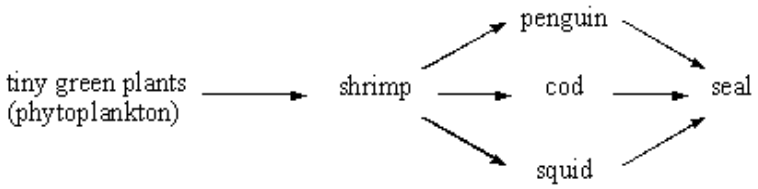
Q1. Scientists have found the following food web in the Antarctic Ocean.



(a) (i) Write down the name of the producer in this web.

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(ii) Write down the names of **two** organisms which are prey in this web.

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(3)

(b) Humans are removing large numbers of the cod.
Some scientists argue that this could lead to a decrease in the numbers of squid and penguins.
Others argue that the numbers of squid and penguins will stay the same.

Carefully explain each argument.

Why they might decrease.

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Why they might stay the same.

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(2)

(c) The following information is about the biomass of the organisms in one of the food chains in the web.

tiny green plants	→	shrimp	→	cod	→	seal
1000 tonnes		100 tonnes		10 tonnes		0.5 tonne

Draw and label a pyramid of biomass for this chain.

(2)
(Total 7 marks)

Q2. (a) 1m² of a field gets about 1050MJ of light energy per year.

Only 21 500kJ of energy is stored in the new grass.

(i) How is the energy stored in the new grass?

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(1)

(ii) What is the % of light energy stored in the grass?

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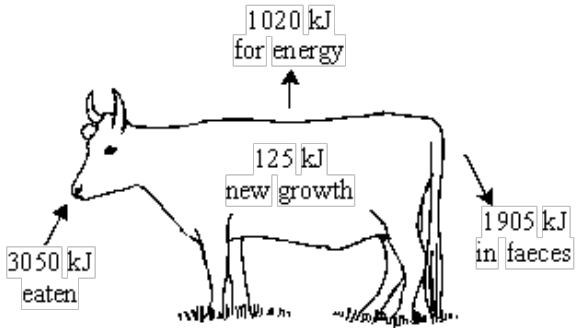
(1)

(b)



The diagram shows what happens to the energy from grass in part of a field which is grazed by a bullock.

Using information in the diagram suggest why food chains are usually short.

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(3)

(c) Many of the animals which from part of our diet are herbivores rather than carnivores. Explain why as fully as you can.

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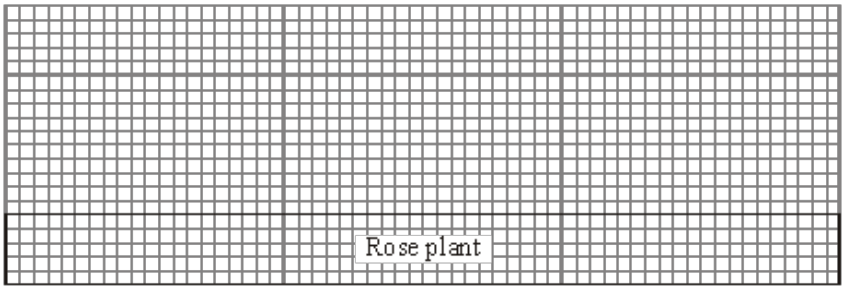
(3)
(Total 8 marks)

Q3. Energy is stored in the materials that make up organisms. These materials are called biomass.

Organisms in food chain	Rose plant	→	Greenfly	→	Ladybird	→	Blackbird
Biomass in g/m^2	600		50		10		1

(a) Complete the pyramid of biomass for this food chain. The rose plant has been done for you. You should draw the rest of the pyramid to the same scale. (5 small squares = 50 g/m^2.)



(3)

(b) What proportion of the energy in a rose plant is transferred to greenfly?

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Proportion = ...

(2)

(Total 5 marks)

Q4. (a) One food chain in the wood is:

Hazel tree nuts → squirrels → owls

(i) What does this food chain tell us?

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(2)

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

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(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;

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2. owls.

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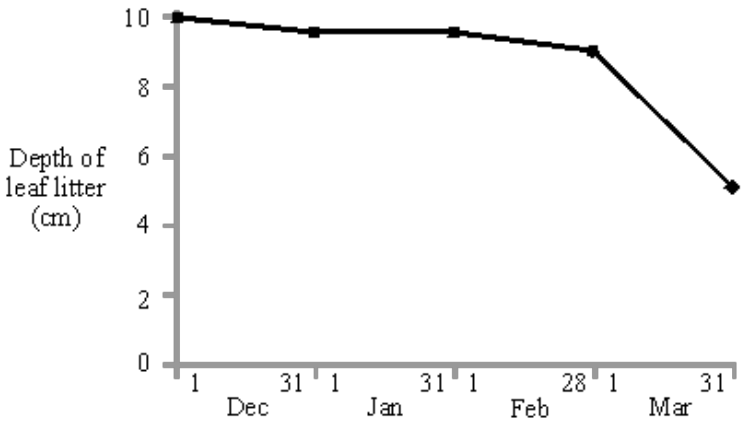
(4)

(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;

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(1)

(ii) how this decrease happened.

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(1)

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

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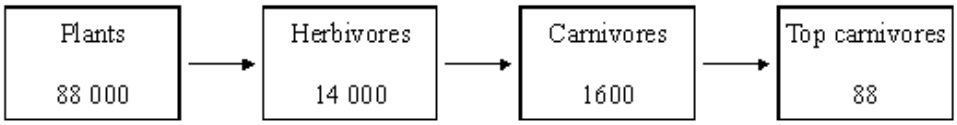
(2)

(Total 11 marks)

Q5. The diagram shows a food chain in a pond. The figures show the amounts of energy in each type of organism, in kilojoules per m^2 of pond per year.



(a) Calculate the percentage of the energy in the plants that is passed to the top carnivores. Show clearly how you work out your final answer.

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Answer ..... %

(2)

(b) In the space below, draw a pyramid of biomass for this food chain. Label your drawing with the names of the organisms.

(2)

(c) If humans ate organisms from this food chain, it would be more efficient to eat plants than to eat herbivores. Why is this?

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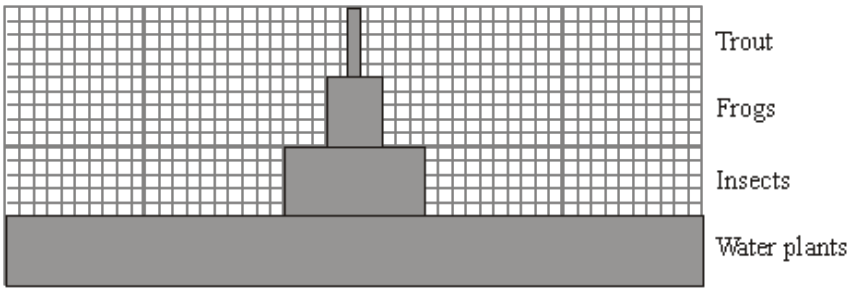
(1)
(Total 5 marks)

Q6. The diagram shows a pyramid of biomass drawn to scale.



(a) What is the source of energy for the water plants?

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(1)

(b) The ratio of the biomass of water plants to the biomass of insects is 5 : 1.

Calculate the ratio of the biomass of insects to the biomass of frogs.

Show clearly how you work out your answer.

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ratio = ... : 1

(2)

(c) Give **two** reasons why the biomass of the frog population is smaller than the biomass of the insect population.

1 .....

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2 .....

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(2)

(d) Some insects die.

Describe how the carbon in the dead insect bodies may be recycled.

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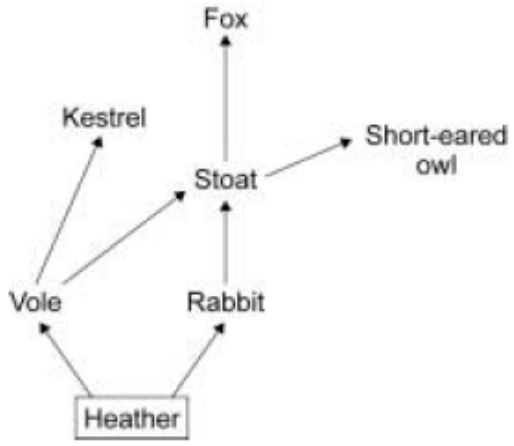
(4)

(Total 9 marks)

Q7. *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagram below shows a food web for some of the organisms that live on moorland.



Only a small percentage of the Sun's energy captured by the heather is eventually incorporated into the body tissues of the fox.

Explain, as fully as you can, what happens to the rest of the energy captured by the heather.

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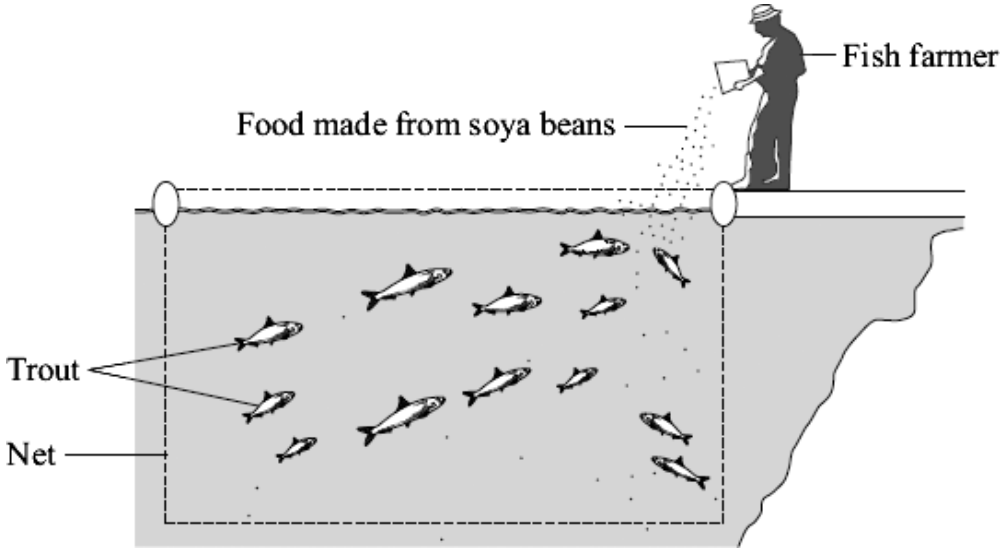
(Total 6 marks)

Q8. A fish farmer keeps trout in a large net in a lake.



The fish farmer feeds the trout on food made from soya beans.

When the trout are large enough the farmer sells them for food for people.

(a) Draw a pyramid of biomass for the three organisms in this food chain.

Label the pyramid.

(2)

(b) It would be more energy efficient if people ate the soya beans rather than eating the trout.

Which **two** of the following are reasons for this?

Tick (✓) **two** boxes.

Some people do not like eating animals such as trout. ☐

The trout release energy when they respire. ☐

Soya bean plants release energy when they respire. ☐

Some energy will be lost in waste from the trout. ☐

Soya bean plants absorb energy during photosynthesis. ☐

(2)

(c) Suggest **one** advantage to the fish farmer of keeping the trout in a large net instead of letting them swim freely in the lake.

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(1)

(d) Some trout die before they are large enough to be sold.
The dead trout contain carbon.

Use your knowledge of the carbon cycle to describe how this carbon is returned to the atmosphere after the trout die.

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(2)
(Total 7 marks)

Q9. A group of students investigated a food chain in a garden.

The table shows the estimates of the population and biomass of some of the organisms the students found.

Organism	Number in the garden	Mean mass of each one in g	Biomass of population in g
Hedgehog	1	200	200
Slug	600	2	1200
Lettuce	20	300	

(a) (i) Calculate the biomass of the lettuce population.

Show clearly how you work out your answer.

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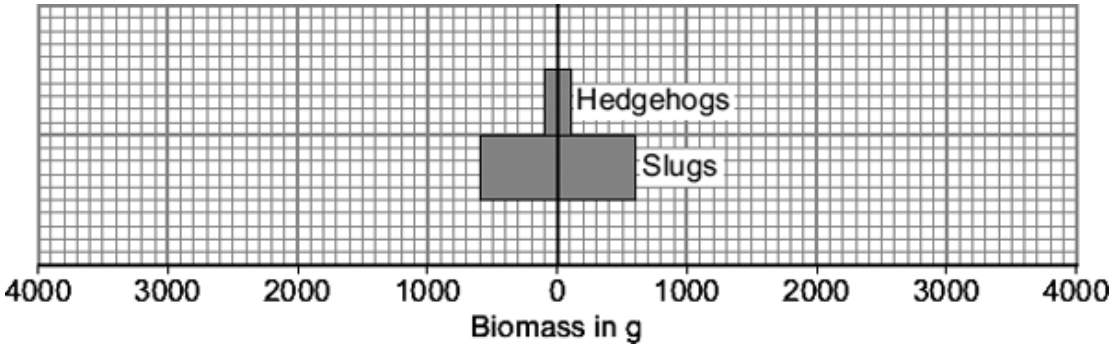
Biomass = ... g

(2)

(ii) Use your answer to part (a)(i) to complete the pyramid of biomass.

Show the biomass of the lettuces in the garden.



(2)

(b) Hedgehogs eat slugs.

The biomass of the hedgehog population is much less than the biomass of the slug population.

Explain why as fully as you can.

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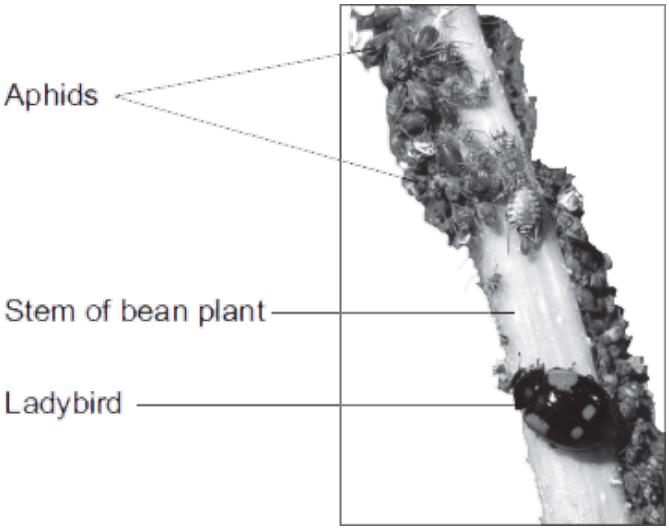
(3)
(Total 7 marks)

Q10. Students investigated a food chain in a garden.

The students found 650 aphids feeding on one bean plant.
Five ladybirds were feeding on the aphids.



Photograph supplied by Hemera/Thinkstock

(a) (i) Draw a pyramid of biomass for this food chain.
Label the pyramid.

(2)

(ii) The biomass in the five ladybirds is less than the biomass in the bean plant.

Give **two** reasons why.

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(2)

(b) The carbon in dead bean plants is returned to the atmosphere via the carbon cycle.

Describe this part of the carbon cycle.

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(4)
(Total 8 marks)

Q11. A group of students investigated populations in a food chain in a garden.

The table shows the estimates of the number and biomass of some of the organisms the students found.

Organism	**Number in the garden**	**Mean mass of each one in grams**	**Biomass of population in grams**
Hedgehog	1	200	200
Slug	600	2	1200
Lettuce	60	100	

(a) (i) Calculate the biomass of the lettuce population.

Show clearly how you work out your answer.

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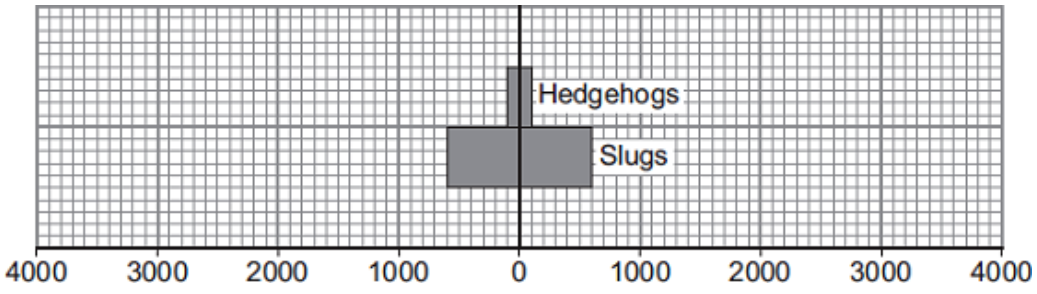
Biomass = ... grams

(2)

(ii) Use your answer to part (a)(i) to complete the pyramid of biomass.

Show the biomass of the lettuce population in the garden.



Biomass of population in grams

(2)

(b) The energy in the hedgehog population is much less than the energy in the slug population.

Explain why as fully as you can.

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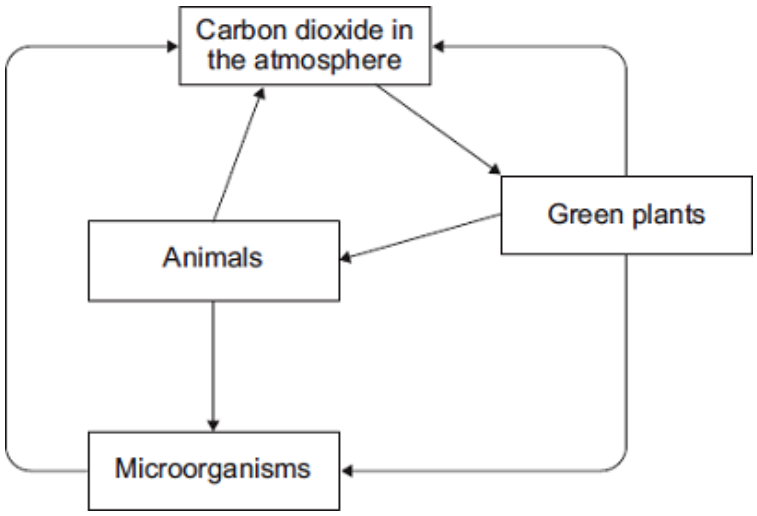
(3)
(Total 7 marks)

Q12. *In this question you will be assessed on using good English, organising information clearly and using specialist terms where appropriate.*

The diagram shows part of the carbon cycle.



Describe how living things are involved in the constant cycling of carbon.

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(Total 6 marks)