

**4-7 Ecology – Biology**

**1.0** Figure 1 shows a fennec fox.

**Figure 1**



Drew Avery Creative Commons 2.0

Fennec foxes live in the desert.

**1.1** Draw **one** line from each adaptation of the fennec fox to the advantage of the adaptation.

**[3 marks]**

Adaptation	Advantage
Omnivorous	To help it to find food in places there is a lack of food
Able to get water from food	To reflect the sun's rays
Large ears	To keep it warm in cold nights
	To allow it to cool down blood quickly
	To keep it hydrated

**1.2** Fennec foxes mate for life.  
What type of adaptation is this?

[1 mark]

Tick **one** box.

- Behavioural
- Emotional
- Functional
- Structural

**1.3** Animals, such as fennec foxes, compete with each other.  
Give **two** biotic factors that animals compete for.  
Choose from the words in the box.

[2 marks]

Carbon dioxide	Mates	Light
Heat	Territory	Oxygen

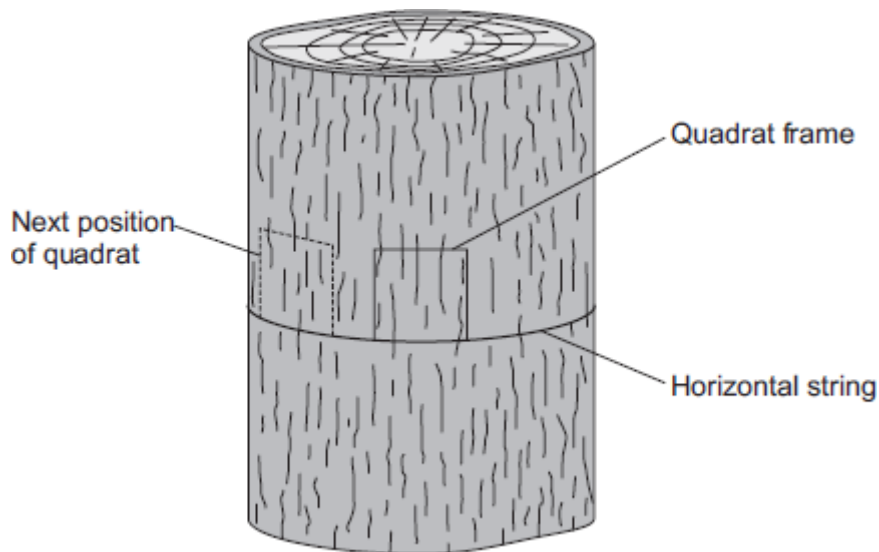
**1.4** Factors that affect communities are biotic factors and abiotic factors.  
Name **two** abiotic factors that affect communities.

[2 marks]

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**2.0** Students investigated the distribution of a green alga on a tree trunk.

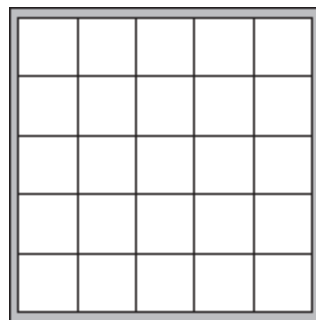


The students:

- tied a piece of string horizontally round a tree
- put a quadrat on the string so that the quadrat faced south
- estimated the percentage of the area in the quadrat covered with the green alga
- repeated the observation with the quadrat facing south west, west, north west, north, north east, east and south east.

**Figure 2** shows the quadrat the students used.

**Figure 2**



**2.1** Describe how you would estimate the percentage of the area covered with the green alga in one quadrat.

**[2 marks]**

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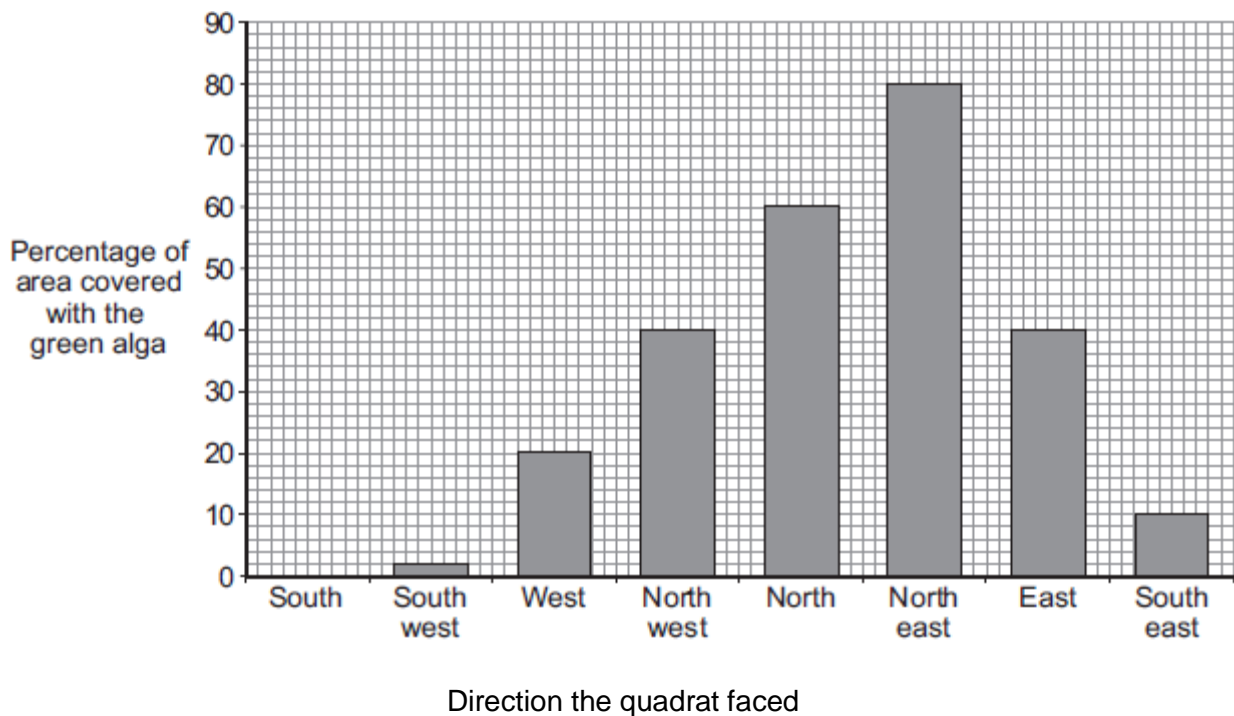
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2.2 Figure 3 shows the students' results.

Figure 3



Describe how the direction that the quadrat faced affected the percentage of area covered with the green alga.

[2 marks]

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2.3 What was the median of the percentage area covered with the green alga?

[2 marks]

Show your working.

Median = \_\_\_\_\_ %

**3.0** Each year more crops are being grown. Large areas of rain forest are being cleared and burnt in many parts of the world. The cleared land is being used to grow crops. The cleared land will often produce crops for only a few years.

**3.1** Explain why more crops are being grown each year.

**[2 marks]**

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**3.2** Explain why burning rain forests is not seen as a sustainable answer to increasing crop production.

Include in your answer **both** local and global effects.

[6 marks]

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**4.0** The future of the human species on Earth relies on us maintaining a good level of biodiversity.

**4.1** State what is meant by the term biodiversity.

[1 mark]

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**4.2** Give **three** examples of ways in which scientists and other people have tried to maintain biodiversity in different environments.

[3 marks]

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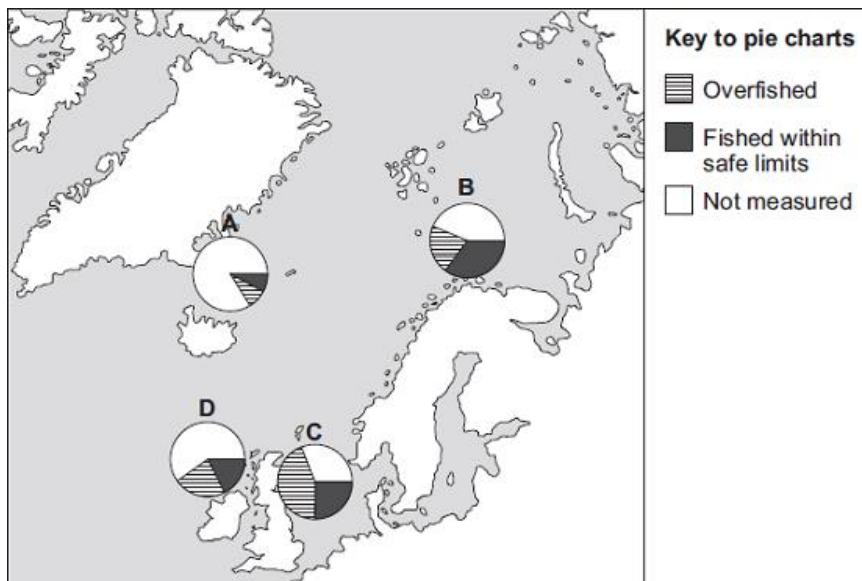
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**5.0** The map in **Figure 4** shows pie charts, **A**, **B**, **C** and **D**, that give information about fisheries in some of the seas around Europe.

**Figure 4**



© European Environment Agency

**5.1** Why is it difficult to tell from this diagram which area has the most amount of overfishing?

[1 mark]

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**5.2** It is important to maintain fish stocks high enough for breeding to continue. Give the reason why.

[1 mark]

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**5.3** Give **two** ways fish stocks can be conserved.

[2 marks]

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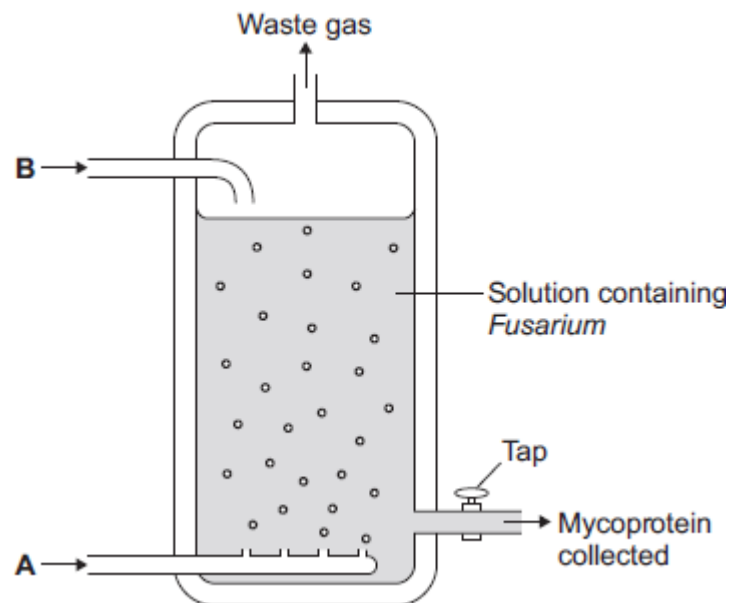


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- 6.0 The world population is increasing and the need for food is increasing. Mycoprotein is a high-protein food made in fermenters using a fungus called *Fusarium*. The process takes only a few weeks to produce a large amount of food. **Figure 5** shows a fermenter used in mycoprotein production.

**Figure 5**



- 6.1 Suggest which substance the solution contains that the *Fusarium* grows on.

[1 mark]

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- 6.2 *Fusarium* makes mycoprotein. *Fusarium* respire aerobically.

Suggest which gas is added to the fermenter at point **A**.

[1 mark]

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- 6.3 Ammonia is also added to the fermenter.

Why is ammonia needed?

[1 mark]

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**6.4** People need to eat protein to grow and to be healthy.

Some people think that it would be an advantage to get more food from mycoprotein and less from farming animals.

Suggest **two** reasons some people may disagree with eating mycoprotein as a source of protein.

[2 marks]

1 \_\_\_\_\_

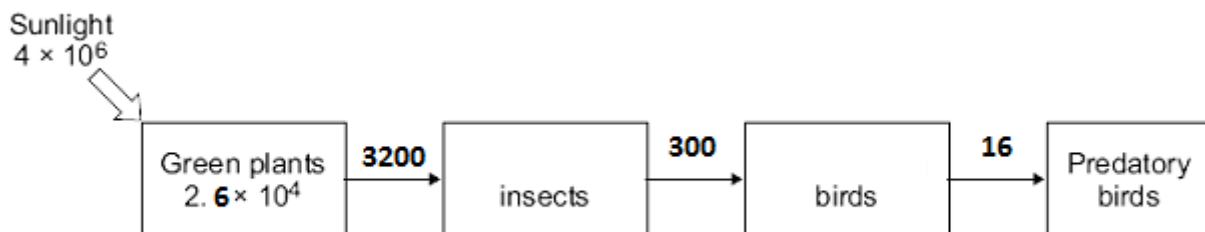
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2 \_\_\_\_\_

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**7.0** The diagram shows the annual flow of energy through a habitat.

The figures are in  $\text{kJ m}^{-2}$ .



**7.1** Calculate the percentage of the energy in sunlight that was transferred into energy in the green plants.

[2 marks]

\_\_\_\_\_

\_\_\_\_\_

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

**7.2** Suggest reasons why the percentage energy transfer you calculated in part 7.1 was so low.

**[2 marks]**

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**7.3** 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]**

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MARK SCHEME

Qu No.		Extra Information	Marks
1.1		extra lines from left cancel mark	3
1.2	Behavioural		1
1.3	Territory Mates	in either order	1 1
1.4	any <b>two</b> from: <ul style="list-style-type: none"> <li>• light (intensity)</li> <li>• temperature</li> <li>• moisture levels</li> <li>• soil pH</li> <li>• soil mineral content</li> <li>• carbon dioxide levels (for plants)</li> <li>• oxygen levels (for aquatic animals)</li> </ul>	do <b>not</b> allow biotic factors	2

Qu No.		Extra Information	Marks
2.1	estimate / count number of squares covered	do <b>not</b> allow number of squares containing algae	1
	divide by total number of squares and multiply by 100 or multiply by four.		1
2.2	any <b>two</b> from: <ul style="list-style-type: none"> <li>• more / most in North east facing</li> <li>• followed by the North facing</li> <li>• the South facing had no green alga</li> </ul>		2
2.3	List numbers in increasing order: 0, 2, 10, 20, 40, 40, 60, 82 Median half way between 20 & 40 Median = 30		1 1

Qu No.		Extra Information	Marks
3.1	increased human population increased standard of living		1 1
3.2			
<b>Level 3:</b>	Clear, coherent answer including effects on crops, local environment and the global environment both in the long and short term.		5 – 6
<b>Level 2:</b>	Answer includes relevant points from at least two of the three areas, but lacking in detail or scientific explanations, or concerning only short or long timescales.		3 – 4
<b>Level 1:</b>	Isolated points made from at least one of the three areas. Little detail.		1 – 2
<b>Indicative content</b>			
<b>Local effects</b>			
Effects on crops			
<ul style="list-style-type: none"> <li>• Short term increase in production</li> <li>• Longer term: nutrients in the soil are absorbed by plants</li> <li>• Longer term: plants are destroyed so the nutrients are not replaced / recycled</li> </ul>			
Effects on local environment			
<ul style="list-style-type: none"> <li>• Decreased biodiversity</li> <li>• Plants and animals lose their natural habitat</li> <li>• Possible loss of species</li> <li>• Erosion of soil due to shallow roots</li> </ul>			
<b>Global effects</b>			
Effects on global environment			
<ul style="list-style-type: none"> <li>• increased release of carbon dioxide into atmosphere when trees are burned</li> <li>• reduced rate of carbon dioxide removal from atmosphere</li> <li>• increased carbon dioxide absorbs more of energy radiated by Earth</li> <li>• (leading to) global rise in temperature</li> </ul>			

Qu No.		Extra Information	Marks
4.1	variety of all the different species of organisms on Earth / in an ecosystem		1
4.2	any <b>three</b> from: <ul style="list-style-type: none"> <li>• breeding programmes for endangered species / example e.g. rhinos</li> <li>• protecting and regenerating rare habitats</li> <li>• reintroduction of field margins and hedgerows where only one crop is grown</li> <li>• reducing deforestation</li> <li>• reducing carbon dioxide emissions</li> <li>• recycling resources and reducing landfill</li> </ul>	allow specific examples (maximum of one per bullet point) allow other relevant examples	3

Qu No.		Extra Information	Marks
5.1	The areas not measured are large so difficult to tell the proportion of overfishing		1
5.2	otherwise species may disappear altogether	allow to avoid extinction	1
5.3	any <b>two</b> from: <ul style="list-style-type: none"> <li>regulate net size</li> <li>impose fishing quotas</li> <li>limit fishing during breeding seasons</li> <li>bans on discarding of fish</li> <li>bans on fishing in certain areas</li> </ul>	if net size specified, must be larger	2

Qu No.		Extra Information	Marks
6.1	Glucose	do not allow sugar	1
6.2	oxygen / O <sub>2</sub>	do <b>not</b> allow O <sup>2</sup>	1
6.3	contains nitrogen / N to make protein	do not allow as fertiliser	1
6.4	any <b>two</b> from: <ul style="list-style-type: none"> <li>“unnatural” process</li> <li>want variety</li> <li>taste issues eg like the taste of meat</li> <li>unclear source of raw materials</li> </ul>		2

Qu No.		Extra Information	Marks
7.1	0.65 or $6.5 \times 10^{-1}$	If no / incorrect answer, allow 1 mark for, <ul style="list-style-type: none"> <li><math>\frac{2.6 \times 10^{-4}}{4 \times 10^6} \times 100</math></li> <li>0.0065</li> <li><math>6.5 \times 10^{-3}</math></li> </ul>	2
7.2	any <b>two</b> from: <ul style="list-style-type: none"> <li>some light is reflected</li> <li>some light is not absorbed <b>or</b> misses chloroplasts / chlorophyll</li> <li>light is wrong wavelength</li> <li>photosynthesis is inefficient</li> </ul>	ignore some light is green allow transmitted <b>or</b> passes through leaves allow hits other plant parts accept other limiting factors / named allow some lost through respiration / as heat (from respiration)	2
7.3	energy lost via faeces / not digested / waste / excreted (of insect-eating birds)		1
	energy loss via respiration / movement / muscle contraction / heat (by insect-eating bird)	accept examples of muscle contraction do <b>not</b> accept energy used for respiration	1
	some of (insect eating) bird not eaten but all / most / more of insect is eaten		1