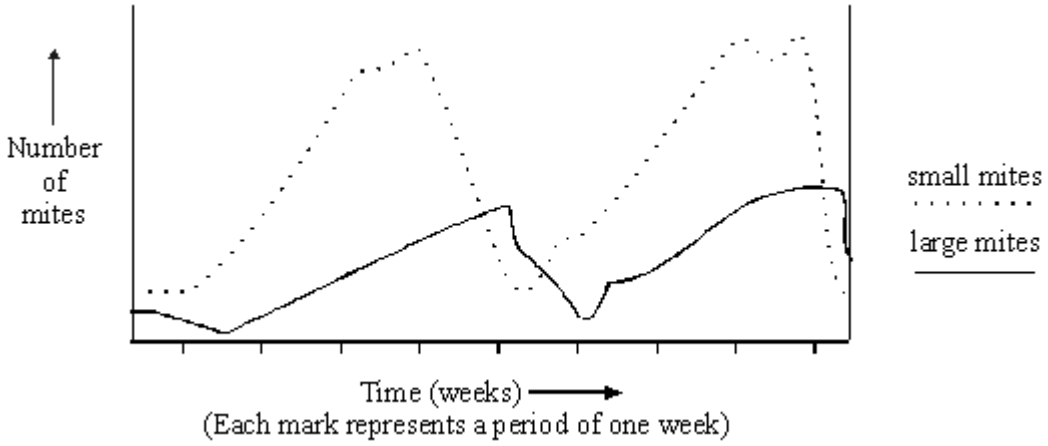
(2)
(Total 5 marks)

49 Some small mites feed on the leaves of orange plants. Larger mites feed on the smaller mites.

(a) What do we call animals, like the large mite, which eat other animals, like the small mite?

.....

(1)



The graph shows how the number of these mites changes over a period of time.

(b) (i) What happens to the number of large mites one week after the number of small mites decreases?

.....

Suggest a reason for this.

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(3)

(ii) What happens to the number of small mites as the number of large mites increases?

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Suggest a reason for this.

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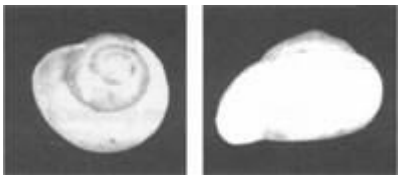
(2)
(Total 6 marks)

50 *Cepaea nemoralis* is a snail which is found on sand dunes. It may have a plain or banded shell. The snails are found on grass stalks and leaves.



Plain

Banded

A scientist collected young unbanded snails and kept them until they were fully grown and mated them.

The eggs laid produced 35 unbanded and 12 banded snails.

(a) Explain these figures as fully as you can. You may use a genetic diagram if you wish to make your answer clearer.

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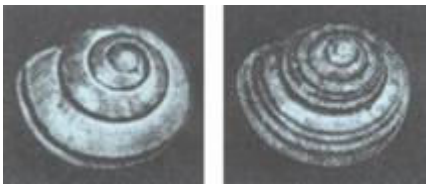
(7)

Variation in colour



Variation in banding

(b) The snail shells show a lot of variation in colour. They are yellowy/green, brown, pink or cream. The banding varies from a single wide band to a mixture of thick and thin bands.

Describe briefly the factors which have produced this variation and explain how these factors may themselves have arisen.

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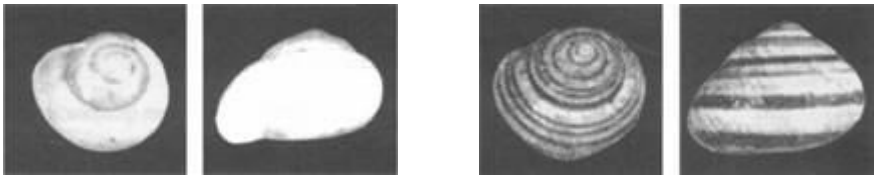
(4)

(Total 11 marks)

51 *Cepaea nemoralis* is a snail which is found on sand dunes. It may have a plain or banded shell. The snails are found on grass stalks and leaves.



Plain Banded

When a scientist collected snails on the sand dunes he got 450 banded
280 unbanded.

Snails are eaten by birds. Sand dunes have clumps of grasses growing on them.

Suggest why there were more banded than unbanded snails on the sand dunes.

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(Total 4 marks)

52 Earthworms are important soil organisms. When they burrow, they help to bring air into the soil as well as improving drainage. Earthworms also bury leaves in the soil. These decay making the soil more fertile. Earthworms in turn are eaten by voles, moles, foxes, badgers and birds.

New Zealand flatworm

In some parts of the United Kingdom, earthworms are being killed by New Zealand flatworms. The animals are spreading quickly and have no natural enemies.

The flatworms do not make their own burrows. They only use the burrows made by the earthworms in order to attack them.

(a) Explain, as fully as you can, why it is important to control or get rid of these New Zealand flatworms in Britain.

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(4)

(b) Suggest **one** possible way, giving **one** advantage and **one** disadvantage, that this New Zealand flatworm could be controlled.

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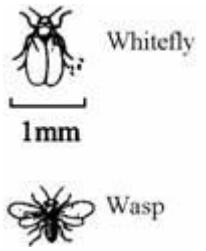
(3)
(Total 7 marks)

53 Whitefly are pests and harm plants in glasshouses.
A small wasp can be used to control the whitefly.



The wasp can only lay its eggs in the larvae of whiteflies.
The wasp larva eats the body of the whitefly larva.
It then changes into a new wasp and flies off.

(a) Choose words from the list to complete the sentences below.

decomposer **predator** **prey** **producer**

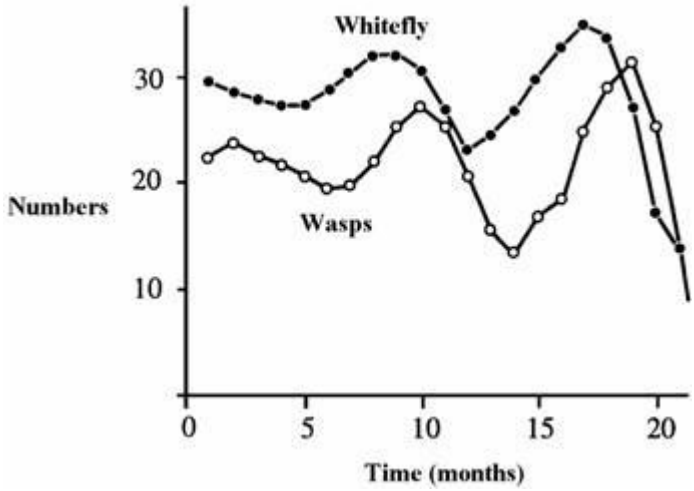
The wasp larva feeds on the whitefly larva.

The wasp is a .....

The whitefly is known as the wasp's .....

(2)

(b) The graph shows how the numbers of whitefly and wasps change over several months.



What happens to the number of wasps between 15 and 20 months?

.....

Why do you think this happens? .....

.....

.....

.....

(4)

(c) What would happen to the wasps if there were no larvae in which to lay their eggs?

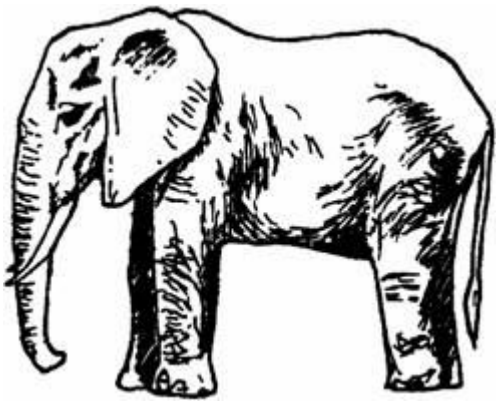
.....

(1)

(Total 7 marks)

54 The elephant is likely to become extinct in parts of Africa.

Use the information below to explain **three** reasons why.



* The African elephant eats lots of trees and other plants for food.
* In Africa the human population is increasing and more food is needed to feed the extra people.
* More trees are cut down for fuel and to clear land for growing crops.
* Elephants are killed by poachers who want the ivory from their tusks.
* A herd of elephants needs a large area in which to live and feed.

1 .....

.....

2 .....

.....

3 .....

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(Total 3 marks)

55 Study the following information, then answer the questions.

Swallow

Swift

- Swallows and swifts spend the summer in Britain and the winter in Africa.
- Swallows feed on insects near the ground.
- Swifts feed on insects high in the air.
- Swallows come back to Britain in spring before swifts.
- In spring the ground starts to warm up. When it is warm it makes the air rise. Insects are carried up in this air.

(a) Suggest two reasons why swifts and swallows fly to Africa for the winter.

1 .....

2 .....

(2)

(b) How do swifts and swallows avoid competing for food?

.....

.....

(1)

(c) Suggest why swifts come back to Britain later than swallows.

.....

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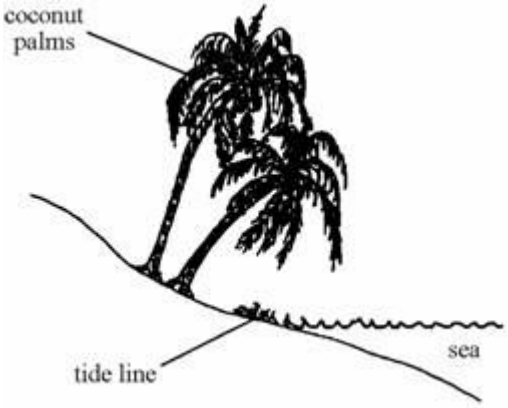
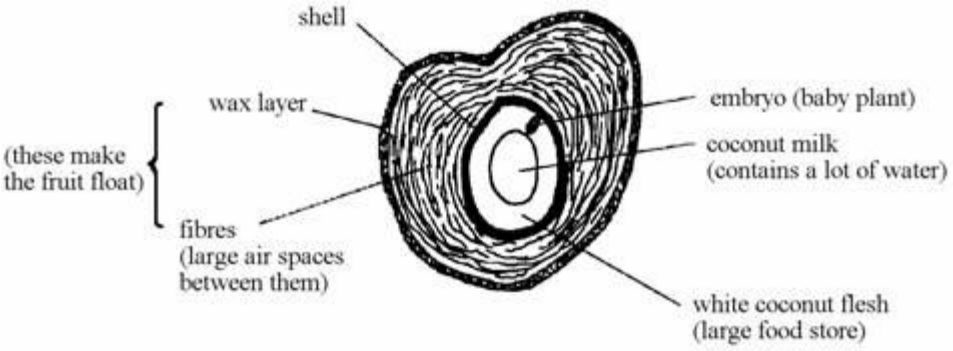
(2)
(Total 5 marks)

56 Coconut palms grow just above the tide line on beaches of tropical islands.





Section through a coconut fruit

The sea carries the fruit to new parts of the beach.
The embryo then puts out its first root.
Fresh water and nutrients are very deep down under the sandy beach.

Explain **three** ways in which the coconut palm is adapted so that its embryo plants can spread and survive.

1 .....

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2 .....

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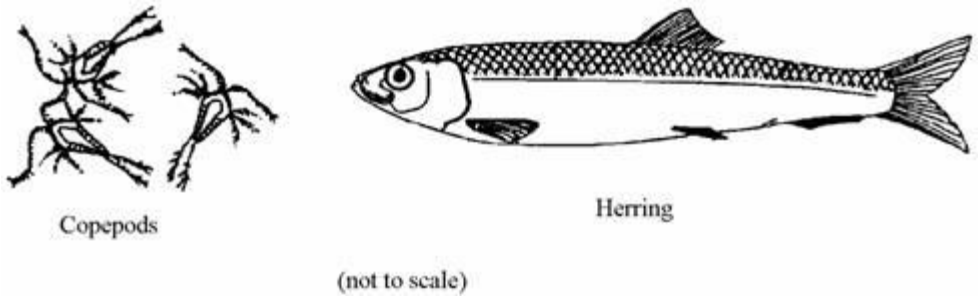
3 .....

.....

(Total 3 marks)

57 Copepods are tiny animals which live in the sea.



During the day they live deep down near the sea bed.
At night they move up to the surface where they feed on tiny plants.
When the sun rises they move down to the bottom again.

(a) Suggest why the tiny **plants** live near the surface of the sea.

.....

.....

(2)

(b) Herring feed on copepods.

Where will herring be found during the day? Give a reason for your answer.

.....

.....

.....

(2)
(Total 4 marks)

58 Kangaroo rats live in the hot, dry deserts of North America.
Their only water comes from the food they eat.
In these regions daytime temperatures are around 45°C.
At night temperatures can fall to below 30°C.

Explain how each of the following features makes these animals well adapted to survive in deserts.

(a) They are a sandy colour.

.....

(b) They are active at night and stay in burrows underground by day.

.....

(c) They produce dry droppings and very little urine. They do not sweat.

.....

(d) Their large ears, feet and tail give their bodies a large surface area.

.....

.....

(4)
(Total 4 marks)

59 Brown trout are fish that kill and eat other animals.

(a) Choose a word from this list to complete the sentence below.

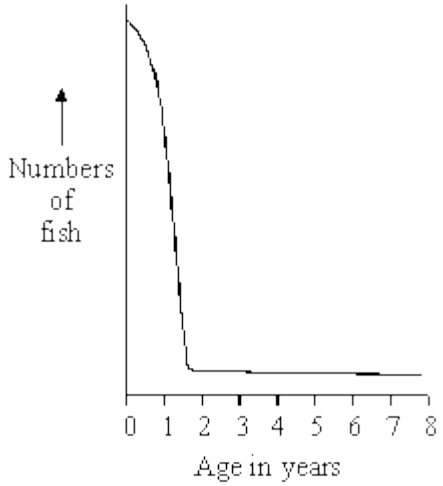
competitors **consumers** **prey** **producers**

Trout are predators, the animals they eat are their ..... .

(1)

(b) The graph shows the ages of the brown trout found in the river Tees.

There was no serious pollution in the river during this time.



Suggest **three** reasons why few brown trout live to be over two years old.

1 .....

2 .....

3 .....

(3)
(Total 4 marks)