

PEARSON EDEXCEL A-LEVEL BIOLOGY B • 9B10

BIOLOGY



EXAM QUESTION PACK

TOPIC 10: ECOSYSTEMS
CHANGES IN ECOSYSTEMS

SCORE

/92

PERCENTAGE

%

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 / $\text{g m}^{-2} \text{yr}^{-1}$
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.

(2)

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

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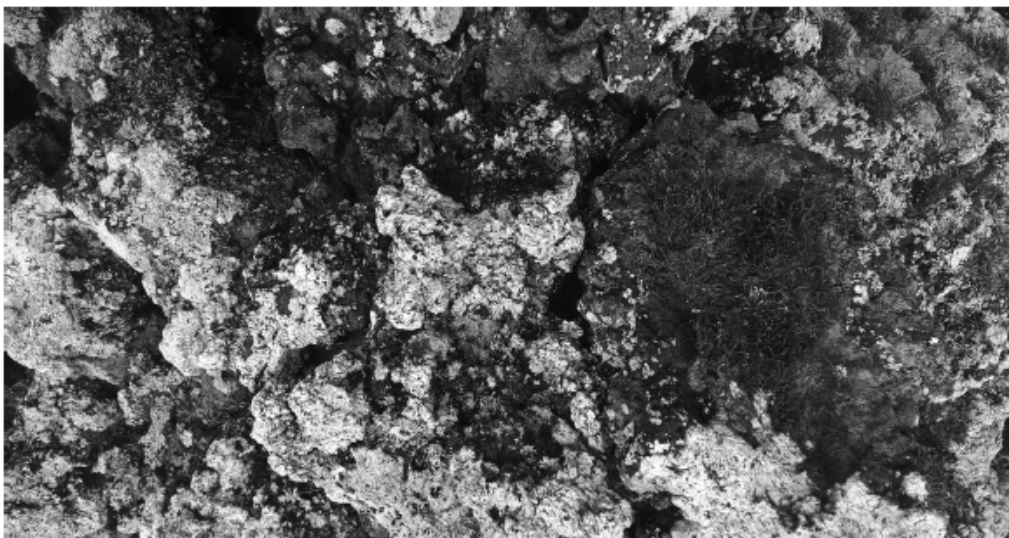
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(Total for question = 9 marks)

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)

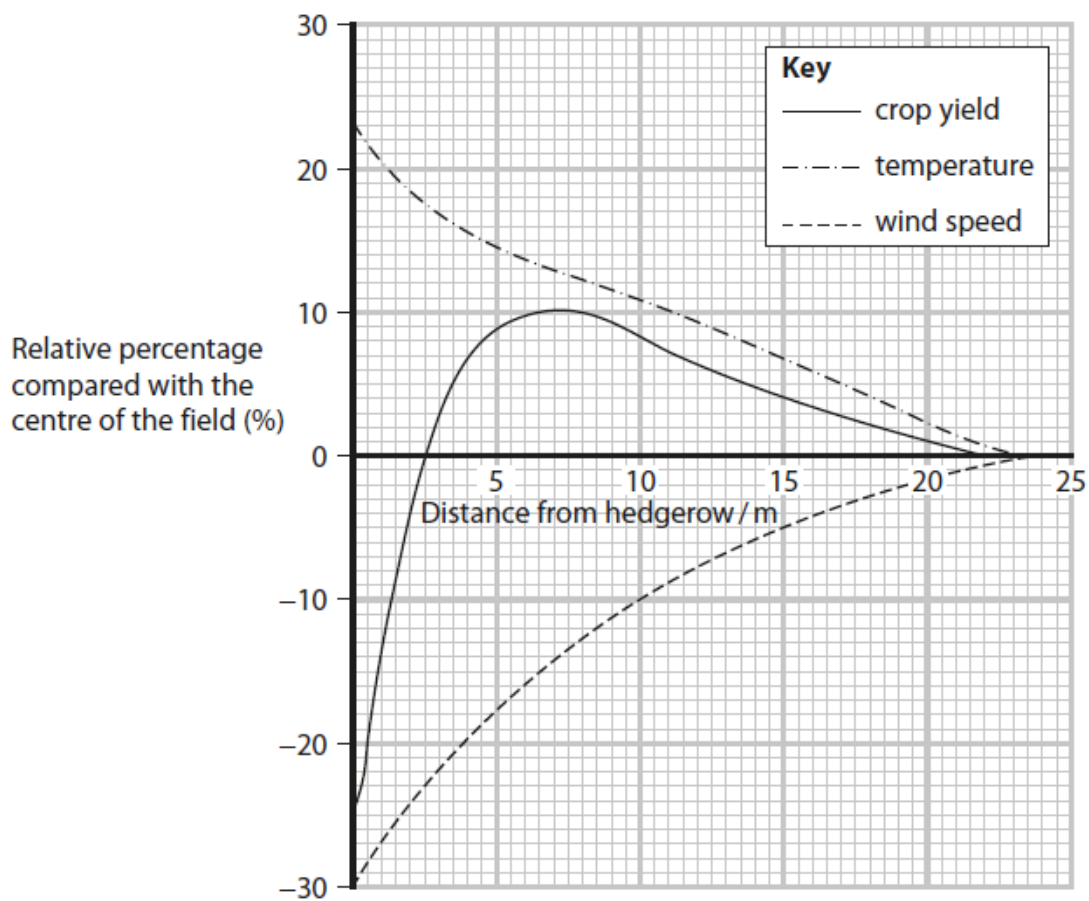
Q4.

* 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.

(2)

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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.

(2)

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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.



lava flow

climax community
in 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.

(4)

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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).

(4)

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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.

(2)

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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.

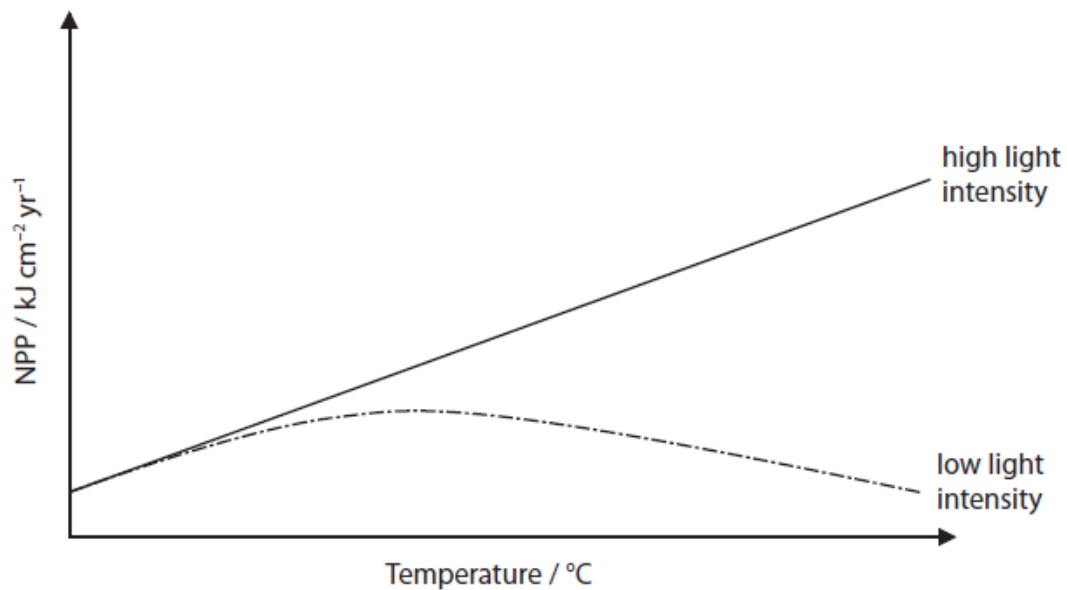
The effects of light intensity and temperature on the net primary productivity (NPP) of young willow trees were investigated.

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.

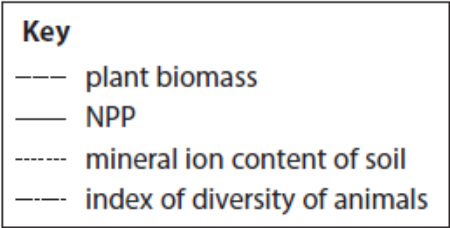
These coniferous trees do not shed many leaves.

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.



(6)

[illegible]

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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.

(5)

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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.

(2)

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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.

(4)

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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. (2)

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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. (2)

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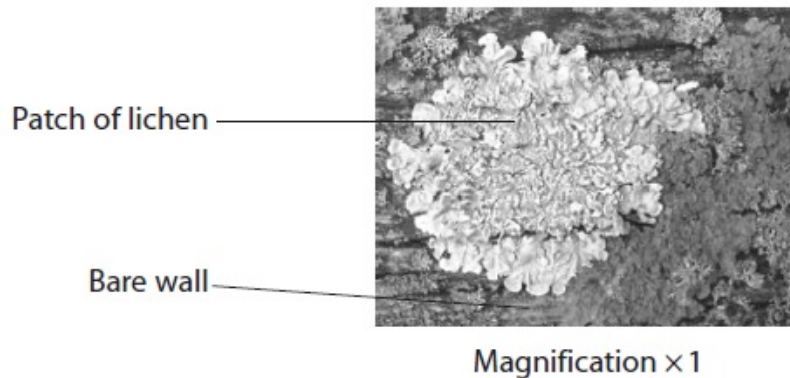
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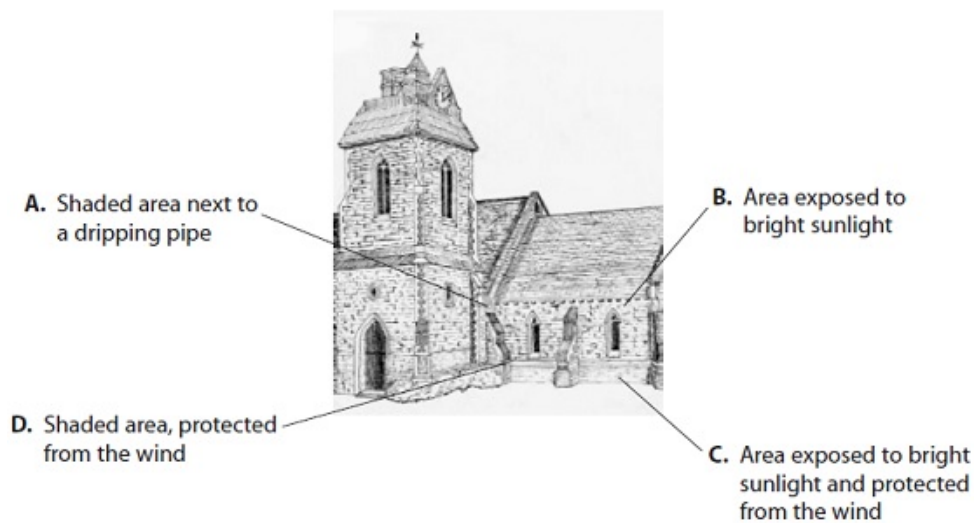
Q14. Lichen consists of two organisms, an alga and a fungus, growing together. The alga photosynthesises producing carbohydrate for the two organisms and the fungus absorbs and retains water so that the lichen does not dry out.

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



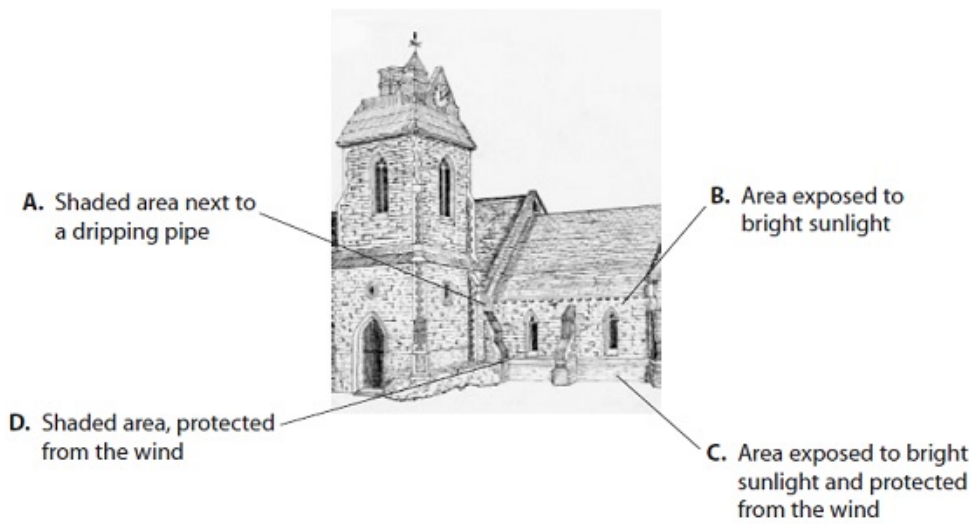
Algae and fungi are eukaryotic organisms.

(a) Place a cross



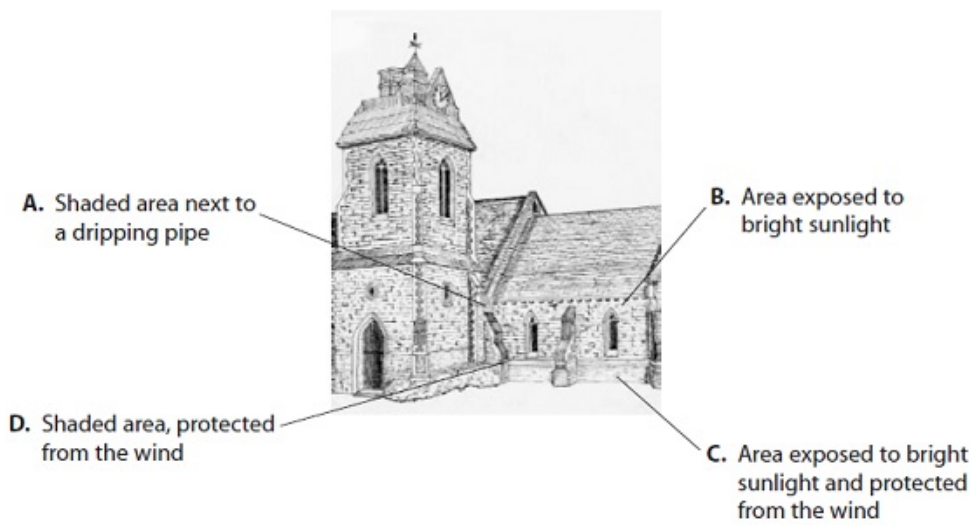
in the box
next to the names of cell structures that would be used to classify algae and fungi as eukaryotic organisms.

(1)



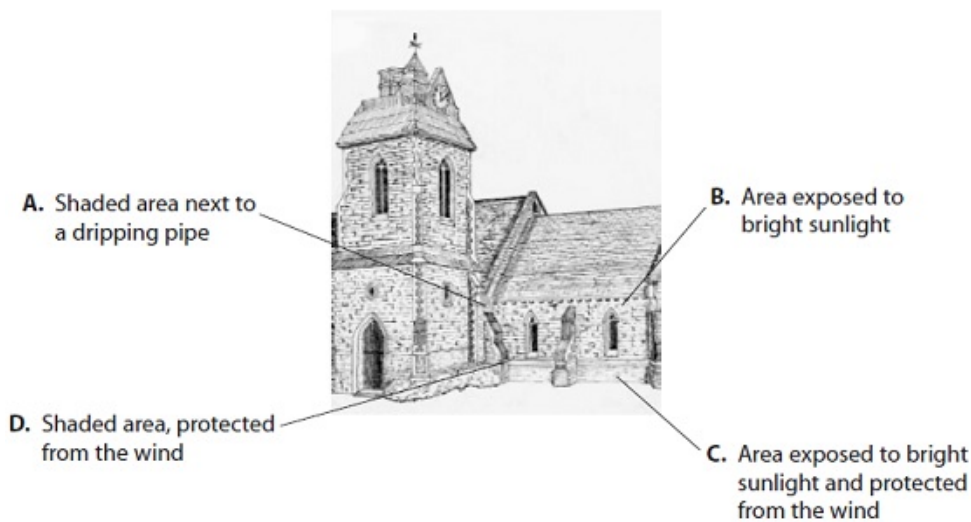
A cytoplasm and large

(80S) ribosomes



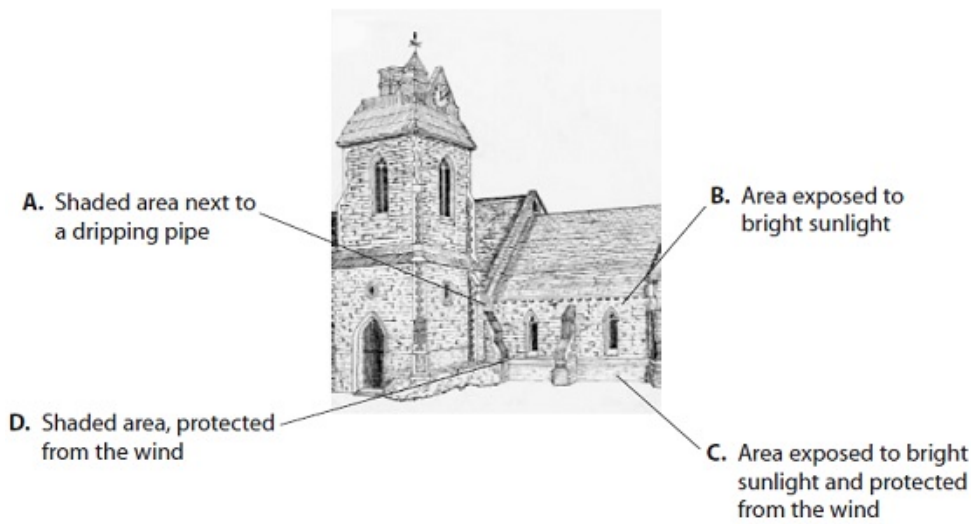
B cytoplasm and small

(70S) ribosomes



C nucleus and large (80S)

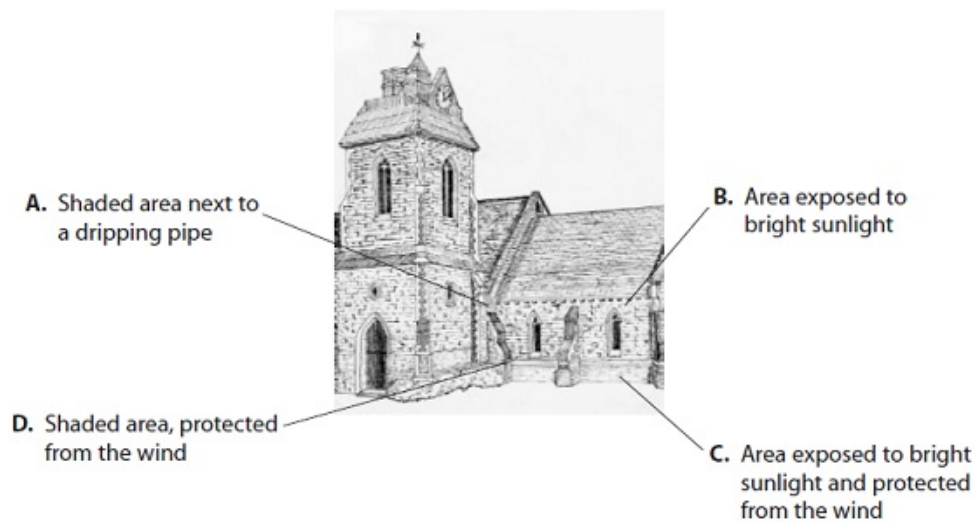
ribosomes



D nucleus and small (70S)

ribosomes

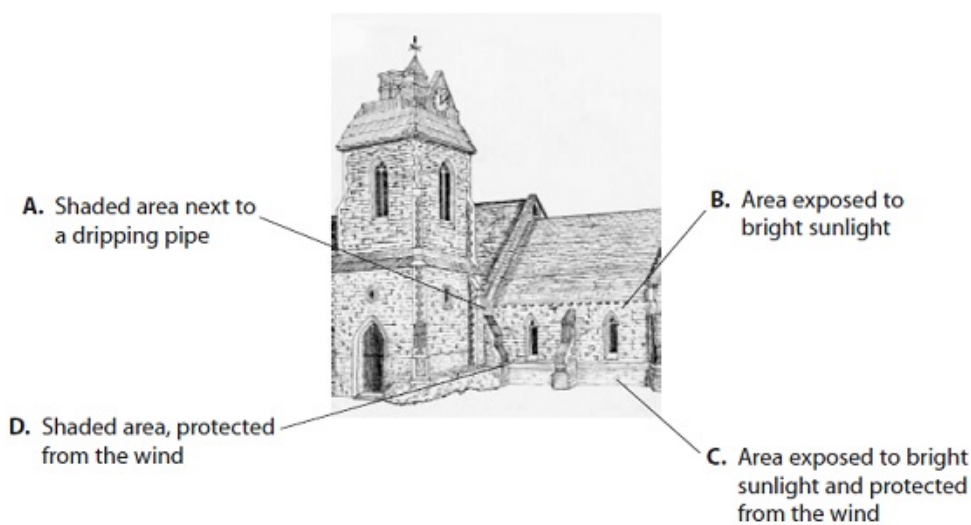
(b) Place a cross



in the box

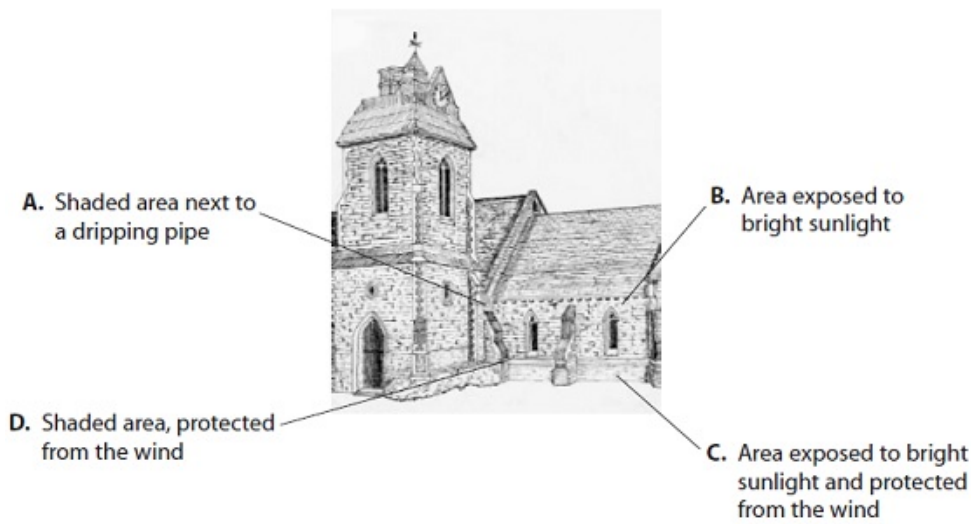
next to one difference in cell structure between these two eukaryotic organisms.

(1)



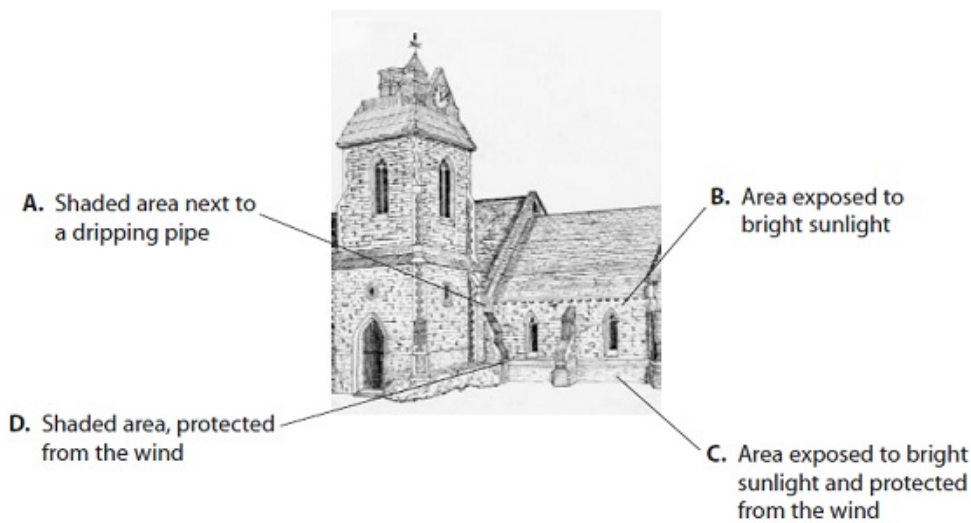
A algae have chloroplasts,

fungi do not



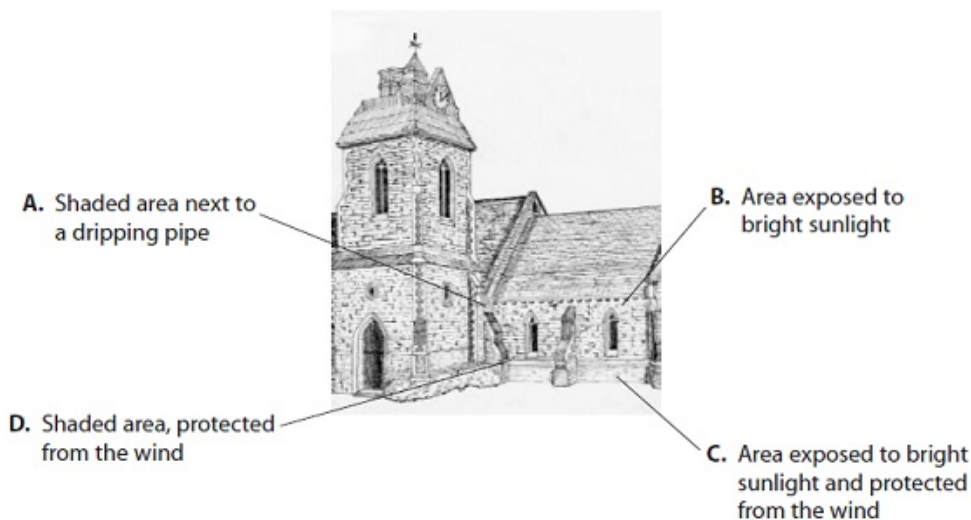
fungi have linear DNA

B algae have circular DNA,



algae do not

C fungi have chloroplasts,



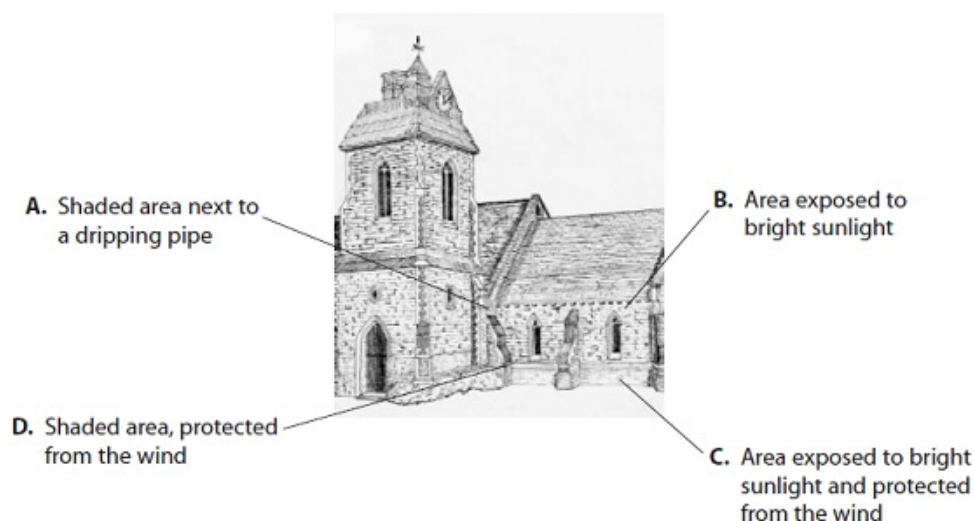
algae have linear DNA

D fungi have circular DNA,

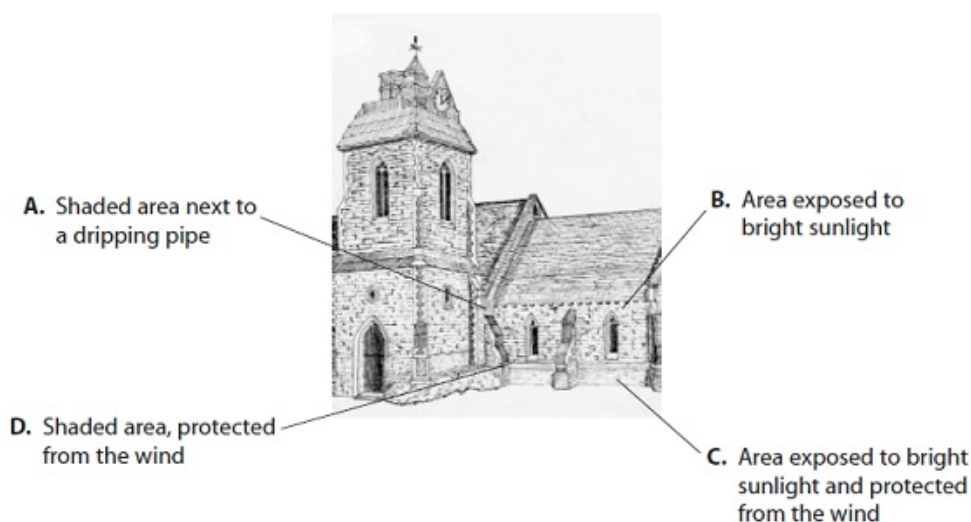
(c) Lichens can reproduce sexually and asexually. Sexual reproduction involves meiosis and asexual reproduction involves mitosis.

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

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



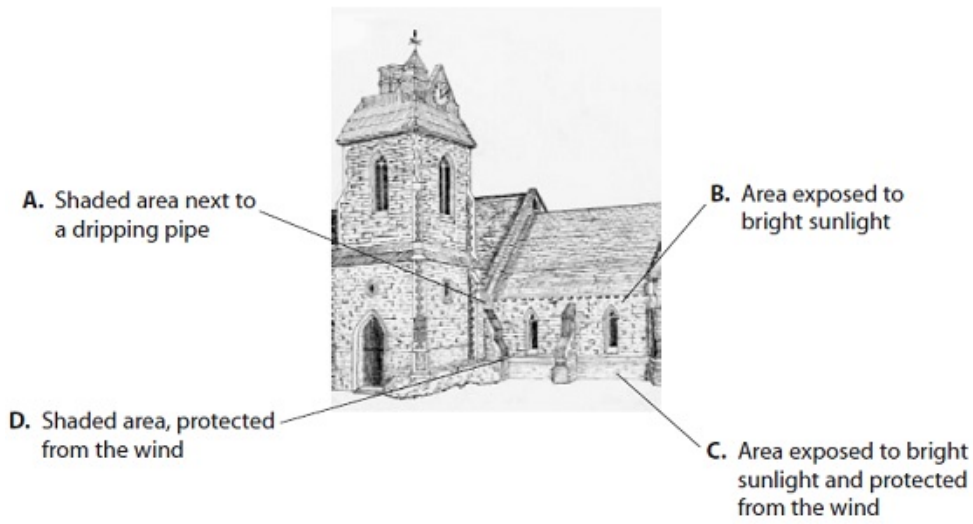
(i) Place a cross



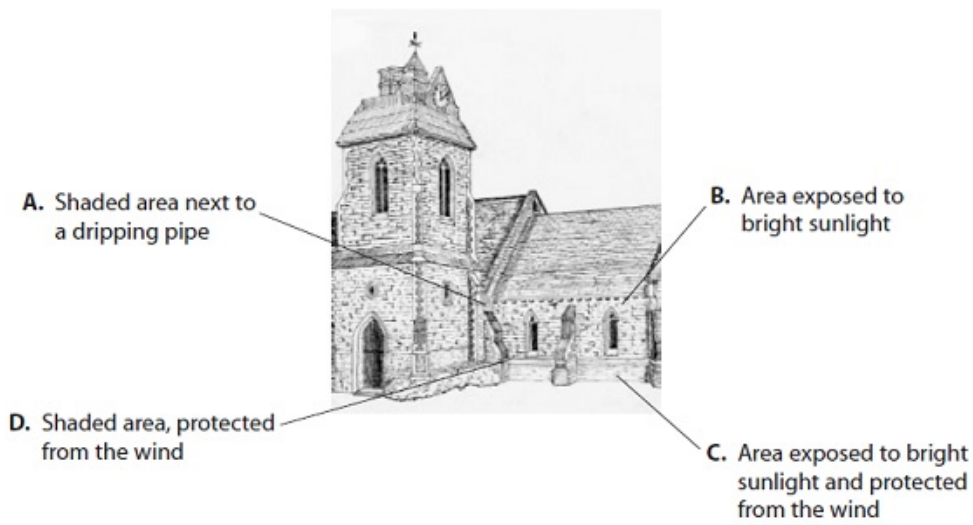
in the box

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

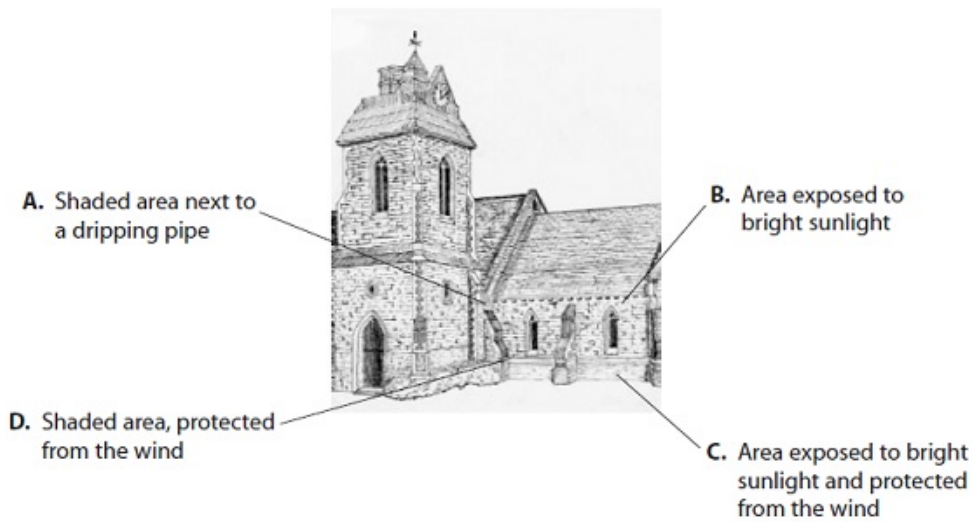
(1)



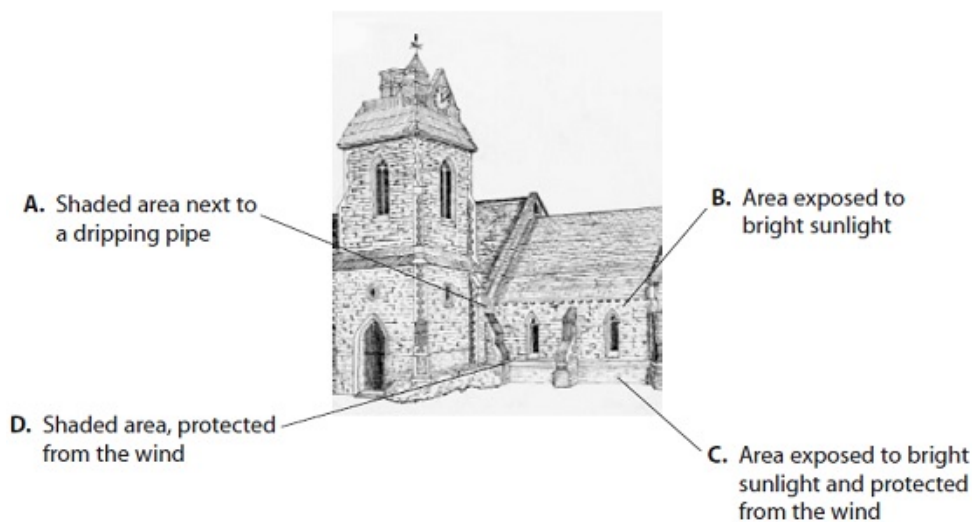
A



B



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.

(3)

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

(2)

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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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Mark Scheme

Q1.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to five of the following points: • {pioneer species / mosses / lichens arrive} (after glaciers melt and colonise bare rock) (1) • {decomposition / decay} increases the soil depth / humus content / minerals / nutrients (1) • therefore (larger) plants can grow (due to soil depth / minerals / nutrients) (1) • leaf litter increases after 40 / 100 years as more herbaceous plants / shrubs / trees are present (1) • • (steep) increase in nitrate after 40 / 100 years as more leaves / plants / animals / faeces (1) • leaf litter falls (towards the end / from 150 – 250 years) as climax community has emerged (1)	Accept animals arrive / increased niches Accept larger plants Accept increase from 12.8 to 277 as equivalent to 40/100 Accept increase from 5.3 to 21.8 as equivalent to 40 / 100 Accept nitrate continues to increase due to presence of animals / faeces (as leaf litter falls)	5 exp

Q2.

Question Number	Answer	Additional Guidance	Mark
(i)	• correct calculation of $N(N-1)$ • correct calculation of $\sum n(n-1)$ • correct division of $N(N-1)$ by $\sum n(n-1)$ 1.5 (3)	<u>Example of calculation</u> = 3906 (1) = 2604 (1) $3906 \div 2604 = 1.5$ Correct answer with no working gains full marks	3

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • index accounts for population / numbers of organisms (1) • because numbers of organisms in {each species vary} (1)	ACCEPT converse for both Mps ACCEPT population sizes can vary for two marks	2

Question Number	Answer	Additional Guidance	Mark
(iii)	An answer that makes reference to four of the following: THREE from: - birds are now {extinct / dead / none left} (on Guam) (1) - decrease in (bio)diversity (1) - Marian crow population increased until 1985 / Island collared dove increased until 1984 / white throated ground dove increased until 1983 / 1984 (1) - bird species decline at different rates (1) TWO from: - loss of some bird species allowed others to increase / loss of some bird species provided niches / food for others (1) - snakes consumed some species before others (1)	ACCEPT other correct dates ACCEPT Species go extinct at different times ACCEPT reduced competition between birds (allows some bird species to increase) / reduced interspecies competition (allows some bird species to increase)	4

Q3.

Question Number	Answer	Additional Guidance	Mark
	An explanation that makes reference to four of the following: - lichens are pioneer species (1) - they break down surface of rocks to create soil (1) - therefore other plants are able to {grow / be established}(1) - death and decay helps to {create humus / recycle minerals} (1) - therefore providing niches for either plants or animals (1)	Allow soil {becomes deeper / contains more minerals / more fertile} Allow wider variety of plants or animals can live there. Allow description of {trees / shrubs} growing Allow climax community develops	(4)

Q4.

Question Number	Indicative content	
*	Answers will be credited according to candidate's deployment of knowledge and understanding of material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. Descriptions • crop yield is highest between 5 m and 10 m from hedgerow D • crop yield is lowest next to the hedgerow / crop yield is lower than the centre of the field upto 2.5 m • crop yield increases up to between 5 m and 10 m from the hedge and then decreases D • wind speed is lowest by the hedge D • wind speed increases with distance from the hedge D • temperature is higher by hedgerow / falls with distance D • hedgerows can increase crop yields, but fields need to be smaller D • hedgerows can take up land that could be used to grow crops D Abiotic Explanations • humidity is higher by the hedgerow A • reduced wind speed (by the hedge) increases the temperature A • transpiration / water loss / evaporation will be lower around hedgerow A • hedgerow acts as a wind break A • less than 2m from hedgerow productivity is lower due to competition / shading reducing photosynthesis A • between 5m and 15 m, higher temperature will increase	6

		photosynthesis rate A • higher temperature is closer to optimal enzyme temperatures A • wind can affect crops pollinated by wind A Biotic Explanations • pollinating species and predators increase productivity B • predators consume herbivores / pests B • pollinators are essential for seeded crops / example B • hedgerow may compete for nutrients / water / light B • less need for pesticides to be used when predator species live in hedgerows B	
Level	Marks		
Level 0	Marks	No awardable content	
Level 1	1-2	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made. Descriptions of factors one mark: any two from D two marks: three from D	
Level 2	3-4	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made. Descriptions and explanations three marks: any four points from D, A or B four marks: any five points from D, A or B and	

Level 3	5-6	A scientific judgement is made which is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made. Detailed explanation of all factors and how use of hedges can be beneficial Descriptions and explanations five marks: any six points from D, A and B six marks: any seven points from D, A and B	
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Q5.

Question Number	Answer	Additional Guidance	Mark
(i)	Effects on plants: { loss / eq } of (existing) species / extinction ; - idea of changes in distribution (of plants / species) ; - idea of changes in {numbers / size / growth / eq } (of plants / species) ; Explanations (max 3): - idea that there will be changes in rainfall patterns ; - idea of a change in growing seasons ; - idea that temperature may become too hot for some species OR credit a link made between temperature and enzyme activity ; - idea of increased carbon dioxide results in more {photosynthesis / GPP / NPP / biomass / eq} ; - idea of fall in pH in {oceans / rivers / eq} ;	NB any link to an affect must be correct 4 ACCEPT droughts 5 ACCEPT flowering times	(4)

Question Number	Answer	Additional Guidance	Mark
(ii)	- idea of reduction of {herbivore / primary consumer} ; - idea that this would result in a reduction of {predator / secondary consumer / tertiary consumers} ; - idea that a change in {distribution / numbers / types / eq} of plants could result in a change in distribution of {herbivores / eq} ; - idea of loss of {habitat / eq} decreasing {breeding rate / numbers / eq} ; - idea of loss of {shelter / camouflage / eq} provides more food for predators so they would increase in {size / number} ;	ACCEPT converse for increase in plant {number / size / eq} 1 ACCEPT idea of loss of animals because of reduction in food supply 2 ACCEPT idea of loss of animals that feed on the herbivores 4 ACCEPT named example e.g. nesting place	(3)

Q6.

Question Number	Correct Answer	Additional guidance	Mark
(a)	An answer that makes reference to one of the following: - poached by humans for their horn (1) <i>Arenga pinnata</i> outcompetes the food source/less food for rhino (1) - disease (1)		(1)

Question Number	Correct Answer	Additional guidance	Mark
(b)	An explanation that makes reference to two of the following: - difficulty in finding mates (1) - so population growth is affected (1) or - loss of genetic diversity / small gene pool (1) - so less resistance to environmental change (1)		(2)

Question Number	Correct Answer	Additional guidance	Mark
(c)	An answer that makes a reference to two of the following: - habitat maintenance / restoration / clearing <i>Arenga pinnata</i> (1) - locate breeding sites for reproduction (1) - protect the rhinos from poachers (1) - ensuring that the food source is maintained/plant more food source (1) - breeding programme outside of national park (1)		(2)

Q7.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to the following: - high light intensity promotes growth due to increased photosynthesis / high temperature promotes growth due to rapid rates of reaction (1) - however lack of { rainfall / water } limits { photosynthesis / transpiration } rate (1) - however { wind / high temperature } increases { transpiration rate / water loss } (1) - however wind results in soil erosion therefore poor soil quality (1)	Accept converse statements	(4)

Q8.

Question Number	Correct Answer	Additional guidance	Mark
	An explanation that makes reference to the following: • sea plantain (1) • idea of different latitudes have different (mean) temperatures (1) • sea plantain grows {better / eq} at all (three) temperatures / bog sedge does not grow very well at {lower temperatures / 10 °C and 14 °C} (1) • credit appropriate comparative manipulated figures (1)		(4)

Q9.

Question Number	Answer	Additional Guidance	Mark
(i)	• (index of diversity) takes into account populations (of each species) (1)	Accept considers abundance / number of each species Accept because an area could have many different species but different populations	1 exp

Question Number	Answer	Additional Guidance	Mark
(ii)	An answer that makes reference to two from the following points: • other species are also conserved (in the ecosystem) (1) • animals are not humanised / behaviours are natural / no change to behaviour (1) • less inbreeding occurs (1)	Accept converse for <i>in situ</i> Accept other species are protected / food webs are maintained / maintains biodiversity / maintains links in ecosystem Accept more space for animals Accept no need to transport animals Accept less inbreeding depression / maintain gene pool	2 grad

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference the following points: - biodiversity has increased (in the paper project area) more (than the protected area) (1) - as less / no grassland is burnt / less poaching (1) (more) niches are available / habitats are not destroyed / elephants transfer plant seeds (1) - local people make money from the paper project / if the elephants are not present, local people lose a source of income (1)	Accept biodiversity has increased but {did not increase / went down} in area where people are banned Accept grassland burning / poaching still occurs in unprotected area Accept converse for protected area Accept converse for protected area Accept people have a vested interest in the elephants / make a profit	4 exp

Q10.

Question Number	Indicative content
*	Answers will be credited according to candidates' deployment of knowledge and understanding of the material in relation to the qualities and skills outlined in the generic mark scheme. The indicative content below is not prescriptive and candidates are not required to include all the material which is indicated as relevant. Additional content included in the response must be scientific and relevant. <u>Succession (S):</u> • succession begins with seeds / roots (from previous crops etc), followed by herbaceous plants, shrubs and trees • increased plant diversity increases number of niches for animals, resulting in an increase in index of diversity • steep increase in diversity at approximately 20 years with herbaceous plants / shrubs providing high numbers of niches • index of diversity stabilises and then decreases as trees shade area • shade reduces herbaceous / shrub plant species reducing niche number and index of diversity <u>NPP (N):</u> • NPP increases as more herbaceous plants and shrubs with higher leaf areas grow • NPP reduces as the community ages due to increase in proportion of non-photosynthetic tissue (wood / roots) reducing photosynthesis rate compared to respiration rate • reduced mineral ion content due to lack of decay of leaves may reduce NPP <u>Mineral ions (M):</u> • starting mineral ions are low due to farming • mineral ions in soil increase with time due to humus / dead organic material from plants and animals • organic material is decomposed by microbes to release minerals • mineral ion content decreases in climax community as few leaves are dropped from pine trees so there is less decay

Level	Marks	Descriptor
0	0	No awardable content
1	1-2	Limited scientific judgement made with a focus on mainly just one method, with a few strengths/weaknesses identified. A conclusion may be attempted, demonstrating isolated elements of biological knowledge and understanding but with limited evidence to support the judgement being made. Level 1: Description of succession (S) with little / no reference to graph
2	3-4	A scientific judgement is made through the application of relevant evidence, with strengths and weaknesses of each method identified. A conclusion is made, demonstrating linkages to elements of biological knowledge and understanding, with occasional evidence to support the judgement being made. Level 2: Explanation of succession (S) as shown in the graph linked to either N or M with some errors.
3	5-6	A scientific judgement is made which is supported throughout by sustained application of relevant evidence from the analysis and interpretation of the scientific information. A conclusion is made, demonstrating sustained linkages to biological knowledge and understanding with evidence to support the judgement being made. Level 3: Detailed explanation of succession (S) as shown in the graph over 50 years using N and M with only minor errors.

Q11.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to the following: (interactions) of {organisms / biotic factors / communities / living} and {environment / abiotic factors / non-living factors} (1)	IGNORE habitat / area	1

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to five of the following: - colonisation (of bare rock) by pioneer species / extremophiles / by organisms that withstand {low water / dry / low soil} (1) (primary) succession occurs (1) - soil / humus produced (1) - therefore provides {water / minerals / nutrients / anchorage} for plants to grow (1) - provides niches / food / habitats for animals (1) - herbaceous plants / shrubs / trees become established / climax community emerging (1)	ACCEPT founder	5

Q12.

Question Number	Answer	Additional Guidance	Mark
(i)	An answer that makes reference to two of the following: - less distribution of seeds (1) - fewer {mineral / ions / fertiliser / nutrients} from faeces / excretion (1) - less predation / eating of insects (1) - less pollination / birds are pollinators (1)	ACCEPT less nutrient recycling ACCEPT not fertilised by faeces	2

Question Number	Answer	Additional Guidance	Mark
(ii)	A description that makes reference to four of the following: • variety of seeds from each {species / type} are kept / seeds from many {species / types / varieties} are kept / seeds with high genetic diversity are kept (1) • kept at {low / cold / frozen} temperature (1) • kept in {low humidity / low moisture / dry} (1) • kept in {airtight / sealed / low oxygen} containers (1) • seeds tested for viability / X-ray seeds to detect embryos / sterilise (1)	ACCEPT cryogenics	4

Q13.

Question Number	Answer	Additional Guidance	Mark
(i)	• calculate rate of growth for both treatments (1) • subtraction (1)	rate for weeds $11 \div 5 = 22$ rate for herbicide $180 \div 5 = 36$ $36 - 22 = 14$ (cm year⁻¹) Correct answer gains full marks, with no working shown	(2)

Question Number	Answer	Additional Guidance	Mark
(ii)	An explanation that makes reference to the following: • herbicide is more effective at removing weeds (1) • therefore there is less competition for {light / carbon dioxide / mineral ions / water} (1)	ACCEPT converse e.g. herbicide kills all the weeds but removing by hand lets them grow again DO NOT ACCEPT nutrients	(2)

Question Number	Answer	Additional Guidance	Mark
(iii)	An explanation that makes reference to two the following: • same species of tree because trees grow at different rates (1) • {animals / pests / disease / herbivores / insects} as they {affect growth / feed on trees} (1) • same {number / spacing} of trees to control (intraspecific) competition (1)	ACCEPT trees get same light / mineral ions / water	(2)

Q14.

Question Number	Answer	Additional Guidance	Mark
(a)	C ; nucleus and large (80S) ribosomes		(1)

Question Number	Answer	Additional Guidance	Mark
(b)	A ; algae have chloroplasts, the fungi do not		(1)

Question Number	Answer	Additional Guidance	Mark
(c)	1. (advantage of sexual reproduction / meiosis) {genetically different / greater gene pool / greater genetic diversity /eq} ; 2. (advantage of asexual reproduction / mitosis) faster / one of each organism needed / conserves advantageous alleles ;	2. Accept don't need a mate	(2)

Question Number	Answer	Additional Guidance	Mark
(d)(i)	C ; area exposed to bright sunlight and protected from the wind		(1)

Question Number	Answer	Additional Guidance	Mark
(d)(ii)	1. idea of using a quadrat ; 2. idea of {random / systematic} sampling (of wall) ; 3. {count number of squares/ determine area} containing lichen /eq ; 4. credit an indication of how the percentage was calculated ;	1. Accept description of quadrat, use of photo and a grid 3. NB reference to measuring percentage cover only is too vague as it is repeating stem of question	(3)

Question Number	Answer	Additional Guidance	Mark
(d)(iii)	1. ref to use of light {probe / sensor /eq} ; 2. idea of taking several measurements ;	1 Accept description of a light sensor 2. Accept ref to places or times of day	(2)

Question Number	Answer	Additional Guidance	Mark
(d)(iv)	1. plot a (scatter) graph of light intensity against lichen / eq ; 2. reference to looking for a correlation ; 3. reference to use of statistics test ; 4. appropriate named test eg Spearman's rank, Pearson ;	2. Accept ref to line of best fit, ref to correlation coefficient also gets Mp 3	(3)

Q15.

Question Number	Acceptable Answer	Additional Guidance	Mark
	An explanation that makes reference to four of the following: • colonisation by pioneer species (1) • which contribute dead organic matter to form soil (1) • therefore creating suitable conditions for other species to establish (1) • leading to { succession / a sequence of changes } in { a community / organisms / species / plants } (1)	Allow lichens	(4)
	• the final { stage / sere / community } is { self-sustaining / stable } (1)		