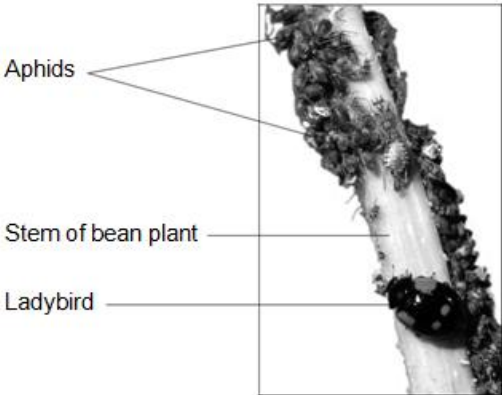


Food Chain and Pyramids of Biomass

Q:1 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.



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

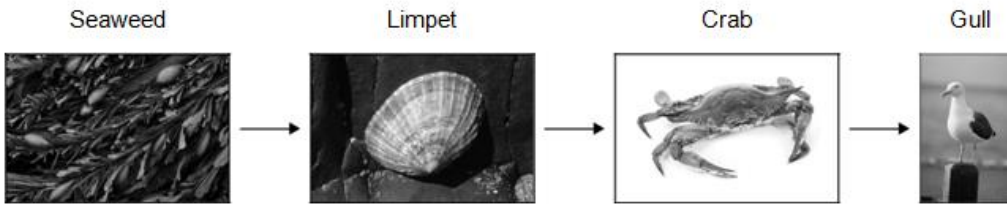
Label the pyramid.

(2 marks)

(a) (ii) The biomass in the five ladybirds is less than the biomass in the bean plant. Give two reasons why.

(2 marks)

Q:2 The photographs show a food chain from a seashore. The photographs are not to the same scale.



Students estimated the population and biomass of each of the organisms on part of a seashore.

The table shows the students' results.

Organism	Population	Mean mass of one organism in grams	Biomass of population in grams
Seaweed	50	4000	200 000
Limpet	1200	30	36 000
Crab	100	90	9 000
Gull	2	900	

(a) (i) Use the data in the table to calculate the biomass of the gull population.

Biomass = _____ g

(1 mark)

(a) (ii) Draw a pyramid of biomass for this food chain.

Label the pyramid.

(2 marks)

(b) The biomass of the crab population is much less than the biomass of the limpet population.

Suggest two reasons why.

1 _____

2 _____

(2 marks)

Q:3 Green plants are found at the start of all food chains.

(a) Complete the sentences.

(a) (i) The source of energy for green plants is radiation from the

(1 mark)

(a) (ii) Green plants absorb some of the light energy that reaches them for a process called

(1 mark)

(b) Draw a ring around the correct answer to complete each sentence

(b) (i) This process transfers light energy into

- | |
|------------|
| chemical |
| sound |
| electrical |

energy.

(1 mark)

(b) (ii) The process uses the gas

- carbon dioxide.
- oxygen.
- water.

(1 mark)

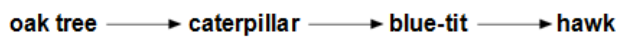
(b) (iii) The process produces carbon-containing compounds called

- carbohydrates.
- minerals.
- salts.

(1 mark)

(c) The amount of living material (biomass) at each stage in a food chain is less than at the previous stage.

The diagram shows a food chain.



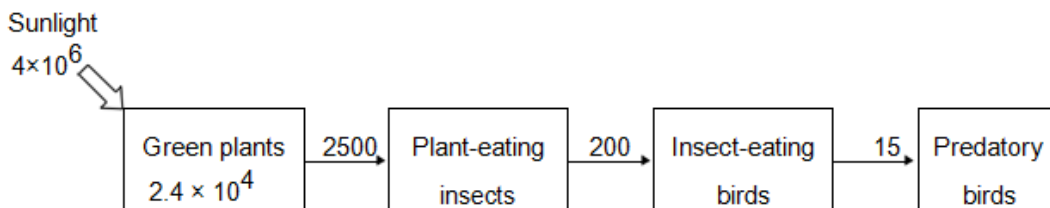
Give two ways in which biomass is lost in this food chain.

Tick (☑) two boxes.

- As carbon dioxide from the caterpillar
- As food eaten by the hawk
- As oxygen from the oak tree
- As faeces (droppings) from the blue-tit

(2 marks)

Q:4 The diagram shows the annual flow of energy through a habitat. The figures are in kJ m⁻².



(a) (i) Calculate the percentage of the energy in sunlight that was transferred into energy in the green plants.

Show clearly how you work out your answer.

Answer = _____ . %

(2 marks)

(a) (ii) Suggest reasons why the percentage energy transfer you calculated in part (a)(i) was so low.

(2 marks)

(b) Compare the amount of energy transferred to the insect-eating birds with the amount transferred to the predatory birds.

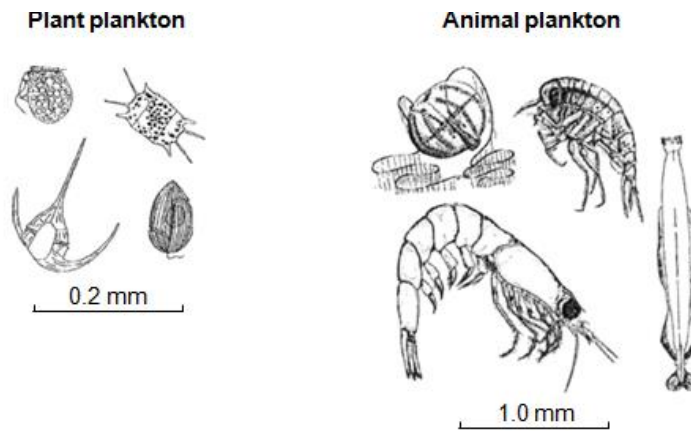
Suggest explanations for the difference in the amount of energy transferred to the two types of bird.

(3 marks)

Q:5 Plankton live in the sea.

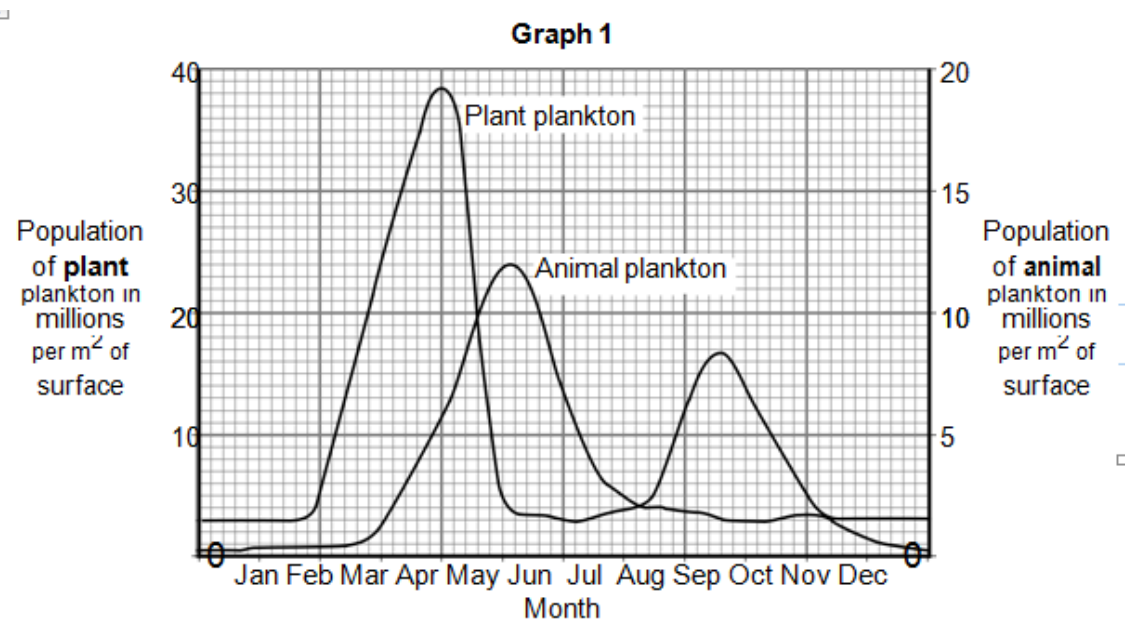
The diagram shows plant plankton and animal plankton drawn to the scales shown.

Plant plankton Animal plankton



Animal plankton eat plant plankton.

Graph 1 shows how the populations of the plankton change through the year in the seas around the UK.

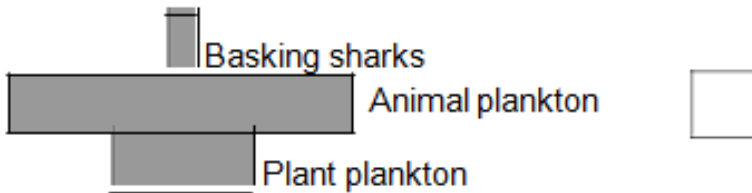
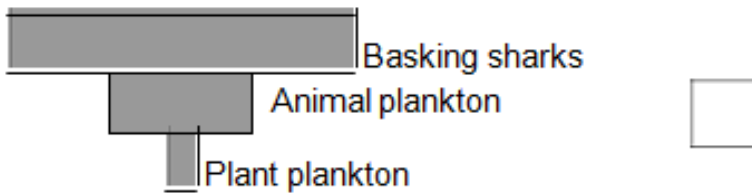
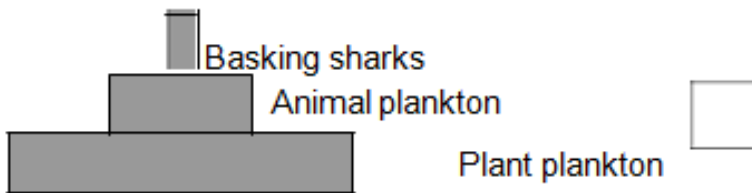


(a) Basking sharks eat animal plankton. Basking sharks grow up to 8 metres long.

Look at the diagram and Graph 1.

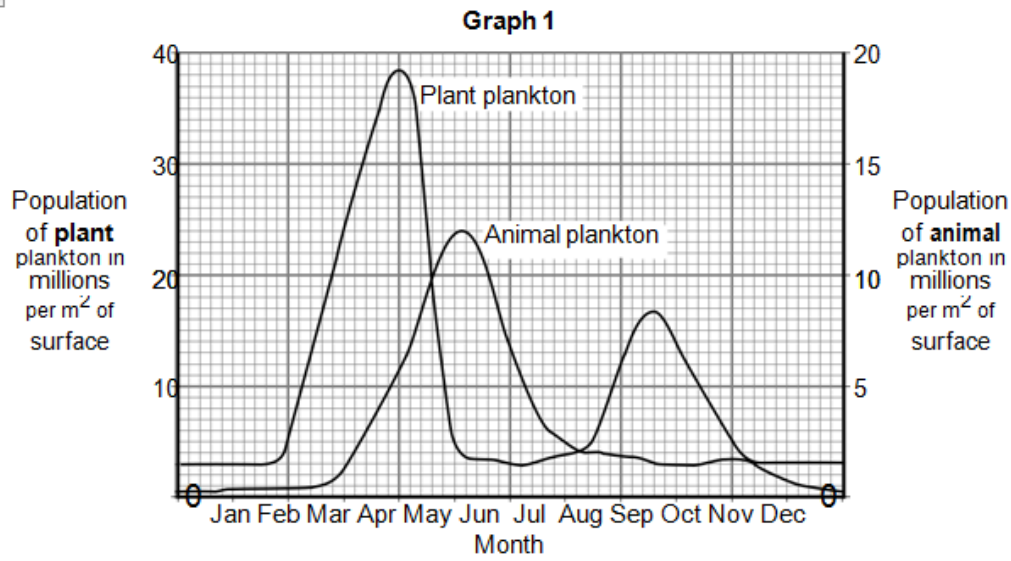
Which is the correct shape for the pyramid of biomass to show the relationship between plant plankton, animal plankton and basking sharks, in June?

Tick (☑) one box.

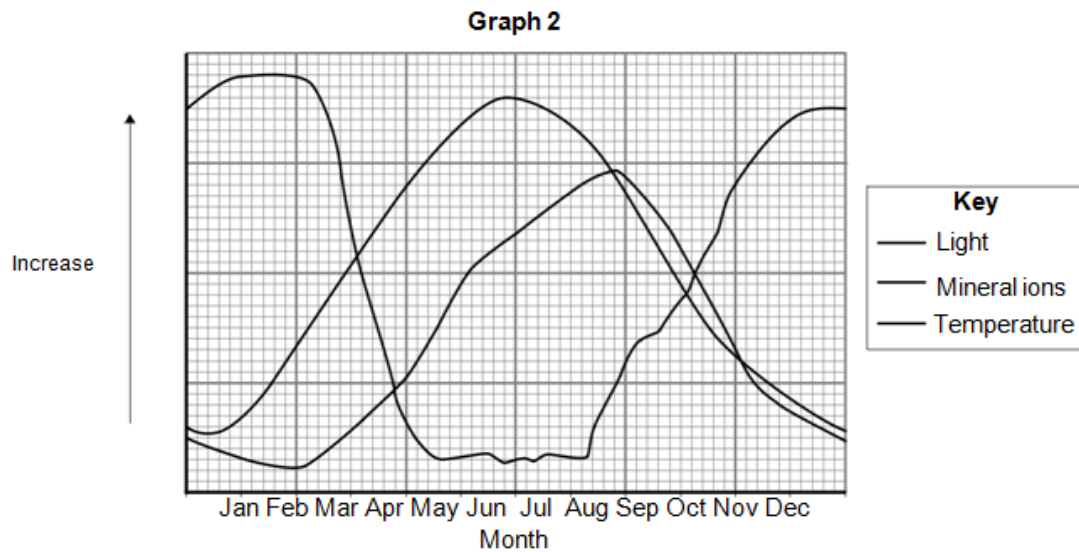


(1 mark)

Graph 1 is repeated here to help you answer the following questions.



Graph 2 shows changes in some of the conditions in the upper layers of the sea around the UK.



(b) The population of plant plankton increases between February and April.

Suggest one reason for the increase.

Explain your answer.

(2 marks)

(c) The population of animal plankton changes between April and July.

Suggest explanations for the changes.

(2 marks)

(d) The concentration of mineral ions changes between February and December.

Suggest explanations for the changes.

(3 marks)

Q:6 The larvae (young) of the peppered moths eat the leaves of birch trees.

The diagram shows the food chain:

birch trees ← peppered moth larvae ← birds

Draw a pyramid of biomass for this food chain.

Label the pyramid.

(2 marks)

(c) (ii) Which two reasons explain the shape of the pyramid you drew in part (c)(i)? Tick (☐) two boxes.

Some material is lost in waste from the birds

The trees are much larger than peppered moth larvae

Peppered moth larvae do not eat all the leaves from the trees

The trees do not use all of the Sun's energy

(2 marks)

Q:7 Food chains show the flow of energy through the organisms in a habitat.

(a) Figure 9 shows a food chain.

Figure 9

grass → sheep → human

The biomass in each stage of the food chain changes as food passes along the food chain.

Draw a pyramid of biomass for this food chain.

Label the pyramid.

[2 marks]

(b) Table 2 shows three food chains, A, B and C.

Table 2

	Food chain
A	plants → sheep → human
B	plants → grasshoppers → frogs → trout → human
C	plants → human

(b) (i) In which food chain, A, B or C, will the greatest proportion of biomass and energy of the plants be passed to humans?

[1 mark]

(b) (ii) Give reasons why the food chain that you chose in part (b)(i) passes on the greatest proportion of biomass and energy to humans.

[3 marks]

TOTAL MARKS=41