

# Food Chain and Pyramids of Biomass 2

**Q:1** (a) Tuna fish are carnivores. In the wild they feed on smaller fish called herring. Herring feed on plankton. Tuna can be attacked by parasitic worms which feed on their flesh.

(i) In the space below sketch the appearance of a pyramid of biomass for this food chain.

Do not forget to label each section of the pyramid.

(2 marks)

(ii) If a tuna eats 1 kg of herring, it gains about 65 g in mass.

Give two reasons why so little of the mass of the herring is converted into mass of the tuna.

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

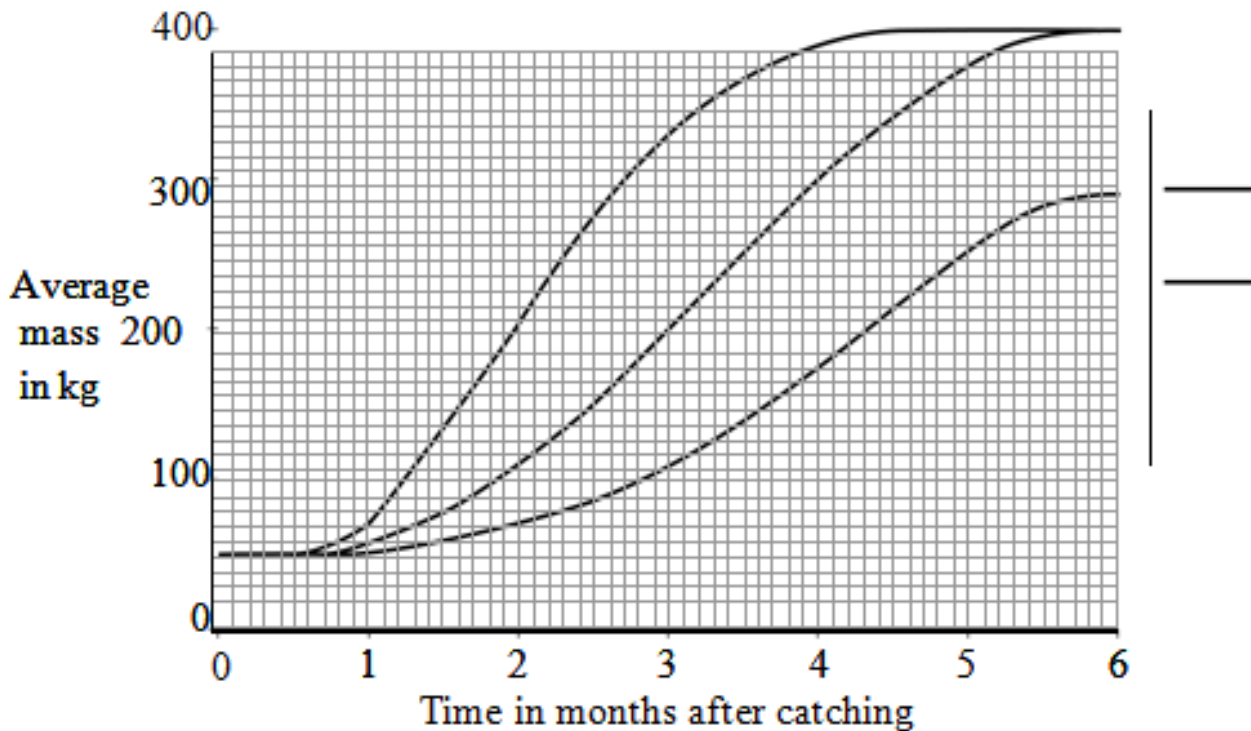
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(2 marks)

(b) Young tuna are caught by fish farmers and reared in large pens in the sea.

The fish are fed more food than they would normally catch themselves so they grow quickly. When they reach 400 kg they are sold.

The graph on the opposite page shows the effect of feeding tuna different amounts of protein in their food.



(i) Calculate the average increase in mass per month of the fish fed on the low-protein diet over the six months.

Show clearly how you work out your answer.

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Average increase in mass per month \_\_\_\_\_ kg

**(2 marks)**

(ii) There is not enough information in the graph to allow the fish farmer to decide whether to use the high-protein diet or the medium-protein diet.

Suggest one other piece of information that he needs in order to make this decision.

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**(1 mark)**

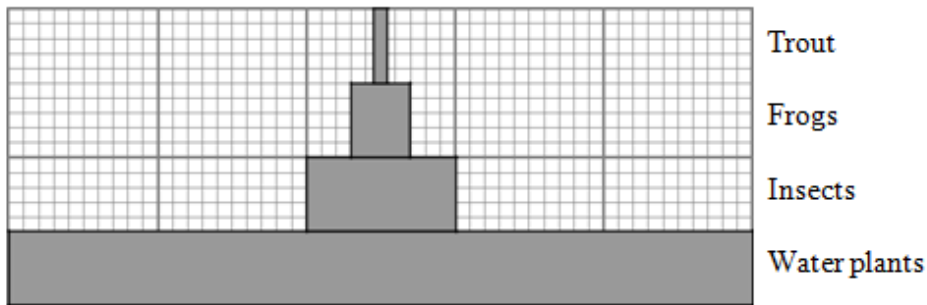
(c) Some consumers will not buy tuna grown in this way. Suggest one reason for their decision.

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(1 mark)

Q:2 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 mark)

(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 marks)

(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 \_\_\_\_\_  
\_\_\_\_\_

(2 marks)

(d) Some insects die.

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

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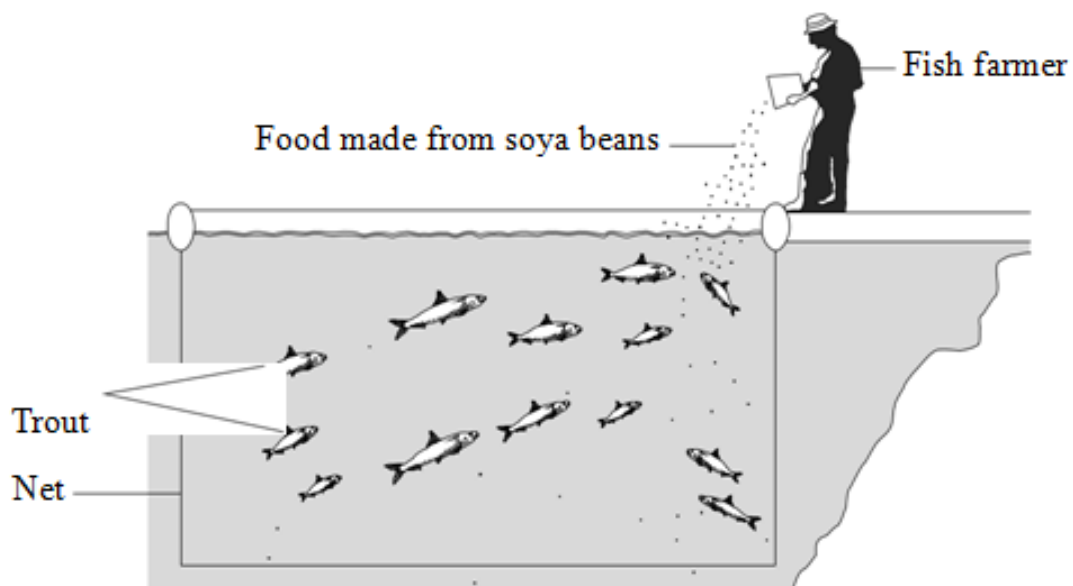
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(4 marks)

Q:3 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 marks)**

**(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 marks)**

**(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 mark)**

(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 marks)

Q:4 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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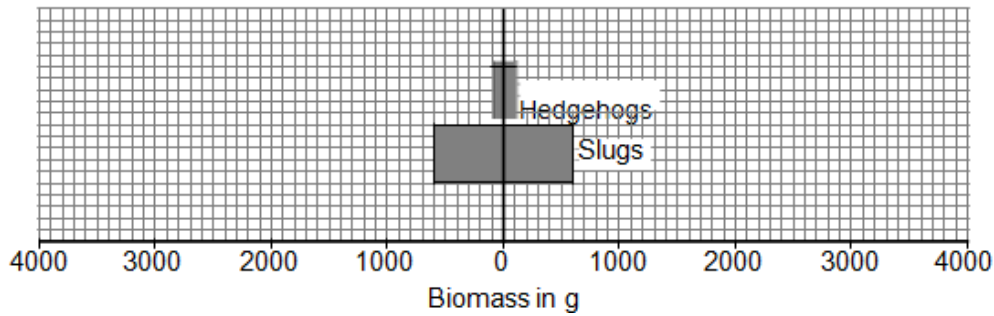
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Biomass = \_\_\_\_\_ g

(2 marks)

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

Show the biomass of the lettuces in the garden.



(2 marks)

(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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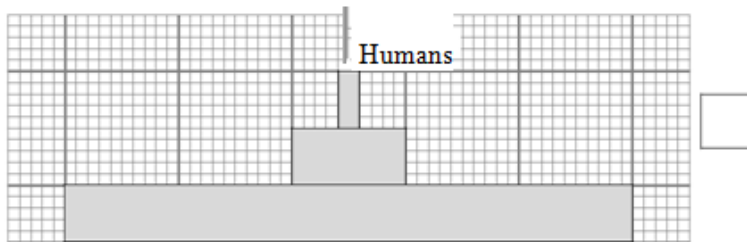
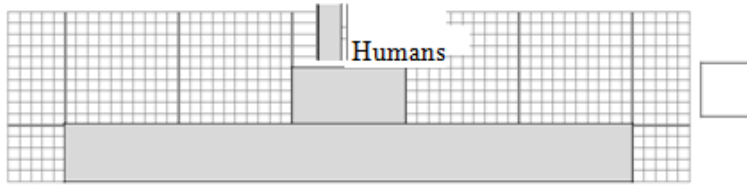
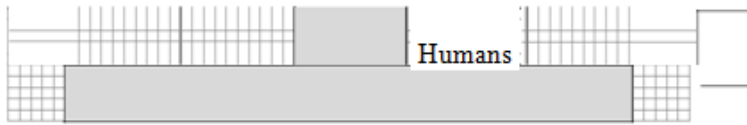
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(3 marks)

Q:5(a) The diagrams show three pyramids of biomass.

(a) (i) Which pyramid would be the most efficient in providing food for humans? Tick ( ) one box.



(1 mark)

(a)(ii) Give one reason for your choice.

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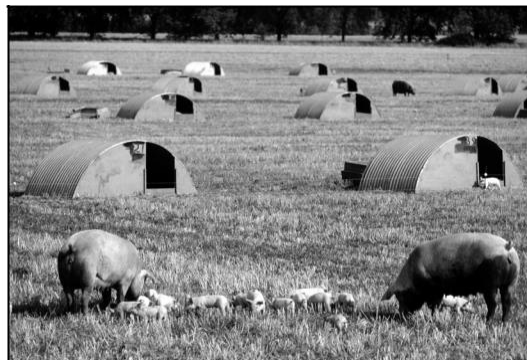
(1 mark)

(b) Pigs may be kept indoors or outdoors.

Pigs kept indoors



Pigs kept outdoors

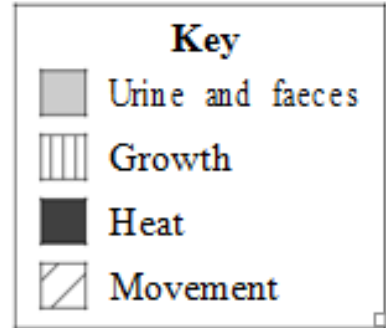
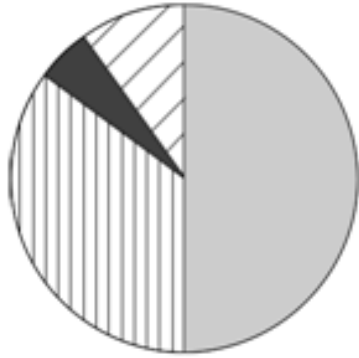




The pie charts show what happens to the energy in the food eaten by pigs kept indoors and pigs kept outdoors.

**Pigs kept indoors**

**Pigs kept outdoors**



**(b) (i)** Farmers make more profit from keeping pigs indoors than from keeping pigs outdoors.

Use information from the pie charts to explain why.

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**(2 marks)**

**(b)(ii)** Meat from pigs kept outdoors may cost more than meat from pigs kept indoors.

Some people prefer to buy meat from animals that have been kept outdoors.

Suggest one reason why.

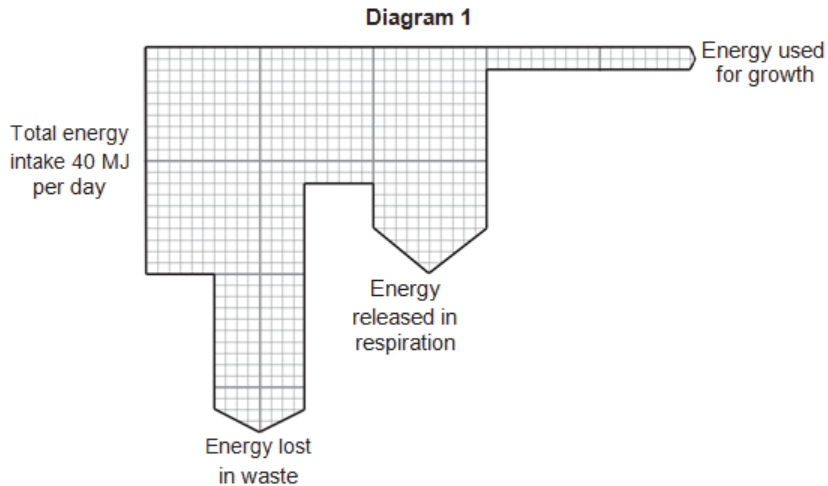
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**(1 mark)**

**Q:6 (a)** Diagram 1 represents what happens to the energy in the food eaten by a herbivore (an animal that eats plants).

Diagram 1



**(a) (i)** How much energy is released in respiration by the herbivore?

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Answer \_\_\_\_\_ MJ per day

**(1 mark)**

**(a) (ii)** What proportion of the total energy intake of the herbivore is used for growth? Show clearly how you work out your answer.

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Proportion \_\_\_\_\_

**(2 marks)**

(b) Give two ways in which the energy, released in respiration, is used by a herbivore.

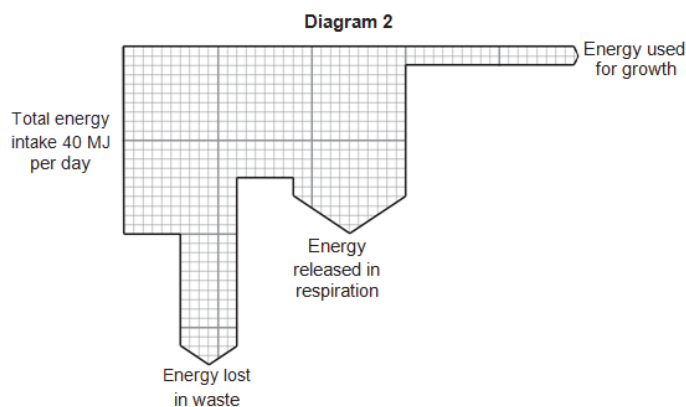
1 \_\_\_\_\_

2 \_\_\_\_\_

(2 marks)

(c) Diagram 2 represents what happens to the energy in the food eaten by a carnivore (an animal that eats other animals).

Diagram 2



The carnivore releases a greater proportion of energy in respiration than the herbivore.

Suggest one reason for this.

(1 mark)

(d) Some farmers keep their animals outdoors. Other farmers keep their animals indoors.

Keeping farm animals indoors increases the proportion of energy in their food that is converted into growth.

Give two reasons why.

1 \_\_\_\_\_

\_\_\_\_\_

2 \_\_\_\_\_

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(2 marks)

**Q:7** The table shows energy transfers in a large insect and a small mammal. Both animals feed mainly on grass.

Energy transfer	Amount of energy in kJ	
	Large insect	Small mammal
Eaten as grass	4.00	25.00
Absorbed into body	1.60	12.50
Leaves body as faeces	2.40	12.50
Production of new tissue	0.64	0.25
Transferred by respiration	0.96	12.25

**(a)** What percentage of the energy in food is transferred into new tissue in the large insect?

Show clearly how you work out your answer.

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Answer = \_\_\_\_\_ %

(2 marks)

**(b)** The proportion of energy in the food transferred into new tissue is much greater in the large insect than in the small mammal.

Explain why as fully as you can.

You should include references to the data in your answer.

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**(3 marks)**

**TOTAL MARKS=49**