Q1. Food chains show the flow of energy through the organisms in a habitat.

(a) The diagram below shows a food chain.

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)

(b) The table below shows three food chains, **A, B** and **C**.

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

(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)

(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.

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(3)
(Total 6 marks)

Q2. 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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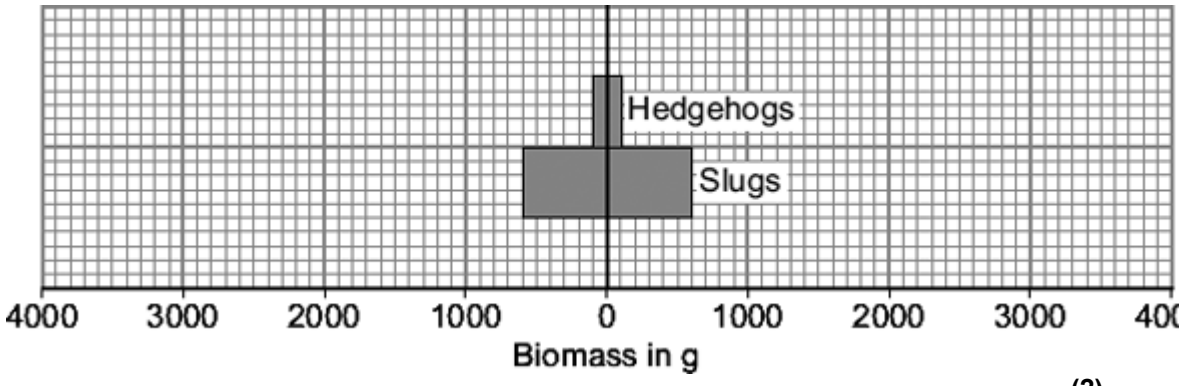
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Biomass = ... g

(2)

(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)

Q3. There are many ways to increase the efficiency of food production.

(a) The table shows the energy available to humans from two different food chains.

Food chain	Energy transferred to humans in kJ per hectare of crop
Wheat → humans	900 000
Wheat → pigs → humans	90 000

(i) Compare the amount of energy the two food chains transfer to humans.

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(1)

(ii) Give **one** reason for the difference in the amount of energy the two food chains transfer to humans.

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(1)

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

Give methods used in the factory farming of animals.
Explain the advantages and disadvantages of these methods.

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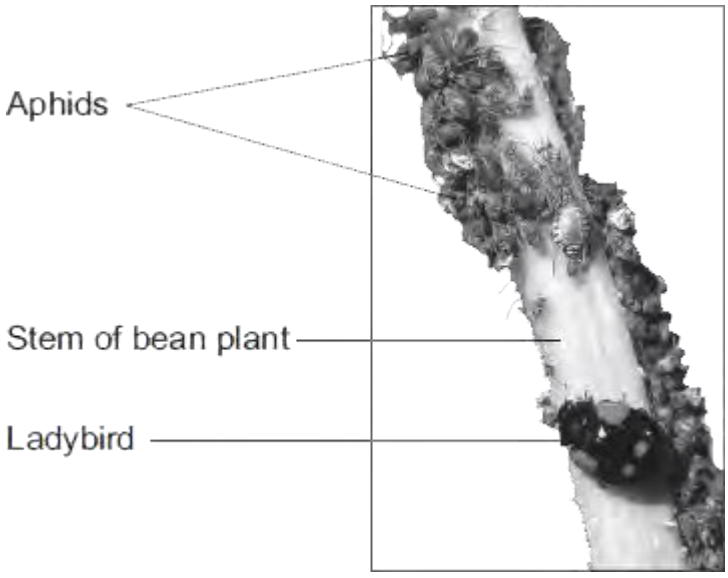
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(6)
(Total 8 marks)

Q4. 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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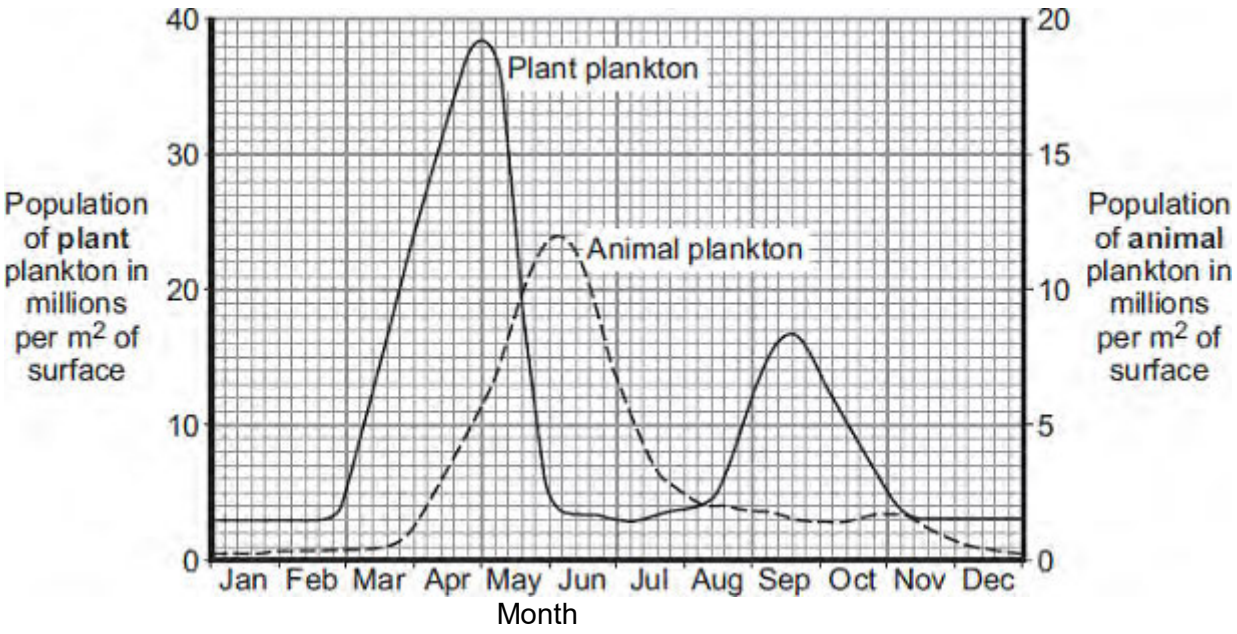
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(4)
(Total 8 marks)

Q5. Plankton live in the sea.Animal plankton eat plant plankton.

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

Graph 1

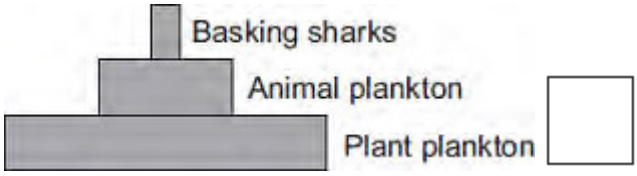


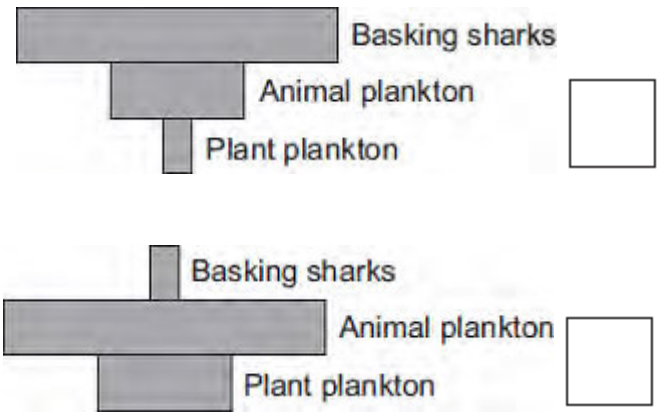
(a) Basking sharks eat animal plankton. Basking sharks grow up to 8 metres long.

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?

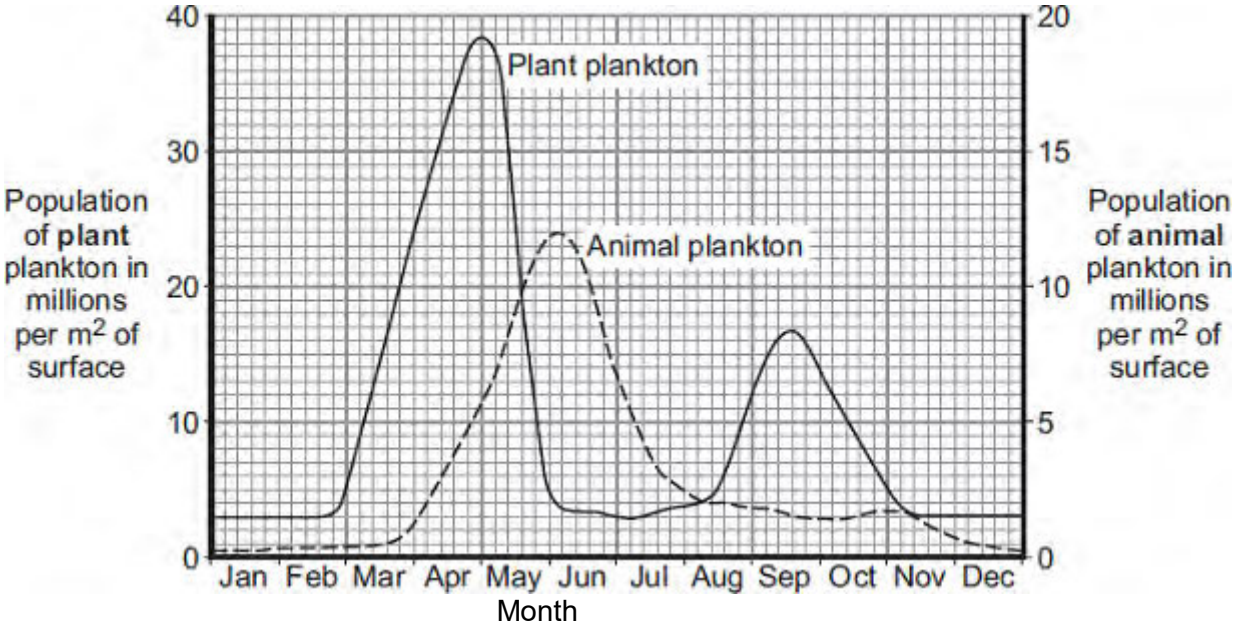
Tick (✓) **one** box.



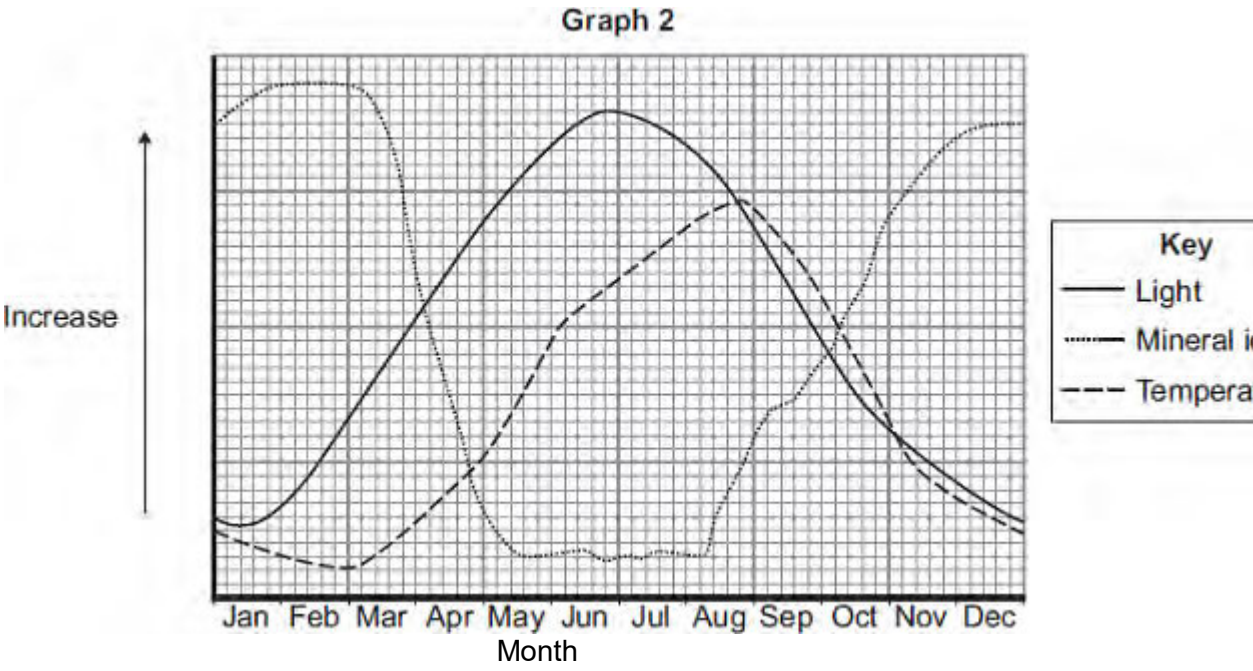


(1)

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.

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(2)

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

Suggest explanations for the changes.

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(2)

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

Suggest explanations for the changes.

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(3)
(Total 8 marks)

Q6. Scientists investigated a food chain in a wheat field immediately after the wheat had been harvested.

Red kites are birds of prey.

(a) The food chain for the wheat field is:

Wheat grains → Field mice → Red kites

What is the source of energy for the food chain?

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(1)

(b) The table shows the data the scientists collected.

Organism	Estimated number in the field	Biomass of one organism in kg	Total biomass for field in kg
Fallen wheat grains	40 000	0.0006	24.0
Red kites	2	1.0	.....
Field mice	200	0.04	.....

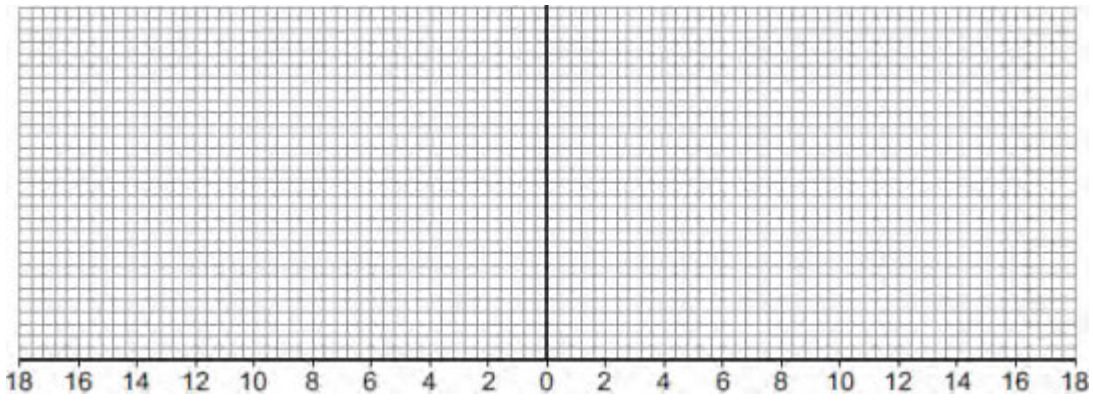
(i) Complete the table by calculating the total biomass of red kites and of field mice.

Write your answers in the table.

(2)

(ii) Use data from your completed table to draw a pyramid of biomass for the food chain shown in the table.

You should label each layer of your pyramid.



(3)

(c) The total biomass of the red kites is less than the total biomass of the field mice.

Give **two** reasons why.

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(2)

(d) The scientists could **not** find the exact number of organisms in the wheat field.

Suggest **two** reasons why.

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(2)
(Total 10 marks)

Q7. The photographs show a food chain from a seashore. The photographs are **not** to the same scale.

Seaweed → Limpet → Crab → Gull


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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.

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Biomass = ... g

(1)

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

Label the pyramid.

(2)

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

Suggest **two** reasons why.

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2.....

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(2)
(Total 5 marks)

Q8.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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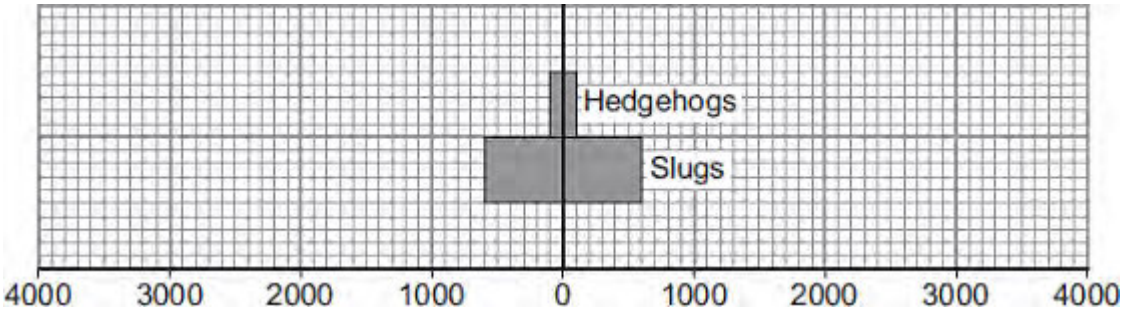
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Biomass = ... grams

(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)