PEARSON EDEXCEL A-LEVEL BIOLOGY B · 9BI0

BIOLOGY



EXAM QUESTION PACK

TOPIC 10: ECOSYSTEMS

CHANGES IN ECOSYSTEMS

SCORE	PERCENTAGE
/92	%

STEMUP

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Q1.

The photograph shows a glacier that is melting. As the glacier gradually melts, it leaves behind bare rock.



(Source: © CHARLES D. WINTERS/SCIENCE PHOTO LIBRARY)

Scientists sampled the soil from areas that had been uncovered for different lengths of time after the glacier ice had melted.

The table shows the results from the samples.

Length of time since glacier melted / years	Soil depth / cm	Mass of nitrate in soil / mg m^{-2}	Mass of leaf litter that falls to ground each year / g m^{-2} yr^{-1}
5	5.2	3.8	1.5
15	6.4	4.1	1.7
40	7.0	5.3	12.8
100	9.2	21.8	277.0
150	10.8	35.4	335.0
200	15.1	53.3	277.0
250	16.2	61.4	261.0

Explain how succession brings about the changes in the soil during this period of time.

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(Total for question = 5 marks)

Q2.

The photograph shows a brown tree snake.



© staticflickr.com

The brown tree snake is found in areas of Indonesia.
This snake eats small mammals, birds and reptiles.

In the 1940s, the brown tree snake was introduced to the Pacific Island of Guam.
The population of this snake is now over two million.

Its introduction has had major effects on bird species in Guam.

The table shows the numbers of individuals of each bird species surveyed in the areas where this snake was present.

Species	1981	1982	1983	1984	1985	1986
Island collared-dove	0	0	3	19	1	0
White-throated ground-dove	1	3	5	5	0	0
Marian fruit-dove	11	19	3	0	0	0
Micronesian kingfisher	29	17	35	26	4	0
Marian crow	28	33	47	36	51	0
Guam flycatcher	6	23	11	0	0	0
Rufous fantail	74	55	43	0	0	0
Micronesian starling	148	159	135	71	7	0
Micronesian honeyeater	31	31	33	2	0	0
Bridled white-eye	108	98	2	0	0	0
Index of diversity (D)	4.6	4.7	4.1	3.5		0.0

(i) Calculate the index of diversity for 1985 using the formula

$$D = \frac{N(N-1)}{\sum n(n-1)}$$

(3)

Answer .....

(ii) Explain why using an index of diversity is a better measure of biodiversity than counting the number of species only.

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(iii) Comment on the effects of introducing the brown tree snake to Guam.

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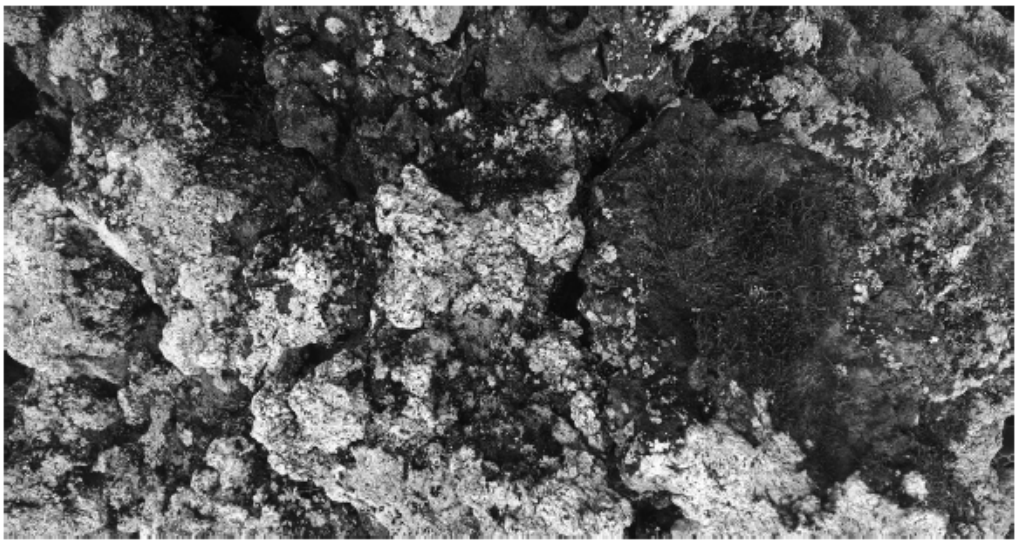
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(Total for question = 9 marks)

Q3.

Lanzarote is a volcanic island in the Atlantic Ocean. It lies near the coast of West Africa.

The photograph shows lichens growing on volcanic rock in Lanzarote.



Lichens are organisms composed of a fungus and algae living together.

Lichens colonise bare rock.

Explain how colonisation of bare rock by lichens can result in succession over long periods of time.

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(Total for question = 4 marks)

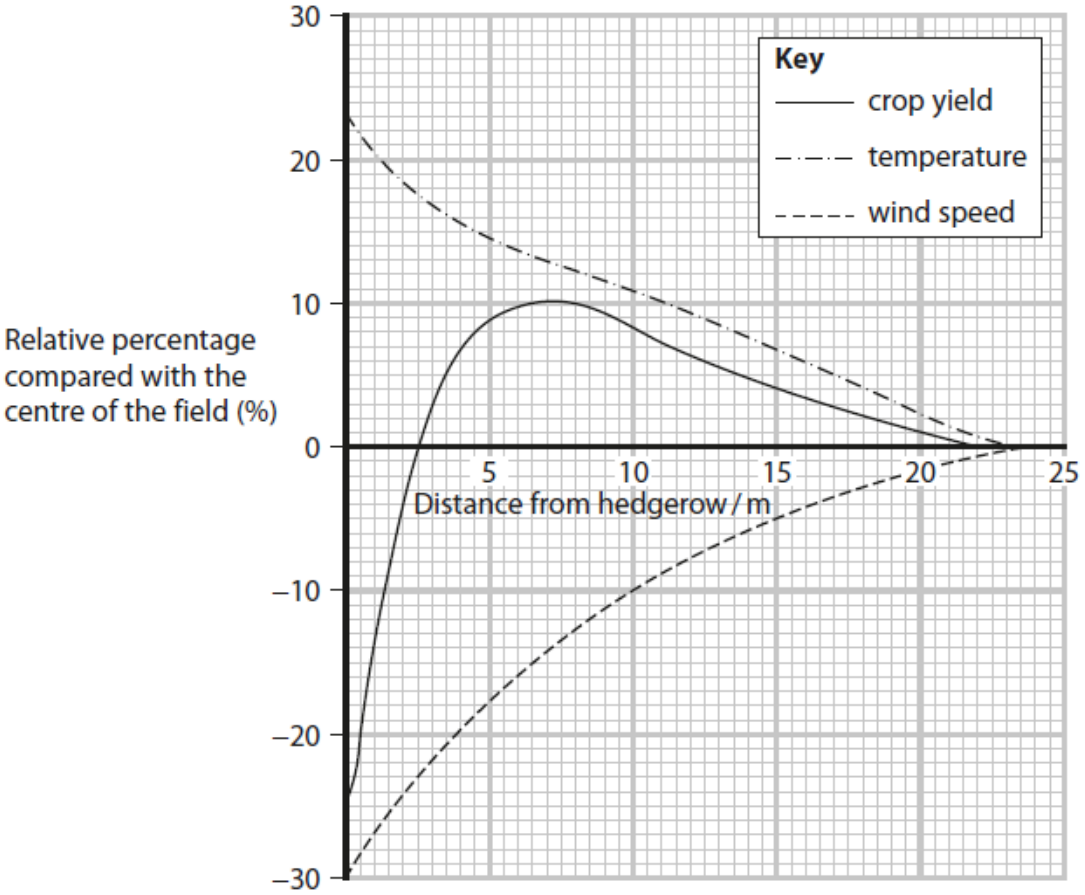
Q4.

* For many years, hedgerows have been removed to increase field sizes to grow crop plants.

Hedgerows provide a habitat for many species of plants and animals.

Some animals that live in hedgerows eat pests of crops and some pollinate crop plants.

The crop yield, temperature and wind speed were measured across the field starting at the hedge. These factors and the crop yield are shown as a relative percentage compared with the centre of the field in the graph.



Analyse the information to comment on the value of conserving hedges around fields used for growing crops.

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(Total for question = 6 marks)

Q5.

(i) Describe and explain how global warming could affect plant species.

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(ii) Explain how the effects on plant species could affect animal species.

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Q6.

Of the five rhino species, Javan rhinos (*Rhinoceros sondaicus*) are the most in threat of extinction, with as few as 35 individuals surviving in Ujung Kulon National Park in Java, Indonesia.

This national park is highly vulnerable to tsunamis and volcanic activity. In Java, large areas have been planted with *Arenga pinnata*, which is a source of palm oil. This plant has now colonised 50% of this national park.



© topimages/shutterstock

(a) Give **one** biotic factor which contributes to *Rhinoceros sondaicus* becoming a critically endangered species.

(1)

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(b) Explain why a species may become endangered when its population falls to a very low

number.

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Conservationists are working with the national park in order to conserve the Javan rhino.

Give **two** methods that could be used to conserve the Javan rhino.

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(Total for question = 5 marks)

Q7.

The island of Lanzarote is near the African coast and has a desert climate.

The photograph shows the edge of a lava flow from a volcano that erupted on this island about 200 hundred years ago.

In the foreground is an area that was not covered by the lava flow.

Over a long period of time, the lava will change to look like the climax community seen in the foreground.



King Juba's spurge grows very slowly on the island of Lanzarote.

Explain how climate affects the growth of King Juba's spurge on this island.

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Q8.

Sea plantain and bog sedge grow at a range of latitudes. A student carried out an investigation into the effect of temperature on the growth of seedlings of these two species.

Sets of seeds from each species were germinated at 18 °C. As soon as they germinated, the seedlings were placed in three temperature-controlled rooms at 10 °C, 14 °C and 18 °C.

They were allowed to grow for 50 days. Samples of seedlings were taken at 10-day intervals and their mean dry masses were recorded.

The results of this investigation are shown in the tables below.

Table 1 – Sea plantain

Day	Mean dry mass / mg		
	10 °C	14 °C	18 °C
10	3	4	6
20	7	12	20
30	13	25	47
40	20	40	109
50	28	80	210

Table 2 – Bog sedge

Day	Mean dry mass / mg		
	10 °C	14 °C	18 °C
10	1	1	1
20	1	2	2
30	2	3	5
40	3	5	12
50	5	7	22

Analyse the data to explain which of the two species is better for growth at a wider range of latitudes (distance from the equator).

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(Total for question = 4 marks)

Q9.

In Kenya, an in-situ conservation project has been set up to make paper from elephant dung.

This project aims to help conserve elephant populations, conserve biodiversity and help local communities.

Elephant conservation often involves the setting up of protected areas to stop poaching. Local people are banned from entering these areas.

This method of elephant conservation sometimes causes conflict with local people, as elephants can trample and eat crops in nearby farmland. Farmers sometimes burn areas of grassland and forest to stop elephants destroying their farmland.

The new paper conservation project encourages local people to make paper from elephant dung they collect from the conservation area. The paper they make is sold at a high price.

Conservationists measured the effect of the new paper project on the index of diversity of the area over two years. They also measured the effect of a protected conservation area where local people were banned from entering on the index of diversity. The results are shown in the table.

Area	Index of diversity	
	At start of project	After two years
Conservation area with paper project	2.8	3.6
Conservation area where local people are banned from entering	2.4	2.2

(i) State why calculating an index of diversity is a better measure of biodiversity than counting the number of different species.

(1)

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(ii) Give two advantages of in-situ conservation of elephants compared with ex-situ conservation of elephants.

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(iii) Explain the effect of the new paper project on biodiversity compared with the protected area where local people were banned.

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(Total for question = 7 marks)

Q10.

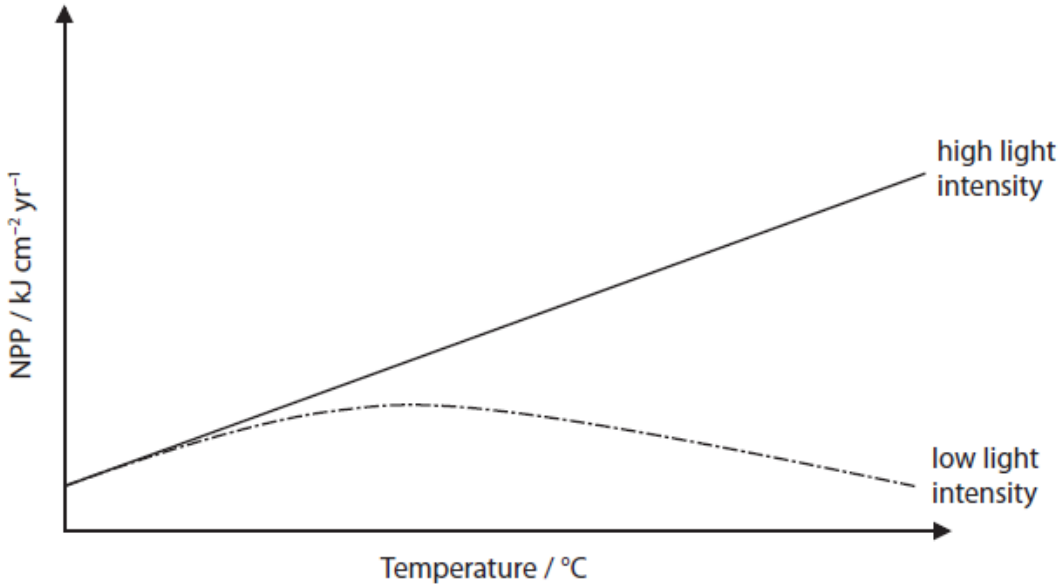
The effects of light intensity and temperature on the net primary productivity (NPP) of young willow trees were investigated.

Young willow trees were grown in two greenhouses: one with high light intensity and one with

low light intensity.

In each greenhouse, groups of these willow trees were kept at different temperatures for six months.

The results are shown in the graph.



* In a further investigation, succession was monitored for fifty years in an abandoned field.

The field was originally used to grow crops.

After fifty years, large numbers of coniferous trees were growing in the field.

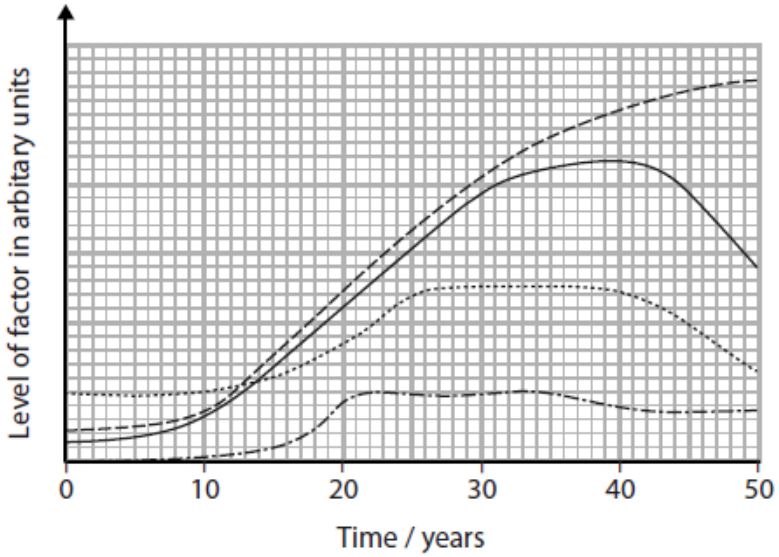
These coniferous trees do not shed many leaves.

When compared with younger trees, older coniferous trees have a much higher proportion of tree stem, branches and roots and a lower proportion of leaves.

The following factors were monitored:

- plant biomass
- NPP
- mineral ion content of soil
- index of diversity of animals

The line graphs show the trends that happened over fifty years for each of the factors.



Key

– – – plant biomass

—— NPP

------ mineral ion content of soil

—·— index of diversity of animals

Analyse the data to explain how succession is linked to the changes in this abandoned field.

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(Total for question = 6 marks)

Q11.

The island of Surtsey was formed by a volcanic eruption in the Atlantic Ocean in 1965.

The photographs show the formation of Surtsey in 1965 and part of the island in 2018.



volcanocafe.files.wordpress.com



vulkaner.no

Scientists have been studying the development of ecosystems on this island since its formation.

(i) State what is meant by the term ecosystem.

(1)

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(ii) Explain how ecosystems have developed on Surtsey since 1965.

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(Total for question = 6 marks)

Q12.

The biodiversity of plant species on Guam has decreased.

(i) Give two reasons why changes in the number of bird species have led to this decrease in biodiversity of plant species.

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(ii) Scientists are using seed banks to conserve the biodiversity of plants.

Describe how seed banks are used as a method of conservation.

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(Total for question = 6 marks)

Q13.

Last year, eight million Christmas trees were bought in the UK.

There are many Christmas tree farms that supply these trees.

The photograph shows young Christmas trees growing on a farm.



Christmas tree farmers remove the other plants (weeds) in order to increase tree growth.

A farmer investigated two methods of removing weeds:

- removing weeds by hand
- spraying herbicides that inhibit weed growth.

The table shows the mean height of Christmas trees using each method, over a five-year period.

Year	Mean height of trees / cm	
	Removing by hand	Using herbicide
0	20	20
1	50	60
2	70	100
3	90	130
4	110	160
5	130	200

(i) Calculate the difference between the mean rate of growth of these trees over the five years.

(2)

Answer .....

(ii) Analyse the data to explain the difference in the mean height of the trees at the end of the five-year period.

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(iii) Explain two biotic variables that need to be controlled to allow a valid comparison of the effect of each method on tree growth.

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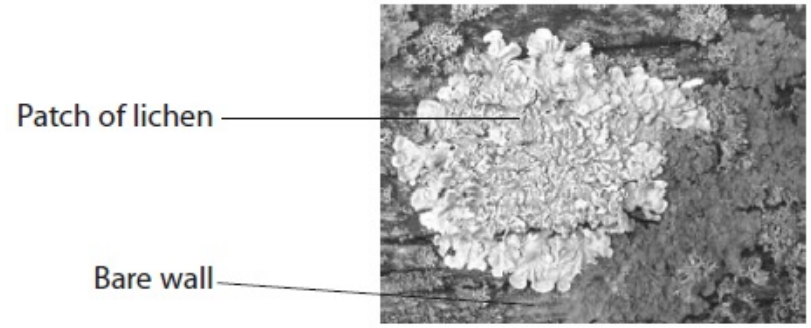
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(Total for question = 6 marks)

Q14. Lichen consists of two organisms, an alga and a fungus, growing together. The alga photosynthesises producing carbohydrate for the two organisms and the fungus absorbs and retains water so that the lichen does not dry out.

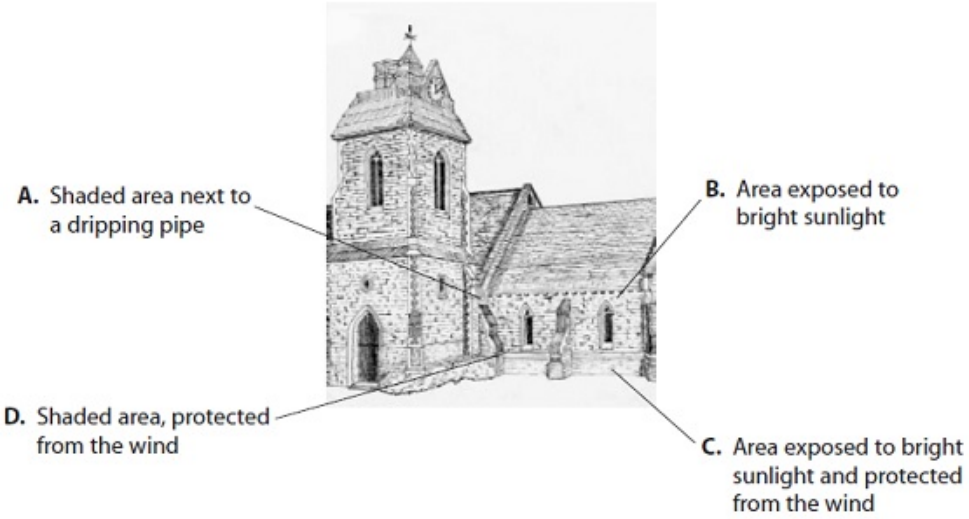
The photograph below shows a patch of lichen growing on a wall.



Magnification ×1

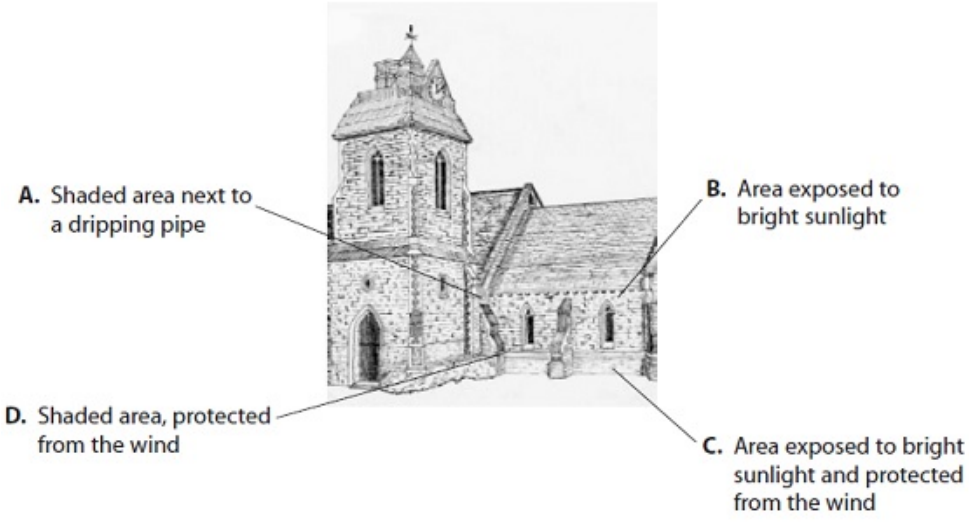
Algae and fungi are eukaryotic organisms.

(a) Place a cross



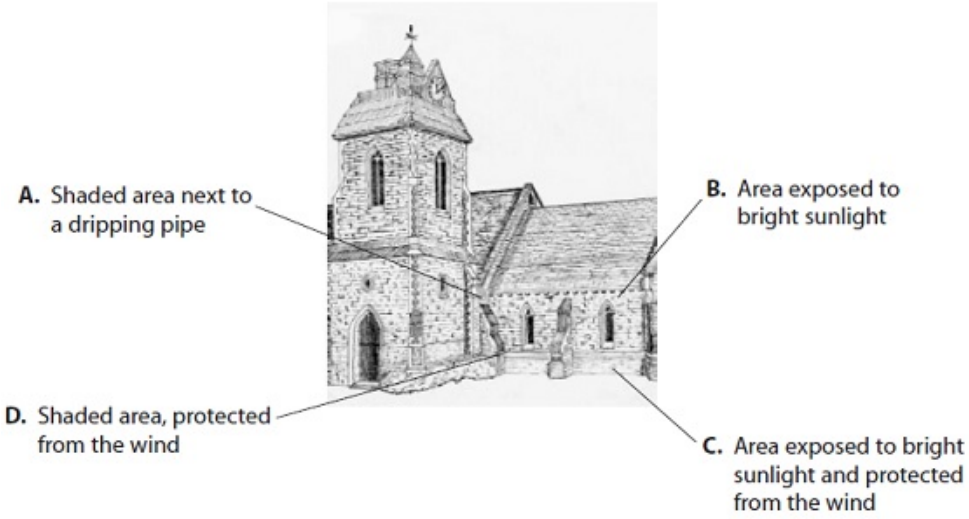
in the box next to the names of cell structures that would be used to classify algae and fungi as eukaryotic organisms.

(1)



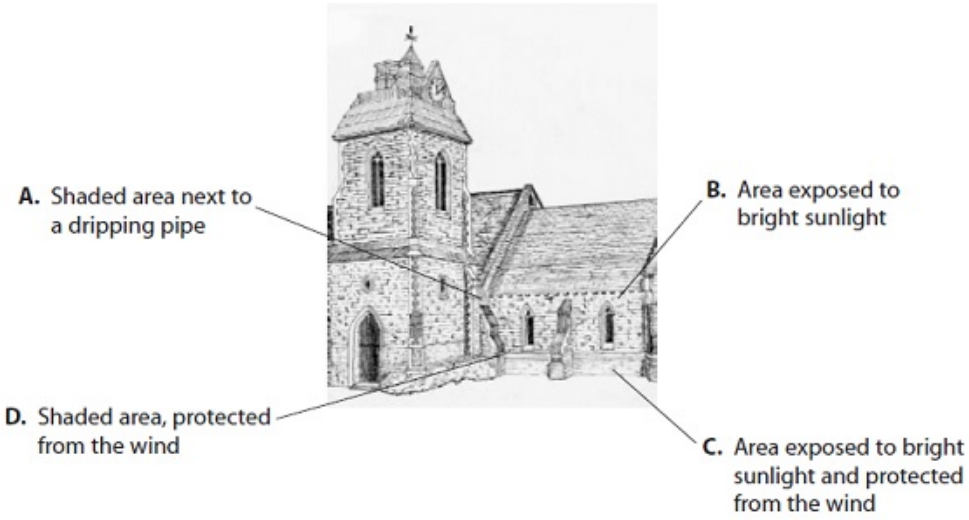
(80S) ribosomes

A cytoplasm and large



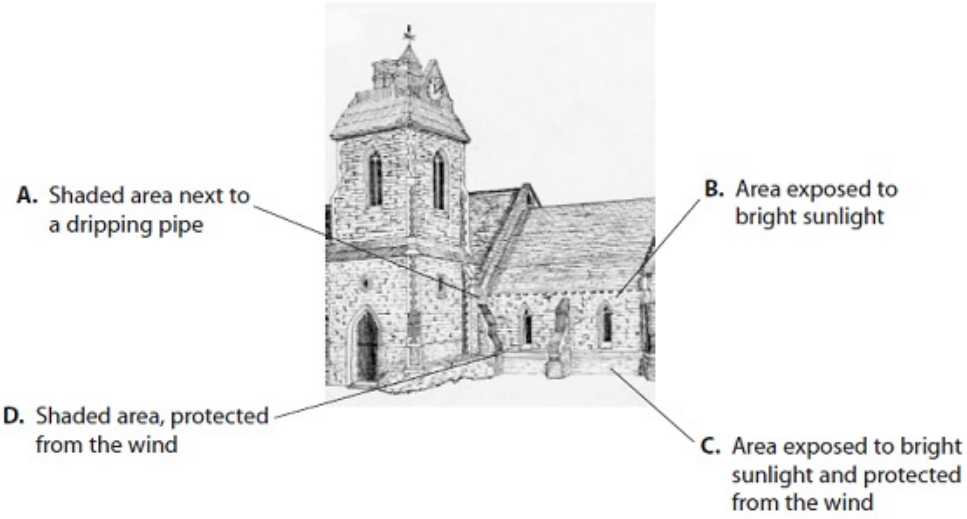
(70S) ribosomes

B cytoplasm and small



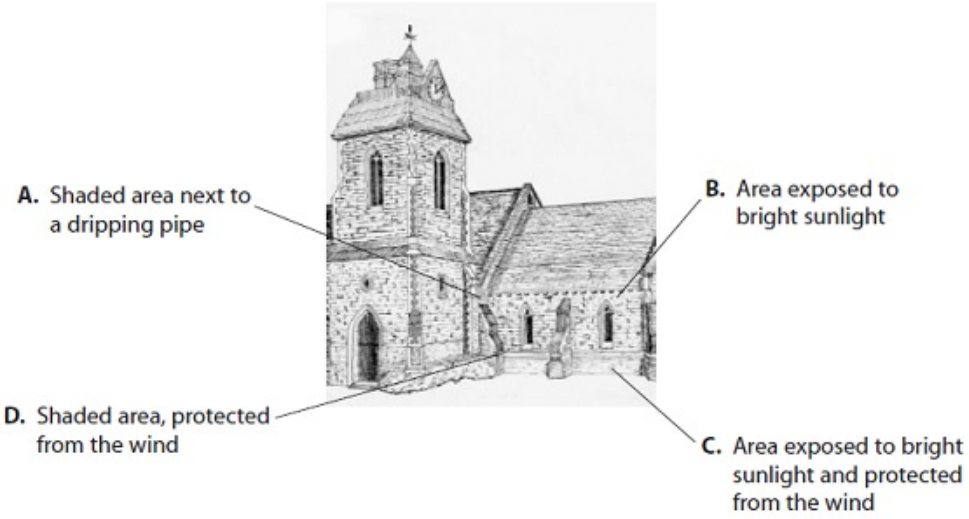
ribosomes

C nucleus and large (80S)



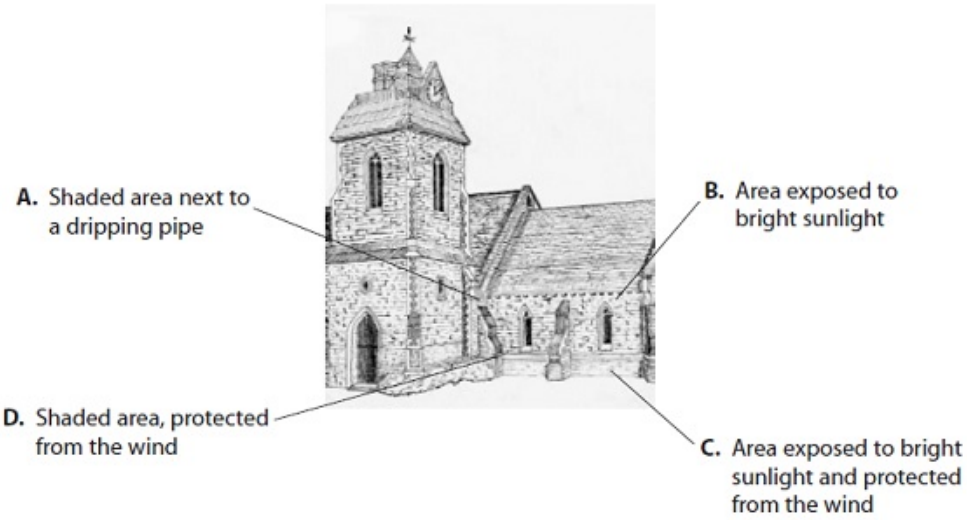
D nucleus and small (70S) ribosomes

(b) Place a cross

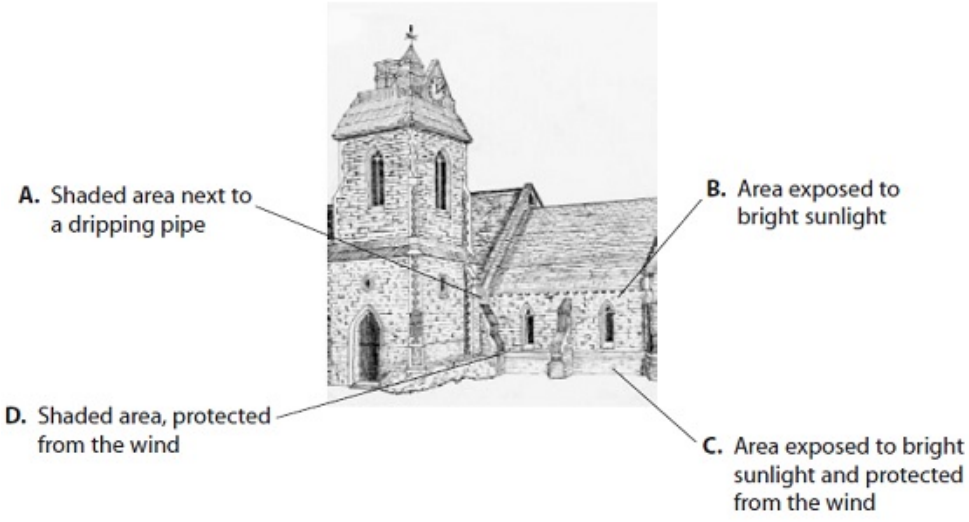


in the box next to one difference in cell structure between these two eukaryotic organisms.

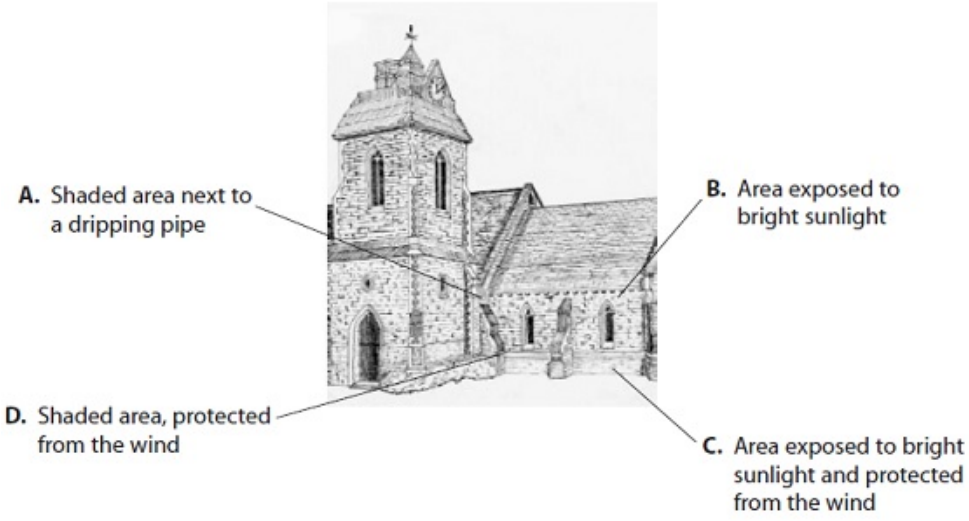
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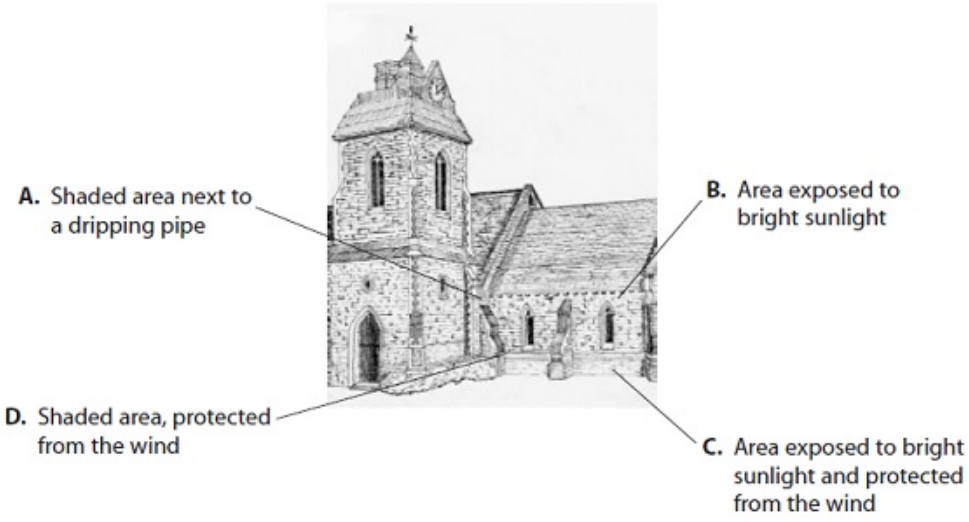
A algae have chloroplasts, fungi do not



B algae have circular DNA, fungi have linear DNA



C fungi have chloroplasts, algae do not



D fungi have circular DNA, algae have linear DNA

(c) Lichens can reproduce sexually and asexually. Sexual reproduction involves meiosis and asexual reproduction involves mitosis.

Suggest advantages to lichens of being able to reproduce both sexually and asexually.

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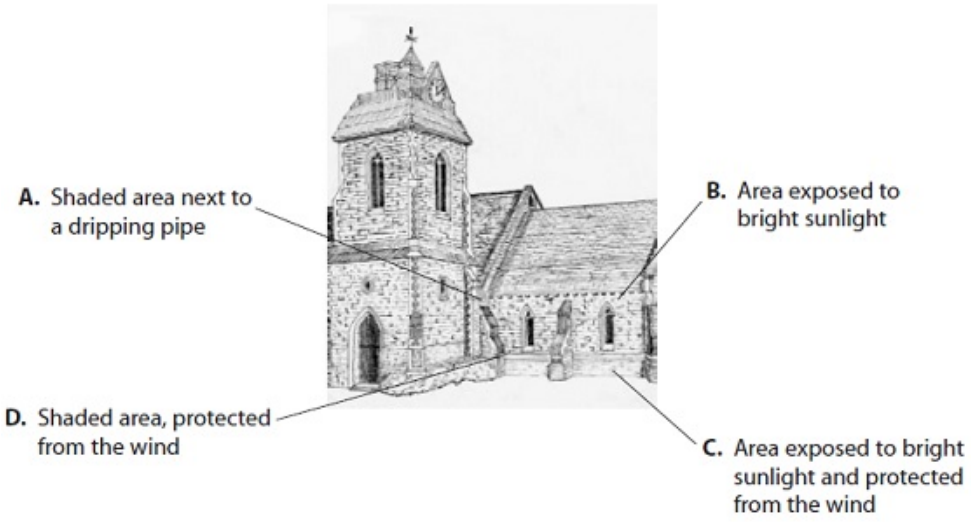
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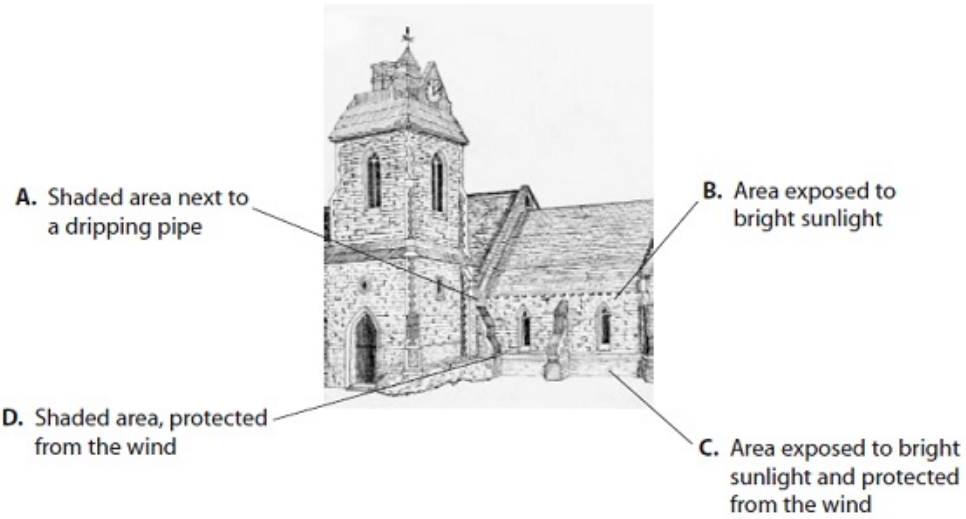
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(d) The diagram below shows the conditions at four positions, A, B, C and D, on a building.

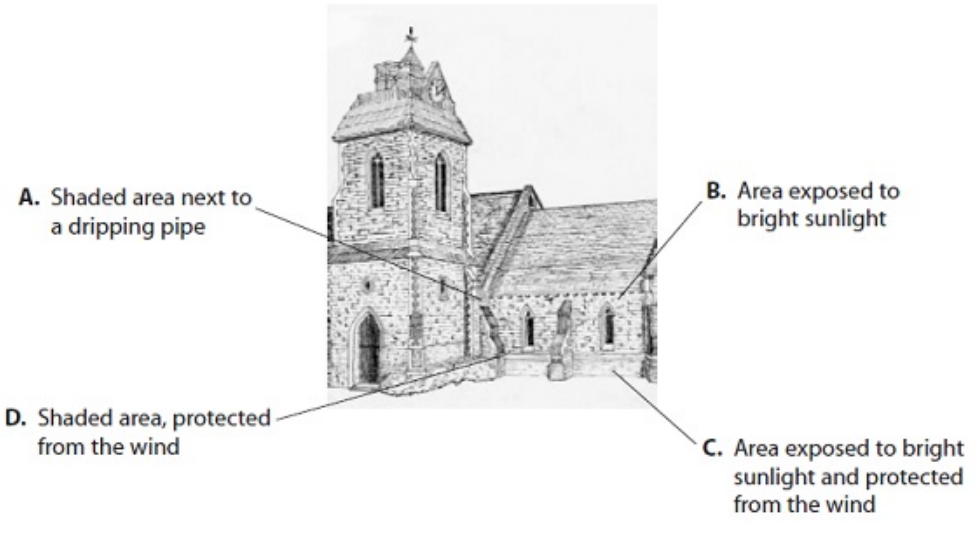


(i) Place a cross

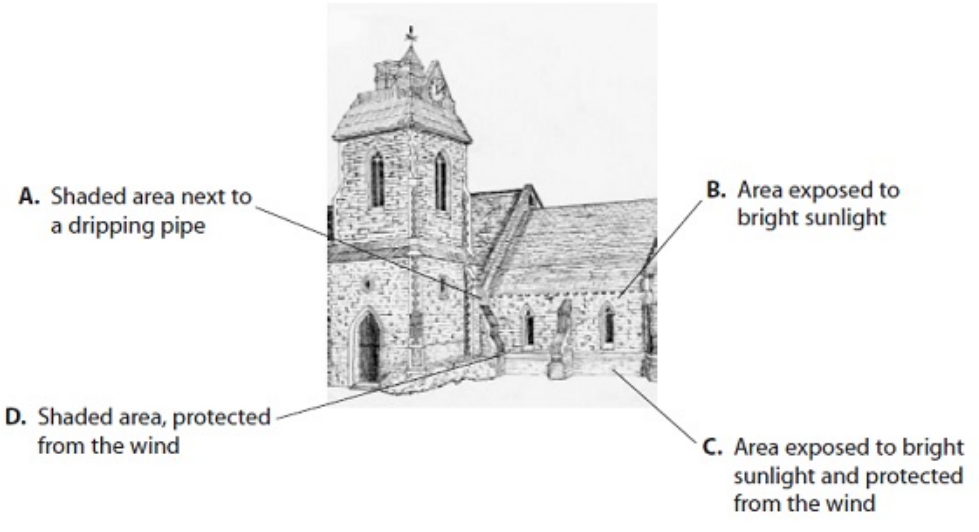


in the box next to the position where the lichen is likely to be most abundant.

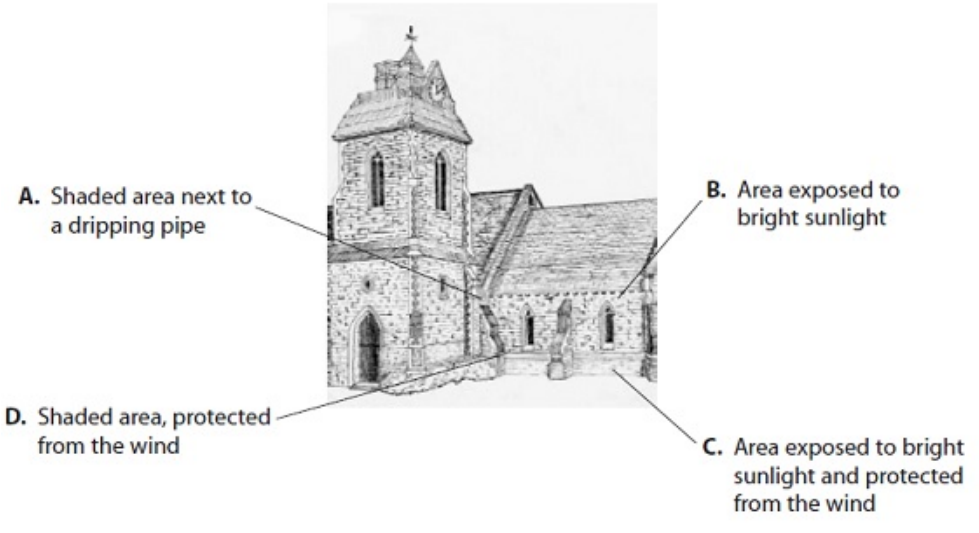
(1)


A. Shaded area next to a dripping pipe
B. Area exposed to bright sunlight
D. Shaded area, protected from the wind
C. Area exposed to bright sunlight and protected from the wind

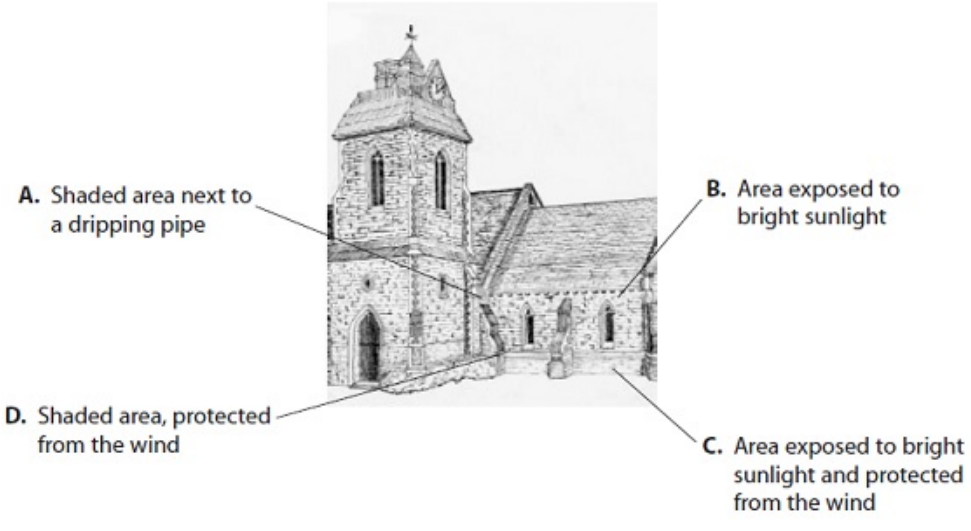
A


A. Shaded area next to a dripping pipe
B. Area exposed to bright sunlight
D. Shaded area, protected from the wind
C. Area exposed to bright sunlight and protected from the wind

B


A. Shaded area next to a dripping pipe
B. Area exposed to bright sunlight
D. Shaded area, protected from the wind
C. Area exposed to bright sunlight and protected from the wind

C



D

(ii) The abundance of lichen on the walls of this building can be measured by determining the percentage cover of lichen.

Suggest how the percentage cover of lichen could be determined.

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(iii) Explain how light intensity could be measured at the surface of the wall.

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(iv) Suggest how the data collected could be used to show whether there is a relationship between the abundance of lichen and light intensity.

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(Total for Question = 13 marks)

Q15.

The island of Lanzarote is near the African coast and has a desert climate.

The photograph shows the edge of a lava flow from a volcano that erupted on this island about 200 hundred years ago.

In the foreground is an area that was not covered by the lava flow.

Over a long period of time, the lava will change to look like the climax community seen in the foreground.



Explain how the edge of the lava flow will change over time to look like the foreground.

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community has emerged (1)