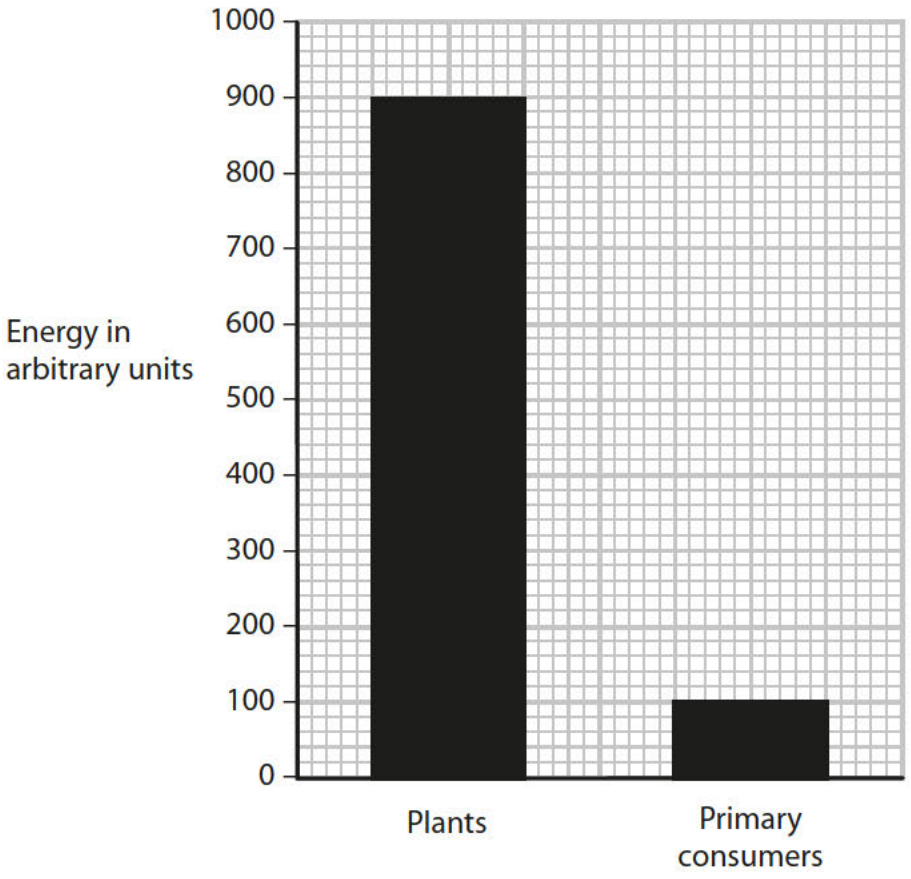
1 The graph shows the units of energy in the plants and primary consumers in a food chain.



(a) Not all the energy in the plants is transferred to the primary consumers.

(i) Calculate the percentage of energy in plants that is transferred to the primary consumers.

Show your working.

(2)

Answer ..... %

(ii) One reason why energy is not transferred is because certain molecules in plants cannot be digested.

Give two other reasons why energy is not transferred.

(2)

1 .....

2 .....

(b) Primary consumers can digest the starch from plants.

Describe how starch is digested in humans.

(3)

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(Total for Question = 7 marks)

2 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Meat-eating plants



Venus flytraps carry out the process of photosynthesis. The glucose produced is used as a source of energy. In addition to synthesising glucose, plants also need to make amino acids, vitamins and other components to survive. To do this, plants need to absorb minerals.

In the bogs where Venus flytraps live the mineral content of the soil is low so minerals are scarce. Most plants cannot survive in this environment because they cannot make enough of the building blocks necessary for growth. The Venus flytrap has evolved the ability to grow well in this habitat by finding alternate means of getting minerals. Insects provide a good source of the minerals missing from the soil, and they contain additional carbohydrates.

Carnivorous plants attract and capture insects, discriminate between food and non-food, and digest the insects. They do this using mechanical and chemical processes. Plants lack the muscles and tendons to eat, chew and swallow food. The Venus flytrap completes the entire process using specialised leaves that carry out the role of the mouth and the intestines.

Most plants have some mechanism to attract insects. The Venus flytrap does this by secreting sweet nectar from the leaves of the trap. When an insect lands or crawls on the trap, it is likely to touch one of six, short, stiff hairs on the trap's surface. These are trigger hairs, and they serve as a motion detector for the plant. If two of these hairs are brushed in quick succession, or one hair is touched twice, the leaves close on the insect.

The mechanism of trap closure is not clearly understood but it involves changes in the concentration of solution in the cells. The cells expand as water enters causing the trap to close. Once the trap fully closes, the leaves form a seal so that digestive fluid and insects are kept inside the trap and bacteria and fungi cannot get in.

To make sure that the insects are kept in the trap, the edges of the leaves have projections that fit together when the leaves shut. These projections look like teeth but they are only used to keep the trap shut.

The leaf trap now serves as a digestive organ to dissolve the soft tissues and cell membranes of the food. It produces acid and enzymes. The insect body is broken down over a period of 5 to 10 days and the products of digestion are absorbed.

(a) Name the process that the plant uses to release energy from glucose (lines 1 and 2).

(1)

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(b) Carnivorous plants attract insects for food.

Give a reason why other plants need to attract insects (line 11).

(1)

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(c) The Venus flytrap can be placed at two different trophic levels.

Name these levels.

(2)

1 .....

2 .....

(d) The trap only closes 'If two of these hairs are brushed in quick succession, or one hair is touched twice' (lines 20 and 21).

Suggest why this is an advantage to the plant.

(2)

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(e) Explain how changes in the concentration of solution in the cells can lead to water entering the cells (lines 23 and 24).

(2)

(f) Suggest two reasons why the traps need to prevent the entry of bacteria or fungi (line 26).

(2)

1

2

(g) (i) The trap lacks teeth that function as they do in animals.

Explain how this may affect the rate at which the insect is digested.

(2)

(ii) Name one enzyme that may be present in the digestive fluid produced within the trap (line 25).

(1)

(h) Explain two factors that could affect the length of time taken to digest an insect once it has been caught in a trap.

(4)

1 .....

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2 .....

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(Total for Question = 17 marks)

3 Fish produce and release nitrogenous waste.

(a) Suggest why two fish of the same size may produce different masses of nitrogenous waste.

(1)

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(b) The table shows the mass of nitrogenous waste released into the environment by four different fish farms.

Type of fish farm	Nitrogenous waste released in kg per 1000 kg fish produced
salmon	48.2
halibut	67.1
cod	72.3
haddock	72.3

Calculate the mass of nitrogenous waste released into the environment when 400 kg of cod fish are produced. Show your working.

(2)

mass = ... kg

(c) Nitrogenous waste released into the environment can cause eutrophication.

Describe the process of eutrophication and the effects that it can have on the environment.

(5)

(d) Fish farms remove nitrogenous waste to improve the growth of fish.

Another method to improve the growth of fish is vaccination.

Explain how the process of vaccination improves the growth of fish.

(4)

(Total for Question = 12 marks)

4 Read the passage below. Use the information in the passage and your own knowledge to answer the questions that follow.

Red and Grey Squirrels



(Photographer: Matti Parkkonen)

Red squirrels live in pine tree habitats in the United Kingdom (UK) where their main predators are birds of prey such as the goshawk. The squirrels mainly eat pine cone seeds. This food is plentiful in the autumn and helps the squirrels increase their body mass. Having a larger body mass helps red squirrels to survive the cold winter conditions. It also means that breeding females are in good condition to produce young in the spring.

Red squirrels were common in the UK until a different species, the grey squirrel, was introduced from America in 1876. The two species struggled to exist in the same woodland habitat and it is the red squirrel population that is decreasing. There are estimated to be only 140000 red squirrels left in the UK, and 2.5 million grey squirrels. The spread of the grey squirrel has been rapid, and in some areas native red squirrels are no longer seen.

The grey squirrel outcompetes the red squirrel and there is some evidence that it is also more resistant to disease. The increase in the number of grey squirrels in the UK is having a harmful effect on other native communities where the plants and animals are poorly adapted to withstand their presence. The grey squirrels are causing significant harm to woodland habitats, and recent scientific studies have reported that they are having a serious effect on the number of native woodland birds.

The Forestry Commission is an organisation in the UK trying to develop a long-term conservation strategy to save the red squirrel from extinction. It is hoped that this work will help to restore the UK's native biodiversity.

(a) Name a secondary consumer in a food chain containing red squirrels.

(1)

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(b) Suggest how a larger body mass helps squirrels survive the cold winter (lines 4 and 5).

(2)

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(c) Suggest two reasons why it is an advantage for red squirrels to produce young in the spring (line 6).

(2)

1 .....

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2 .....

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(d) (i) What is meant by the term **habitat** (line 9)?

(1)

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.....

(ii) What is meant by the term **population** (line 9)?

(1)

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.....

(e) Use the data in the passage to calculate the percentage of all the squirrels in the UK that are red. Show your working.

(2)

percentage ..... %

(f) Give two possible reasons why grey squirrels are increasing in number compared to red squirrels.

(2)

1 .....

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2 .....

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(g) Grey squirrels have a greater effect on the number of woodland birds than red squirrels (lines 17 to 19).

Suggest how scientists could collect data to support this hypothesis.

(3)

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(h) Suggest two methods the Forestry Commission might use to save the red squirrel from extinction (line 21).

(2)

1 .....

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2 .....

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(Total for Question = 16 marks)