

Name Date.....

Class Teacher

GCSE Science/ GCSE Biology

Unit B1 who's eating what?

Topic 1 Environment

Sunhil and Ailsa's class has been studying ecology and food chains. They have seen news reports about world food shortages and about the types of food that people eat.



Sunhil and Ailsa want to find out more about food chains. They want to know what we can do to increase the amount of food in the world.

You need to know about food chains, pyramids of number and pyramids of biomass. You need to know about natural selection, selective breeding and genetic engineering.

Question 1

Sunhil and Ailsa investigated a food chain in a local park.

They counted the number of oak trees. They counted the number of aphids feeding on the leaves of the oak trees. Then they counted the number of ladybirds feeding on the aphids.

(a) In the space below, draw the food chain linking oak trees, aphids and ladybirds. Remember to include arrows.

[2 marks]

(b) Ailsa says

“The number of aphids depends on the number of oak trees.”

Sunhil says

“The number of aphids depends on the number of ladybirds present”

(i) Explain both of these statements.

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[4 marks]

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(ii) Give one advantage of using a computer model instead of real data to find out how the numbers of aphids might change.

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[1 mark]

Question 2

Sunhil and Ailsa counted the aphids on 5 oak trees in the park.

The first oak tree had 150 aphids feeding on its leaves, the fifth oak tree had 190 aphids, the third oak tree had 220 aphids, the second oak tree had 260 aphids and the fourth oak tree had 330 aphids.

They estimated that there were 350 ladybirds feeding on all the aphids from all 5 oak trees.

- (a) Complete table 1 to show
(i) the number of aphids on each of five oak trees
and
(ii) the average number of aphids per oak tree.

Table 1

oak tree	number of aphids present
first oak tree	
second oak tree	
third oak tree	
fourth oak tree	
fifth oak tree	
total on all 5 oak trees	1150
average per oak tree	

[6 marks]

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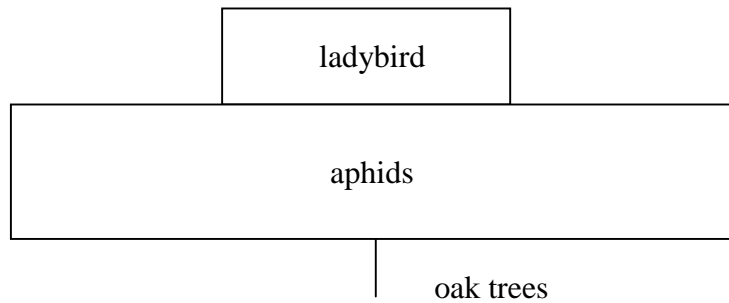
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(b) Table 2 shows the total numbers of organisms present in the food chain in the wood.

Table 2

name of organism	number of organisms
ladybird	350
aphid	1150
oak tree	5

This table is represented in the diagram below. This diagram is called a pyramid of numbers.



(i) Explain the shape of the pyramid of numbers.

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[2 marks]

(c) Sunhil said they should have collected the information needed to draw a pyramid of biomass for the food chain instead of a pyramid of numbers.

(i) How would the shape of the pyramid of biomass would be different from the pyramid of numbers. (You may draw the shape if you wish.)

[1 mark]

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(ii) Explain **one** advantage of representing a food chain as a pyramid of biomass instead of a pyramid of numbers.

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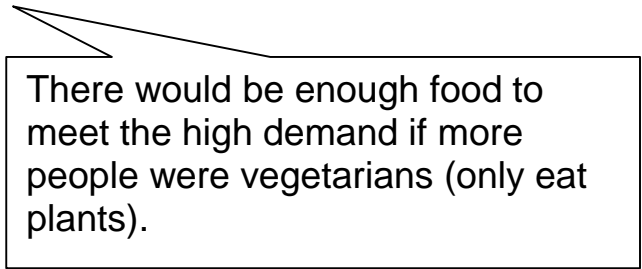
[1 mark]

Question 3

The world human population is increasing and more food is needed. People are looking for ways of making food production more efficient.

(a) Humans are at the top of their food chains and many eat both plants and animals.

Ailsa tells Sunhil that



There would be enough food to meet the high demand if more people were vegetarians (only eat plants).

Explain the evidence that supports Alisa.

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[2 marks]

(b) One way of increasing crop yield is by selective breeding. Sunhil says that there is no need for selective breeding because crop yields are increasing through the process of natural selection.

The crop yield of two identical original crops has increased. One crop has undergone selective breeding and the other natural selection. The table shows the percentage of each crop with fungal disease in the next five generations.

	percentage crop with fungal disease	
	selective breeding	natural selection
original crop	50	50
first generation	42	46
second generation	33	41
third generation	24	39
fourth generation	17	35
fifth generation	17	32

Explain the results.

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[4 marks]

(c) Discuss how genetic modification could make crop production more efficient.

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[4 marks]

27 marks

Quality of written communication /3

Total 30 marks

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Edexcel Internally Assessed Activity Mark Awarded

/30

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Unit B1 who's eating what?

Specification learning outcomes covered in this assessment

Learning outcome	Description	Met (y/n)
1.1	Describe food chains quantitatively using pyramids of biomass.	
1.3	Explain why it is more cost effective, in terms of energy, to produce a field of wheat rather than a field of beef cows.	
1.4	Explain population data in terms of predator-prey interdependence and intra-species competition.	
1.6	Demonstrate an understanding of how computer models can be used to study populations, and show an awareness of the advantages and disadvantages of these models compared with real data.	
1.7	Compare natural selection, selective breeding and genetic engineering in terms of changing the characteristics of a species.	
1.13	Understand that crop plants can be genetically modified and the reasons for doing so.	

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Whose eating what?

Marking Scheme

1	a		Oak tree, aphids and ladybirds in the correct order; Arrows pointing the correct way (towards the organism doing the 'eating').	1 1
		b	i	The higher the number of ladybirds, the less the number of aphids; Ladybirds eating aphids;
				The more oak trees present, the greater the number of aphids; Aphids feed on oak trees;
		ii	Get answer quicker/don't have to go outside/other appropriate answer	1

2	a	i	150; 260; 220; 330; 190; 230	5
		ii	230	1
	b	i	Two from: Oak trees large therefore not many of them needed for food (for aphids); Aphids small therefore many of them needed for food (for ladybirds); Less ladybirds less than aphids as they are bigger/reference to loss of biomass/energy as you go up trophic level	2
			c	i
		ii	One of e.g. Pyramid of biomass shows the total mass in each (trophic) level/it is similar in shape to energy at each (trophic) level/it is a more realistic of the mass/energy available; Mass isn't dependent on the number of organisms or their size	1

3	a		Eating plant material is more efficient / saves energy; One of the following: Idea that energy is lost between trophic levels; Mode of energy loss e.g. heat, respiration, excretion, egestion; A greater percentage of plant material is edible compared to animal material / animal bones cannot be eaten; Idea that plants cost less to grow than animals; Idea that costs are less in harvesting plants / costs are more in slaughtering animals;	1 1
		b	Idea that both 'methods' decrease fungal disease; Percentages decrease faster with selective breeding; Selective breeding is done artificially/by man Natural selection relies on mutations	1 1 1 1
	c		Level 1 (1-2 marks) Shows a limited understanding of genetic modification; Makes a tentative link to crop production	4
			Level 2 (3-4 marks)	

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			Shows a good understanding of genetic modification; Makes a clear and comprehensive link to crop production being more efficient.	
Total 27 marks				
Quality of written communication 3 marks				
Overall total 30 marks				

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