



7.7.5 Adaptation and Extinction



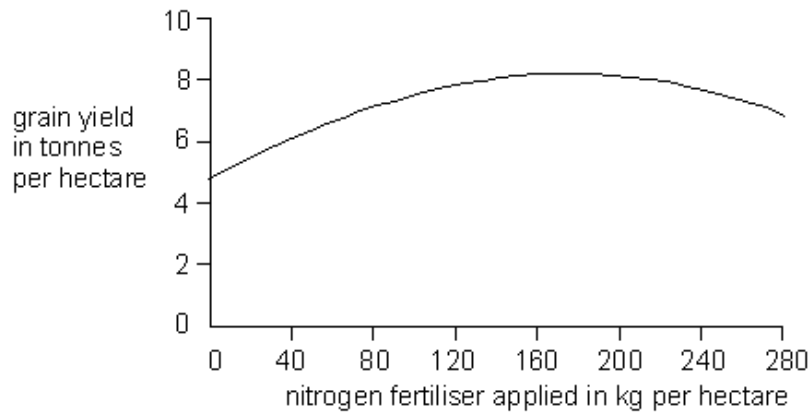
88 minutes



113 marks

##

Modern intensive agriculture often uses fertilisers to increase crop yields. The graph below shows the relationship between the grain yield of winter wheat and the amount of nitrogen fertiliser applied.



- (a) Adding nitrogen fertiliser causes plants to grow more rapidly. However, the grain yield falls when over 180 kg of fertiliser is applied to each hectare. Suggest a reason for this.

.....
.....

1 mark

- (b) Inorganic fertilisers often leach into streams and lakes and pollute the water. Give **one** way in which the land can be damaged by the continuous use of fertilisers without organic matter.

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.....

1 mark

- (c) Explain why grain yield is a measure of the efficiency of the transfer of energy from the Sun to the winter wheat.

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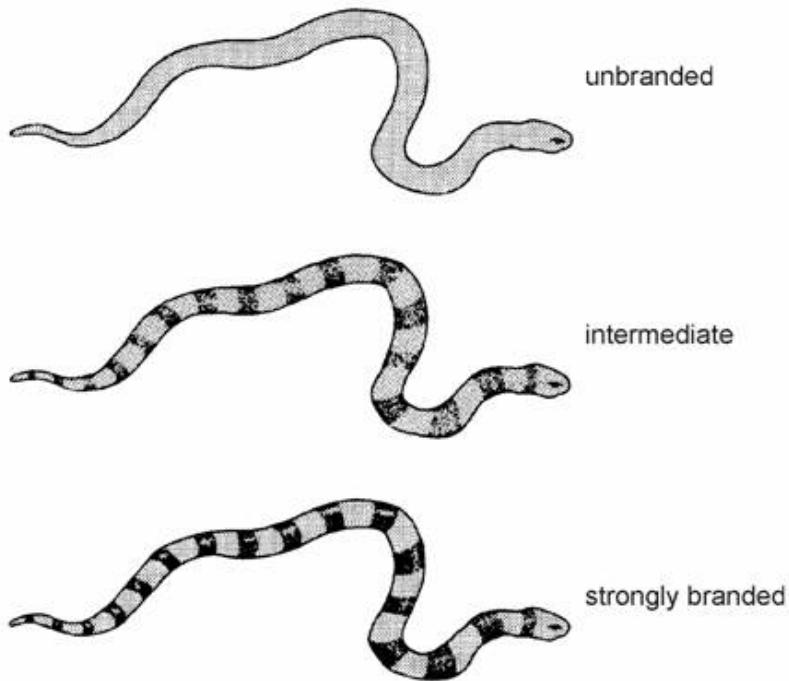
1 mark

Maximum 3 marks

##

The water snake *Natrix sipedon* lives on small islands in Lake Erie in North America and on the nearby mainland.

The colour pattern on the body of the snakes is inherited. There are three body patterns.



A survey of the snakes on the islands gave the following results:

body pattern	percentage of newly hatched snakes	percentage of adult snakes
unbranded	8	37
intermediate	74	58
strongly branded	18	5

- (a) (i) Which body pattern seems to improve the chances of survival to adulthood?

.....

1 mark

- (ii) Explain how camouflage helps snakes to survive.

.....

.....

1 mark

There is much more vegetation on the mainland than on the islands.
Most of the snakes on the mainland are strongly banded.

Snakes from the mainland interbreed with snakes on the islands.

- (b) (i) Suggest how the proportions of strongly banded and unbanded snakes on the islands would change over a number of years if this interbreeding stopped.

.....
.....

1 mark

- (ii) Explain your answer with reference to the genes for body pattern.

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.....
.....

2 marks

Maximum 5 marks

##

Phosphates are found in many fertilisers and detergents. When waste water containing phosphates gets into rivers and lakes, the phosphates encourage the growth of cyanobacteria (once called 'blue-green algae'). The cyanobacteria multiply and cover the surface of the water.

- (a) Suggest **two** reasons why growths of cyanobacteria can be harmful to plants and animals which live in lakes and rivers.

1.
.....

1 mark

2.
.....

1 mark

- (b) If the phosphate pollution is very severe almost all the plants and animals die. Micro-organisms then produce methane which bubbles off.

- (i) Which group of micro-organisms produces the methane?

.....

1 mark

- (ii) What is the name of the process in which methane is produced by these micro-organisms?

Tick the box.

aerobic decomposition

☐

aerobic respiration

☐

anaerobic respiration

☐

1 mark
Maximum 4 marks

##

Uganda is a country close to the equator in Africa. Most Ugandan bred cows produce only 1 litre of milk each day. In Britain, some cows can produce nearly 30 litres of milk each day. The milk yield of British cows exported to Uganda drops dramatically, even though they get sufficient food.

- (a) Suggest why a British cow exported to Uganda would be less likely to produce 30 litres of milk each day.

.....
.....

1 mark

By selectively breeding British and Ugandan cattle, it is possible to breed cows which produce 10 litres of milk each day.

- (b) A Ugandan farmer wishes to continue the breeding programme to improve his herd of cows further. When he is choosing which cows to use for breeding, milk production is an important quality. Give **two** other important qualities he could consider.

1.
.....
2.
.....

2 marks
Maximum 3 marks

Q5. Changes to the environment sometimes harm plants or animals.

Use **only** the words in the list below to fill the gaps in the sentences.

You may use some of the words more than once. You do not need to use all the words.

birds

farmland

fertiliser

fish

insects

sewage

wood

- (i) Rivers may be polluted by.....
and

2 marks

River pollution harms and sometimes kills
and

2 marks

- (ii) Hedges may be dug up to make more

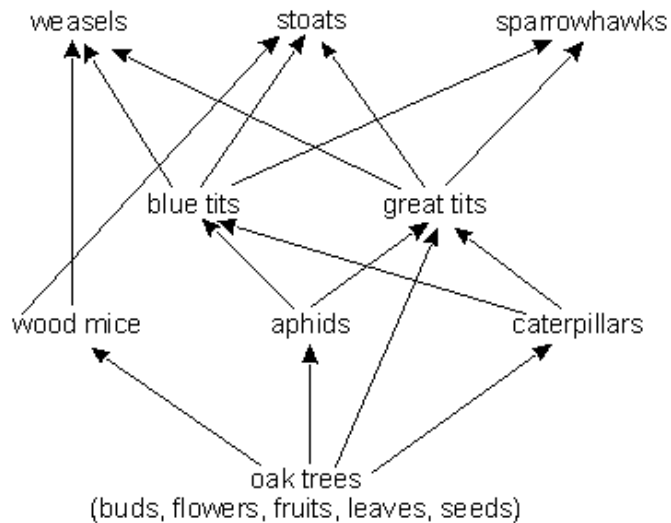
1 mark

Digging up hedges destroys the homes of some
and

2 marks

Maximum 7 marks

Q6. The diagram shows part of a food web in a wood.



Use **only** the information in the diagram to answer questions (a) and (b).

(a) Name **one** herbivore and **one** omnivore.

herbivore

omnivore

2 marks

(b) The number of blue tits in the wood decreases.
This affects the number of great tits in the wood.

(i) Give **one** reason why the number of great tits might **increase**.

.....
.....

1 mark

(ii) Give **one** reason why the number of great tits might **decrease**.

.....
.....

1 mark

(iii) Why might a decrease in the number of blue tits affect the sparrowhawks more than the stoats?

.....
.....

1 mark

- (c) The arrows in the diagram show the direction of energy flow through the food web. A weasel eats a wood mouse. Most of the chemical energy stored in the wood mouse does not end up as chemical energy in the weasel. Explain why.

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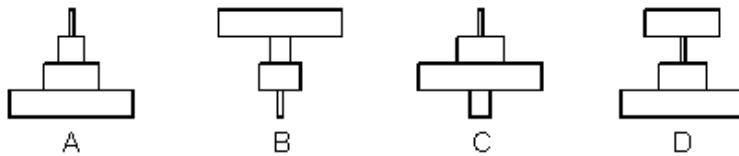
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2 marks

- (d) The following diagrams show four different **pyramids of numbers**.



A food chain in the food web is

oak trees → **aphids** → **blue tits** → **sparrowhawks**

Which of the drawings, A, B, C or D, best represents the pyramid of numbers for this food chain?

.....

1 mark

Maximum 8 marks

##

Primroses and violets are small plants which grow in a wood. Some of the trees in the wood fell down in a storm. The fallen trees were taken away.

- (a) The next year, more primroses and violets grew in the wood than in the year before. Give **two** reasons for this.

1.

.....

2.

.....

2 marks

- (b) After the fallen trees were taken away, not as many birds lived in the wood.
Give **two** reasons for this.

1.

.....

2.

.....

2 marks
Maximum 4 marks

Q8. Mango trees are grown in hot, dry countries where the soil can be hard and tightly compacted. Farmers water the mango trees by spraying water onto the soil around them.

- (a) (i) Only a small amount of the water actually reaches the roots of the trees. Suggest one reason why.

.....

.....

1 mark

- (ii) Suggest **one** other reason why mango trees do not grow well in soil which is hard and tightly compacted.

.....

.....

1 mark

- (b) Give **two** reasons why mango trees and other plants need water.

1.

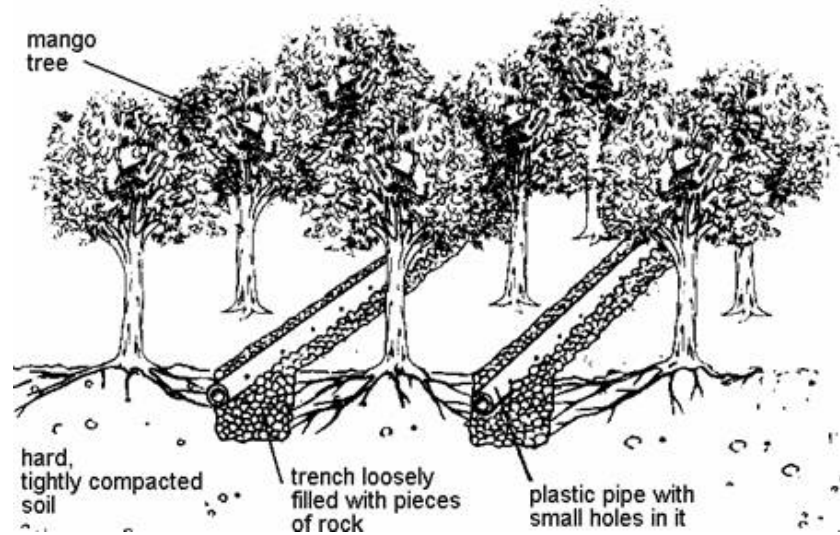
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2.

.....

2 marks

- (c) There is a new method of watering mango trees. Trenches are dug between the trees and filled with small pieces of rock. Plastic pipes with small holes in them are placed on top of the pieces of rock and water is pumped along the pipes. Mango trees watered by this method produce 15% more fruit.



- (i) Suggest **one** reason why pieces of rock are placed in the trenches under the pipes.

.....
.....

1 mark

- (ii) With the new method, farmers can also add nitrates to the water in the pipes. Give **one** reason why plants need compounds which contain nitrogen.

.....
.....

1 mark

Maximum 6 marks

- Q9.** Some pupils grew carrot plants for a project on plant growth. At the end of the summer they dug up the carrots. The drawings show two of their carrots.



- (a) Plant A came from a part of the garden which was covered with weeds. Plant B came from a part of the garden which had been kept free of weeds.

Suggest two ways in which the weeds may have stopped plant A from growing as large and healthy as plant B.

1.
.....
2.
.....

2 marks

- (b) Explain why the pupils' plants produced bigger roots when they received more light.

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.....
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3 marks
Maximum 5 marks

##

- (a) In producing high yields of cereal many farmers use very large machinery and rely heavily on fertilisers and pesticides.

Describe **three** ways in which these agricultural methods can damage ecosystems.

1.
.....
2.
.....
3.
.....

3 marks

- (b) Intensively reared cattle eat grain to produce animal protein in milk and meat. For every ten kilojoules of energy in the cereals grown as cattle food, about one kilojoule is stored in cattle.

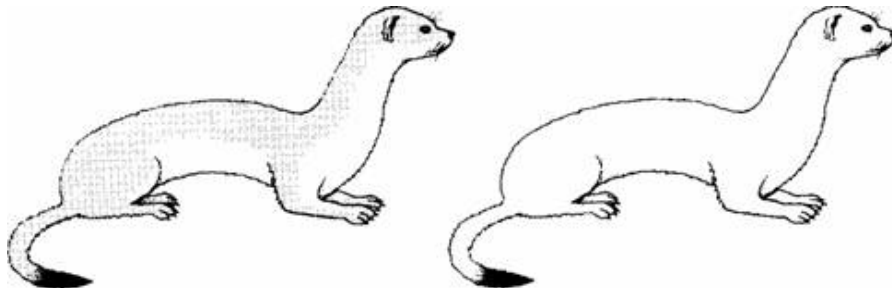
Give **two** reasons why the amount of energy stored in cattle is so much lower than the amount of energy in the cereal crop.

1.
.....
2.
.....

2 marks

Maximum 5 marks

- Q11.** (a) The drawings below show a stoat in summer and in winter.



stoat in summer

stoat in winter

In winter the ground is often covered by snow or frost. During this part of the year a stoat's fur is white.

Suggest **two** ways its white coat helps a stoat to survive in the winter.

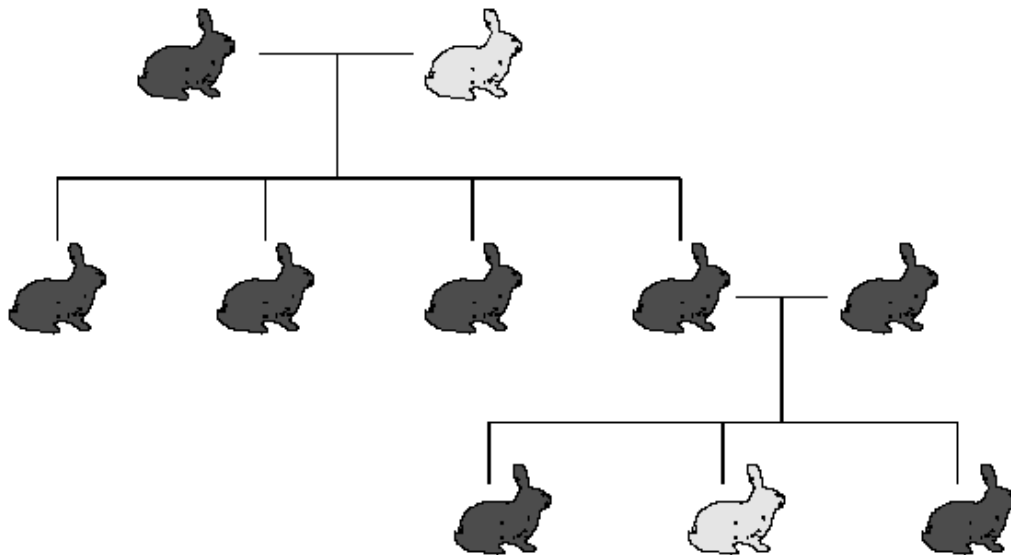
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2 marks

(b) The diagram shows the family tree for a family of rabbits.



Use words from the list below to complete the sentences.

adapt cytoplasm genes grow inherit
letters membrane mutate nuclei

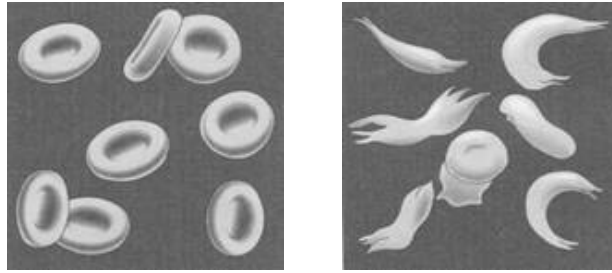
Rabbits have the same fur colour all year round.

Young rabbits fur colour from their parents.

Information about fur colour is passed on from one generation to
 the next in the form of in the of
 an egg and sperm.

3 marks
 Maximum 5 marks

- Q12.** Sickle-cell anaemia is an inherited disease which can be fatal. People with sickle-cell anaemia have sickle-shaped red blood cells.



- (a) Sickle-shaped red blood cells can become tangled together. Suggest **one** consequence of this.

.....

1 mark

- (b) Red blood cells contain a chemical called haemoglobin. People with sickle-cell anaemia produce an abnormal form of haemoglobin which crystallises at low oxygen concentrations. Explain why the abnormal haemoglobin is likely to crystallise as the blood flows through the tissues, such as muscle.

.....

1 mark

- (c) Malaria is another disease which can be fatal. The micro-organism which causes malaria spends part of its life cycle inside human red blood cells. The table shows how a person's type of haemoglobin affects their chances of getting malaria.

Person's type of haemoglobin produced	does the person suffer from sickle-cell anaemia	will the person catch malaria easily?
normal only	no	yes
a mixture of normal and abnormal	only slightly	no
abnormal only	yes	no

The type of haemoglobin a person makes is an inherited characteristic.
In areas where malaria is common, there are more people in each successive generation with a mixture of both normal and abnormal haemoglobin. Explain why.

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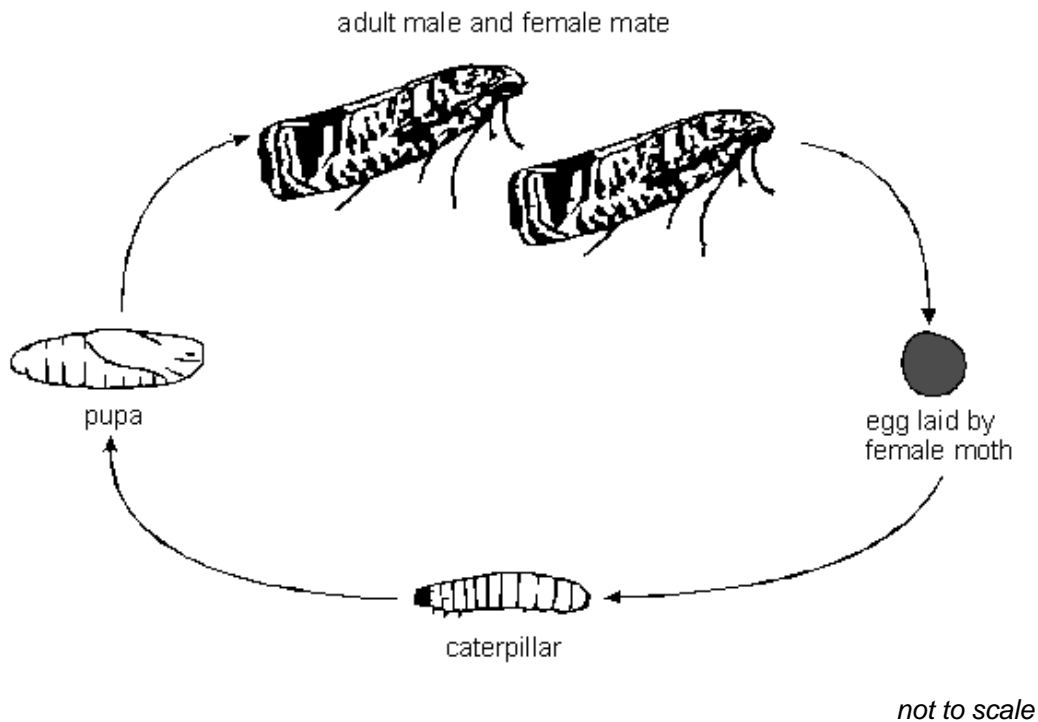
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2 marks
Maximum 4 marks

- Q13.** Codling moths lay eggs on apple trees. The caterpillars of the codling moth feed on apples. The diagram below shows the life cycle of codling moths.



Apple growers use special traps to catch male codling moths.
The traps contain a chemical which female moths produce to attract male moths.

- (a) (i) Explain why trapping male moths may result in fewer caterpillars the next year.

.....

.....

1 mark

- (ii) Some apple growers spray their trees with insecticide to kill moths.
Other apple growers disagree with this method of control.
Suggest **two** reasons for **not** using insecticides.

1.
.....
2.
.....

2 marks

- (b) The female moth lays large numbers of eggs.
Suggest why this is necessary.

.....
.....

1 mark

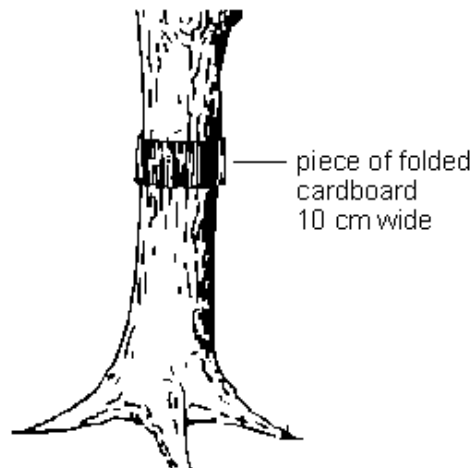
- (c) When the caterpillars are fully grown, they crawl into tiny spaces under the bark of the trees. The caterpillars stay under the bark during the winter and then change into pupae.

- (i) Suggest why more caterpillars and pupae survive when they are under the bark.

.....
.....

1 mark

- (ii) Some apple growers wrap bands of folded cardboard around the trunks of apple trees, as shown below. Caterpillars crawl into the folds. The cardboard is removed during the winter and destroyed.



Suggest **one** way in which this helps to protect the next year's apples from damage by caterpillars of codling moths.

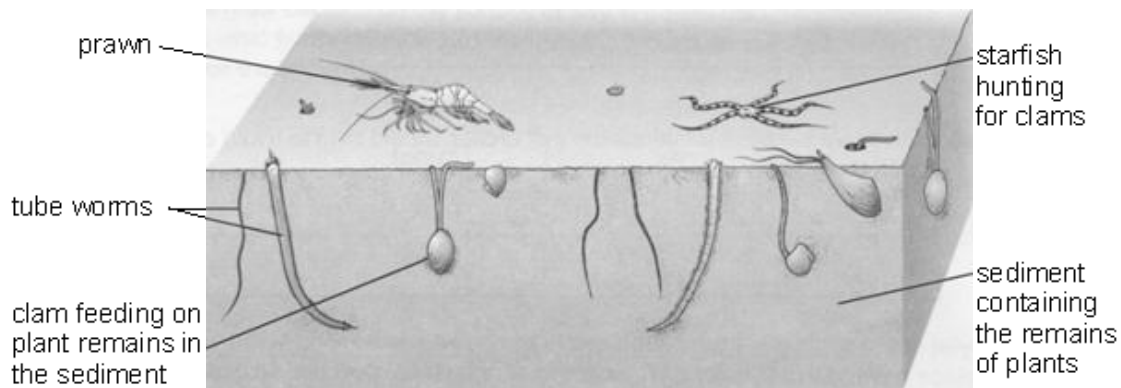
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1 mark
Maximum 6 marks

##

The drawing shows some of the animals which live at the bottom of the North Sea.



not to scale

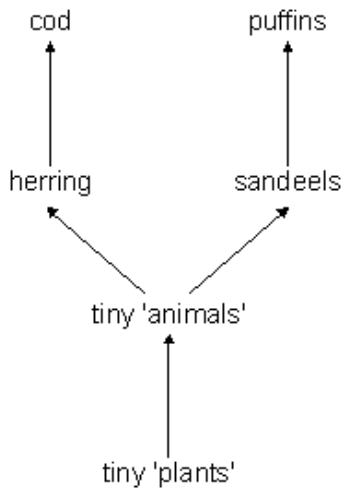
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(a) Suggest **two** advantages clams get from living in the sediment.

1.
.....
2.
.....

2 marks

(b) Part of a food web in the North Sea is shown below.
Herring, sandeels and cod are types of fish. Puffins are sea birds.



- Herring lay eggs in the gravel on the seabed.
- Sandeels live where the seabed is covered with sand.

Millions of cubic metres of gravel and sand are removed from the bottom of the North Sea every year for roads and buildings.

(i) Give **one** way removing some of the sand and gravel might cause the numbers of herring and cod to decrease.

herring
.....
.....

1 mark

cod
.....
.....

1 mark

- (ii) Explain why removing some of the sand has led to a decrease in the number of puffins.

.....

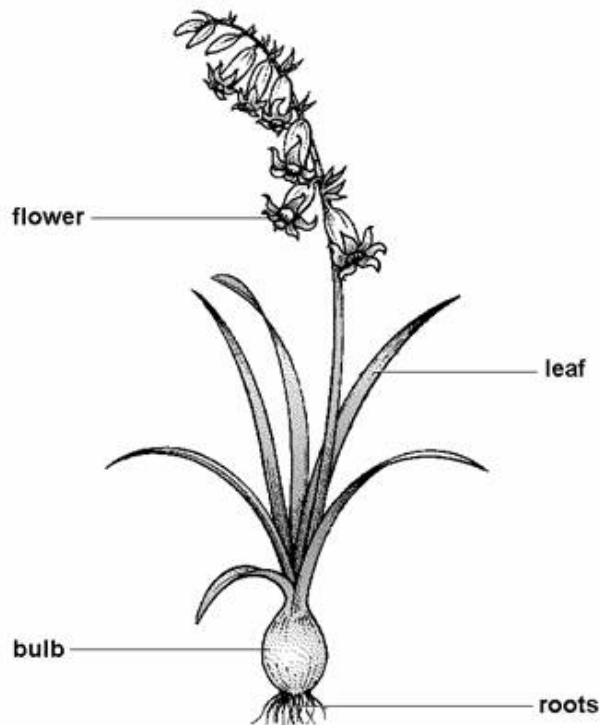
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2 marks
Maximum 6 marks

- Q15.** The drawing shows a bluebell plant. The plant grows from an underground stem called a bulb.
Each year new leaves and flowers grow from the bulb.



- (a) Describe the process by which glucose is made in the leaves.

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.....

.....

3 marks

- (b) Many plants make starch from glucose.
What group of nutrients do both glucose and starch belong to?

.....

1 mark

- (c) In the sixteenth century bluebell bulbs were dug up to obtain a starch-like substance that was used to make collars stiff.



- (i) Digging up bluebell bulbs has caused a decrease in the number of bluebells growing in Britain.
It is now against the law to dig up bluebells.

Suggest **one** other environmental reason why the number of bluebell plants has decreased in Britain.

.....
.....

1 mark

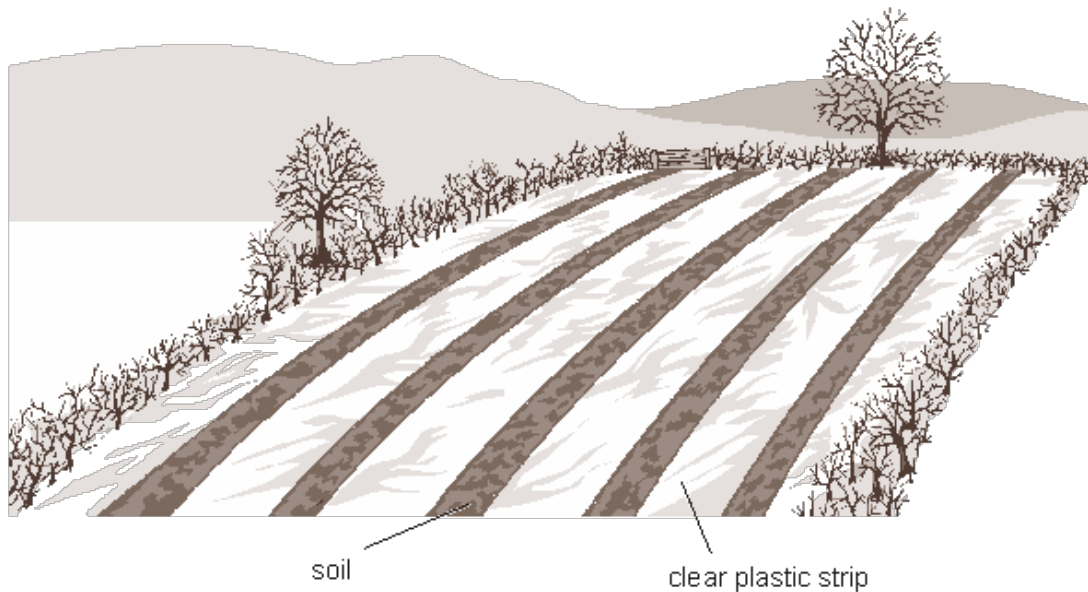
- (ii) Every 10 years the trees and bushes in some bluebell woods are cut down to ground level.

What effect does this have on the number of bluebells in the woods?
Explain your answer.

.....
.....

1 mark
Maximum 6 marks

- Q16.** Potatoes have just been planted in a field.
The rows of potatoes are covered with clear plastic strip.



- (a) (i) The potatoes were planted in winter.
How will the plastic strips help the potatoes to start to grow?

.....

1 mark

- (ii) Complete the sentences below with words from the list.

air heat light water

The plastic strips covering the growing potato plants must be

clear so the leaves will get enough

The potato plants grow well because the gaps between the plastic strips will let and

get into the soil.

3 marks

- (b) The plastic strips break down naturally after a few weeks.

Suggest why it is useful that the plastic strips break down naturally.

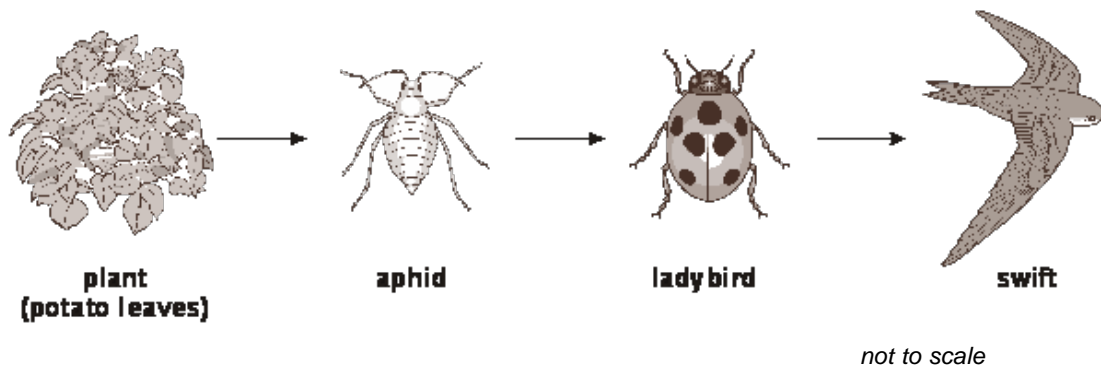
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1 mark

- (c) Aphids are insects that feed on potato leaves.

Aphids and potato plants are part of the food chain shown below.



- (i) Some farmers put ladybirds on their potato plants to get rid of aphids.

How do ladybirds get rid of aphids?

.....

.....

- (ii) What else could farmers use to get rid of aphids?
Tick the correct box.

fertiliser

☐

insecticide

☐

slug pellets

☐

weedkiller

☐

2 marks
maximum 7 marks

- Q17.** The drawing below shows a barn owl.
Barn owls hunt for small animals such as mice.



- (a) (i) Look at the drawing of the barn owl.

Give **two** ways the barn owl is suited for catching small animals.

1

2

- (ii) Draw a line from each animal below to the word that describes it.
Draw only **two** lines.

animal

**word that describes
the animal**

mouse

predator

barn owl

prey

producer

4 marks

- (b) The photograph below shows two young barn owls.
They are covered with soft feathers.



Why do the young barn owls need feathers?

.....
.....

(c) Barn owls build nests in farm buildings. Mice eat wheat seeds.

- (i) Many old farm buildings have been knocked down so that houses can be built on the farmland.

Give **one** reason why this has caused the number of barn owls to decrease.

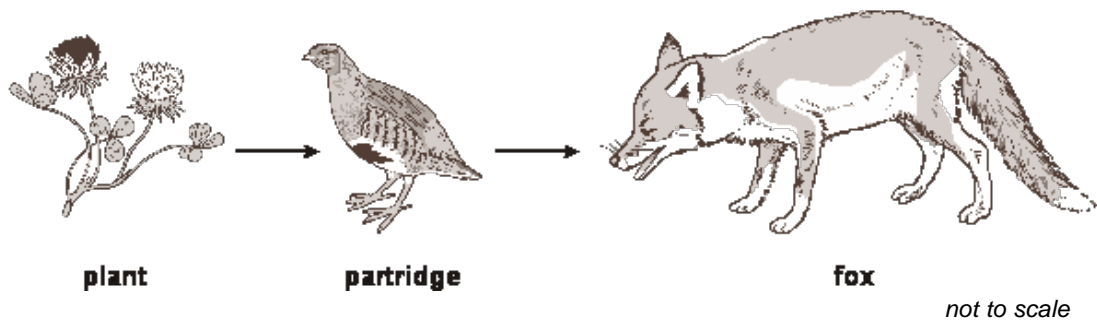
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- (ii) Suggest **one** reason why farmers like to have barn owls on their farms.

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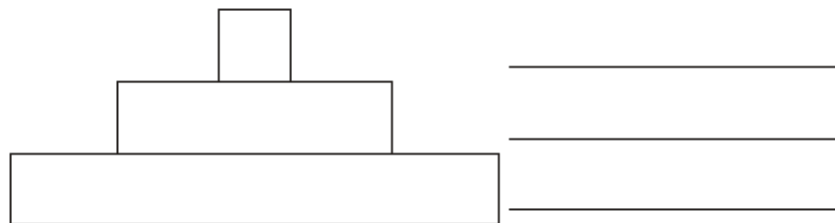
3 marks
maximum 7 marks

Q18. The drawings show part of a farmland food chain.



- (a) A pyramid of numbers represents the number of organisms at each stage in a food chain.

On each line by the pyramid of numbers below, write the name of the correct organism from the food chain above.



1 mark

- (b) Partridges feed mainly on insects and wild plants (weeds).

Some farmers spray their crops with chemicals to kill insects and weeds.

How would this affect the number of foxes?

.....

Explain your answer.

.....

.....

1 mark

- (c) Partridges build their nests on the ground among plants.
They lay up to 18 eggs in the nest.

Suggest why partridges need to lay so many eggs.

.....

.....

1 mark

- (d) Some farmers leave a strip of land around the edge of each field which they do **not** spray with chemicals.

Suggest **two** reasons why this will lead to an increase in the number of partridges on these farms.

1

.....

2

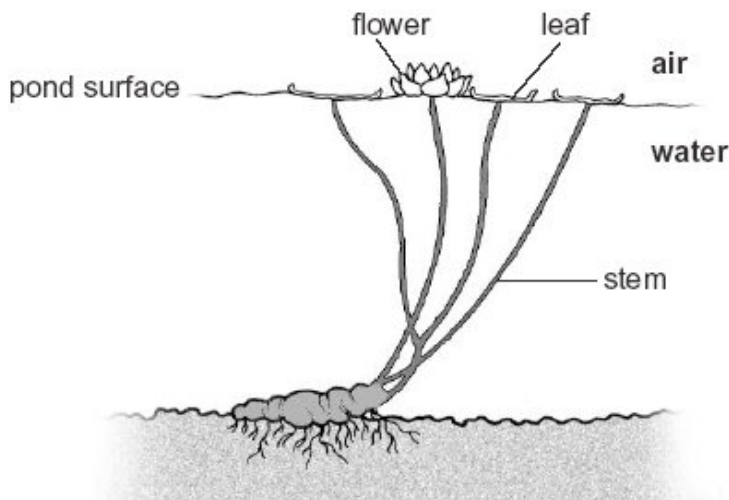
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2 marks
maximum 5 marks

Q19. The photograph below shows some water lilies in early summer.



This diagram shows a water lily plant.



(a) Water lilies do **not** grow well in moving water.

Suggest a reason for this.

.....
.....

1 mark

(b) During the winter, many water lily plants do **not** grow new leaves.

Suggest **one** reason why the plants do **not** grow new leaves in the winter.

.....

1 mark

(c) (i) Give **one** way water lily plants are adapted to live in water.

.....

1 mark

- (ii) Explain how this adaptation helps the water lily to grow in water.

.....

.....

1 mark

- (d) In the summer, water lilies produce large yellow flowers.
The flowers float on the surface of the pond.



Suggest **one** way these colourful floating flowers help the water lily to reproduce.

.....

.....

1 mark

- (e) When water lilies cover the pond surface with leaves, the pond does not get as hot during the day.


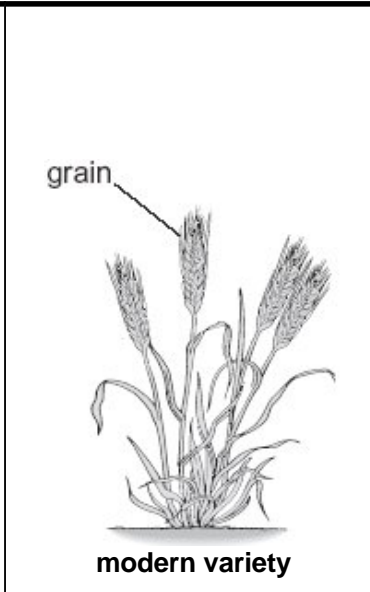
Explain why the pond does **not** get as hot.

.....

.....

1 mark
maximum 6 marks

Q20. (a) The drawings below show an old and a modern variety of wheat plant.

	 <p style="text-align: center;">old variety</p>	 <p style="text-align: center;">modern variety</p>
average mass of grain produced per m² (kg)	0.5	0.8
average length of stalk (cm)	145	78

Glucose produced by the wheat plants is used:

- to provide energy for growth
- to make cell walls
- to make starch which is stored in the grain.

Give **one** reason why modern wheat plants with short stalks can store more starch in the grain. Use the drawings and information.

.....

.....

1 mark

(b) A plant breeder wants to use selective breeding to produce corn with short stalks and a high mass of grain. He could use the following varieties of corn:

<p style="text-align: center;">variety A</p> <p style="text-align: center;">long stalks high mass of grain</p>	<p style="text-align: center;">variety B</p> <p style="text-align: center;">short stalks low mass of grain</p>	<p style="text-align: center;">variety C</p> <p style="text-align: center;">long stalks low mass of grain</p>
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- (i) What would the plant breeder need to do to make sure he always produced corn with short stalks and a high mass of grain?
Describe the three steps the breeder would use.

.....

.....

.....

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.....

.....

3 marks

- (ii) Suggest **one** other characteristic that farmers might like corn plants to have to increase the amount of corn produced.

.....

1 mark
maximum 5 marks

Q21. The drawings below show a snail and a slug.

snail



slug



- (a) Look at the drawings above.

- (i) Give one way the snail and slug are **different** from each other.

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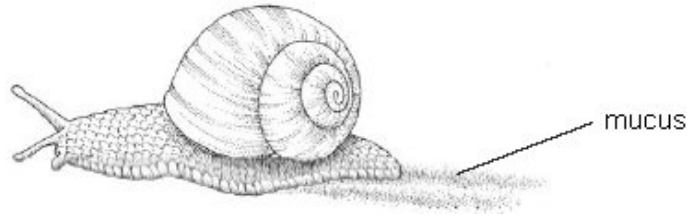
1 mark

- (ii) Give one way the snail and slug are the **same**.

.....

1 mark

- (b) Snails produce mucus to help them move along the ground.



How does mucus help snails to move?
Tick the correct box.

Mucus is cold.

☐

Mucus reduces friction.

☐

Mucus increases weight.

☐

Mucus leaves a trail.

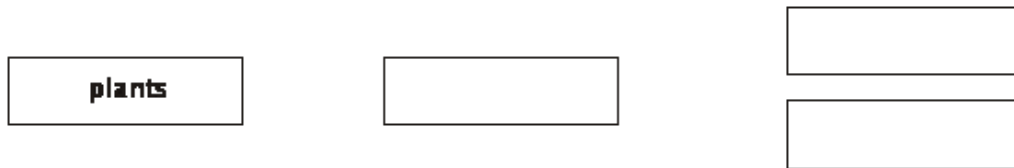
☐

1 mark

- (c) Snails are herbivores. Thrushes and blackbirds eat snails.

Complete the food web below to show the relationship between plants, snails, thrushes and blackbirds.

Draw arrows on the diagram.



2 marks

- (d) Snails that live in woodland areas are usually brown or red.



Suggest how the colour of snails in woodland areas protects them from birds.

.....

1 mark
maximum 6 marks

