



EXAM PAPERS PRACTICE

On the Wild Side -3

Name: _____

Class: _____

Date: _____

Time:

Total Marks Available:

Total Marks Archived:

Level: Edexcel A level Biology

Subject: Biology

Exam Board: Pearson Edexcel Level 3 GCE AS and A level Biology A (Salters-Nuffield) and also Pearsons Edexcel AS and A Level Biology B (9BI0) - Is however suitable for use by AS and A level Biology Students of other Boards

Topic: On the Wild Side -3

Type: Topic Question

To be used by all students preparing for Edexcel AS and A level Biology A and Biology B - Students of other Boards may also find this useful

Questions

Q1.

Global warming can affect abiotic factors that determine the distribution of organisms. The presence of sodium chloride in soil is an abiotic factor that affects the germination of seeds.

The effects of sodium chloride solution and gibberellin on the germination of rice seeds have been investigated.

Gibberellin regulates developmental processes in plants.

Fifty seeds were placed in each of three Petri dishes containing different solutions.

The seeds were incubated for 96 hours and the number that germinated in each Petri dish was counted.

Treatment	Solution	Number of seeds germinating
Control	Distilled water	48
Sodium chloride	120 mmol dm ⁻³ of sodium chloride	33
Sodium chloride and gibberellin	120 mmol dm ⁻³ sodium chloride and 50 μmol dm ⁻³ gibberellin	45

(i) Give a null hypothesis for this experiment.

(1)

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(ii) Calculate the chi-squared (χ^2) value for these results, using the formula provided.

(3)

$$\chi^2 = \sum \frac{(O - E)^2}{E}$$

Answer



(iii) In a second experiment, using the same three treatments, the chi-squared (X^2) value was found to be 6.635.

The table gives the critical values for the chi-squared (X^2) test at different probability levels.

Degrees of freedom	Probability level		
	0.05	0.01	0.001
1	3.841	6.635	10.83
2	5.991	9.210	13.82
3	7.815	11.34	16.27
4	9.488	13.28	18.47

Deduce the statistical significance of the results of the second experiment.

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(Total for question = 6 marks)

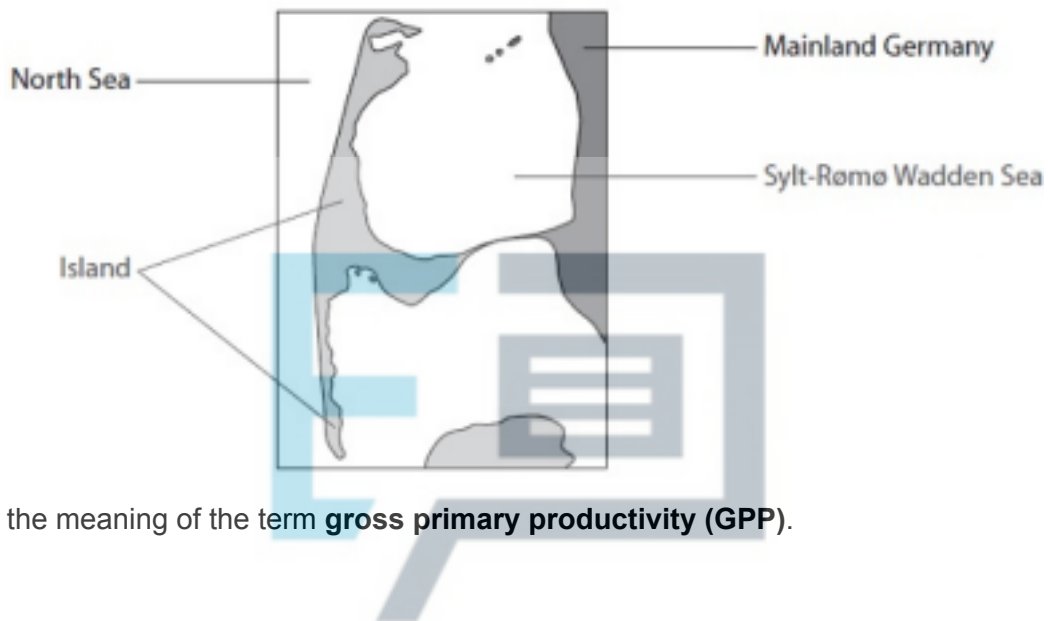


Q2.

The Sylt-Rømø Wadden Sea, shown in the diagram below, has a high gross primary productivity (GPP) which is monitored constantly.

The Sylt-Rømø Wadden Sea is protected from the North Sea by an island.

There are no large rivers flowing into the Sylt-Rømø Wadden Sea.



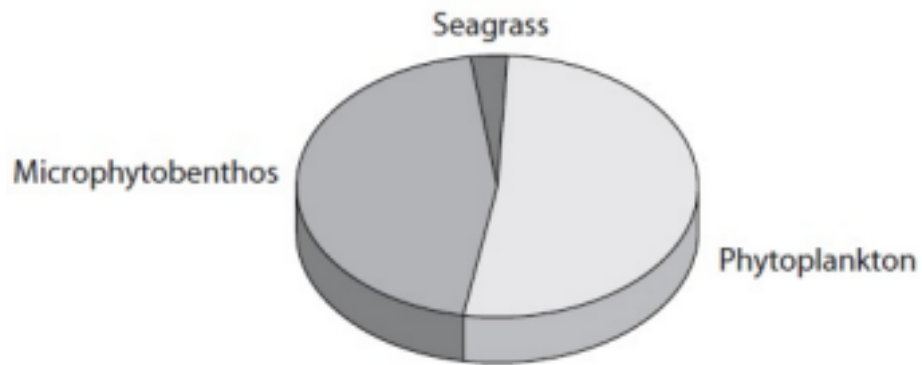
(a) Explain the meaning of the term **gross primary productivity (GPP)**.

(2)

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(b) Seagrass, microphytobenthos and phytoplankton are the producers found in the Sylt-Rømø Wadden Sea.

The chart below shows the distribution of GPP between these producers.



(i) Using the chart, describe the distribution of GPP in this sea.

(2)

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(ii) The total GPP for this sea is $840 \times 10^6 \text{ kJ m}^{-2} \text{ y}^{-1}$.

Explain how GPP for the phytoplankton could be calculated.

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(2)

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(iii) Suggest why GPP for this sea is very high.

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(c) Explain why net primary productivity (NPP) is lower than GPP.

(2)

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(Total for Question = 10 marks)

Q3.

Anthropogenic activities are contributing to global warming.

Scientists from the IPCC (Intergovernmental Panel on Climate Change) say that changes to diet can have a major impact on greenhouse gas emissions. The method of farming affects the level of impact.

The Paris Agreement of 2015 committed countries to reduce carbon emissions.

The table shows the mass of greenhouse gas released in the production of one serving of a variety of sources of protein.



Source of protein	Mass of greenhouse gas released in the production of one serving of the protein / kg
Beef	7.0
Lamb	5.0
Chicken	2.5
Cheese	2.0
Tofu (from soya beans)	1.0
Nuts	0.5

(i) Explain why a diet based on plant protein produces lower greenhouse gas emissions than a diet based on animal protein.

(3)

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(ii) Beef cattle are traditionally reared by grazing on natural pastures (grassland).
In recent years, large areas of rainforest have been cleared to produce beef.

Explain why the farming of beef cattle on deforested land produces more greenhouse gas emissions than from those reared on natural pastures.

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(Total for question = 6 marks)

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Q4.

The scientific article you have studied is adapted from *Scientific American*.

Use the information from the scientific article and your own knowledge to answer the following question.

Describe how the effects of 'competitive release' could be demonstrated (paragraphs 18 and 19).

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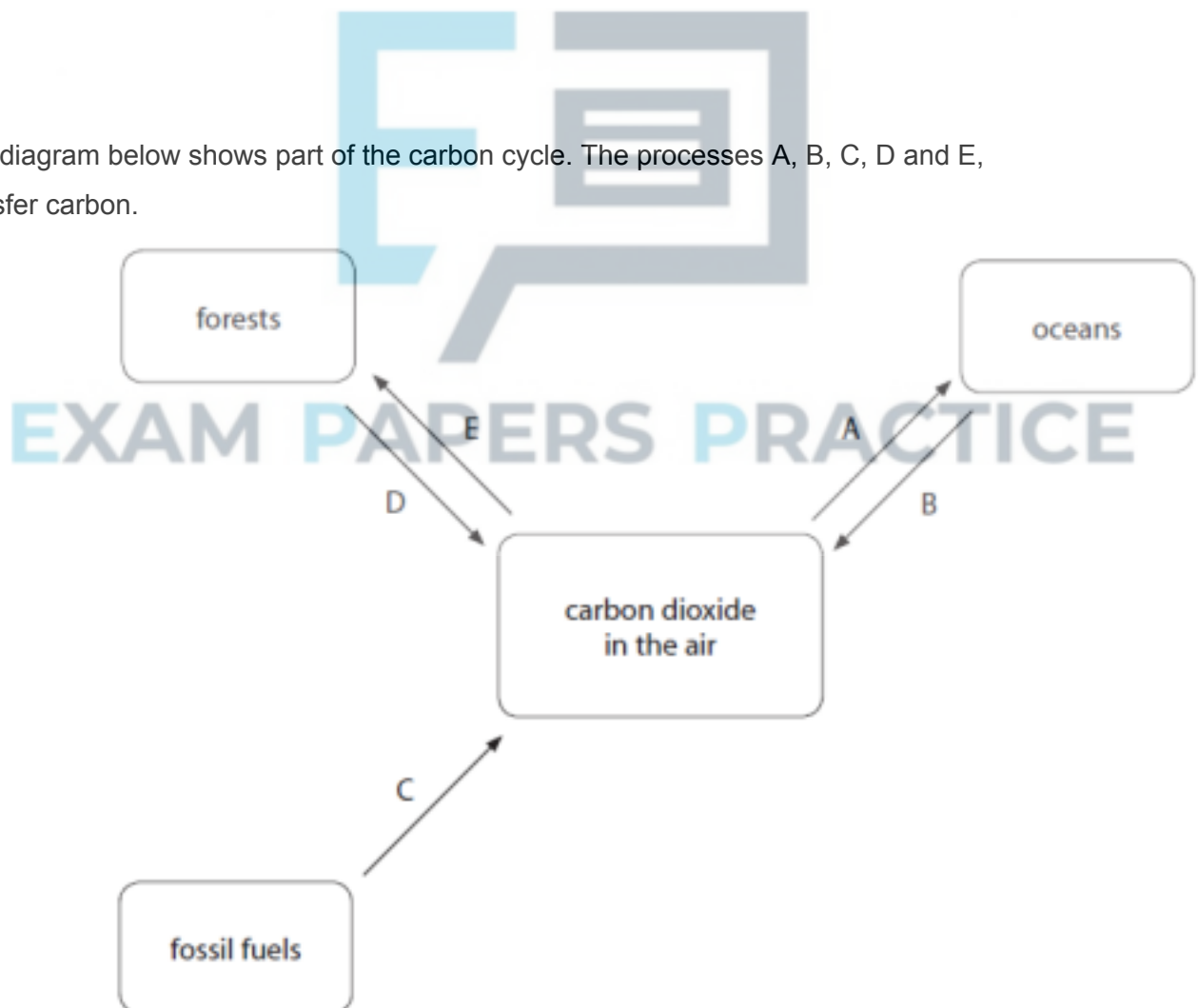
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(Total for question = 4 marks)

Q5.

The diagram below shows part of the carbon cycle. The processes A, B, C, D and E, transfer carbon.





Place a cross in the box next to the reaction in process E that uses carbon dioxide.

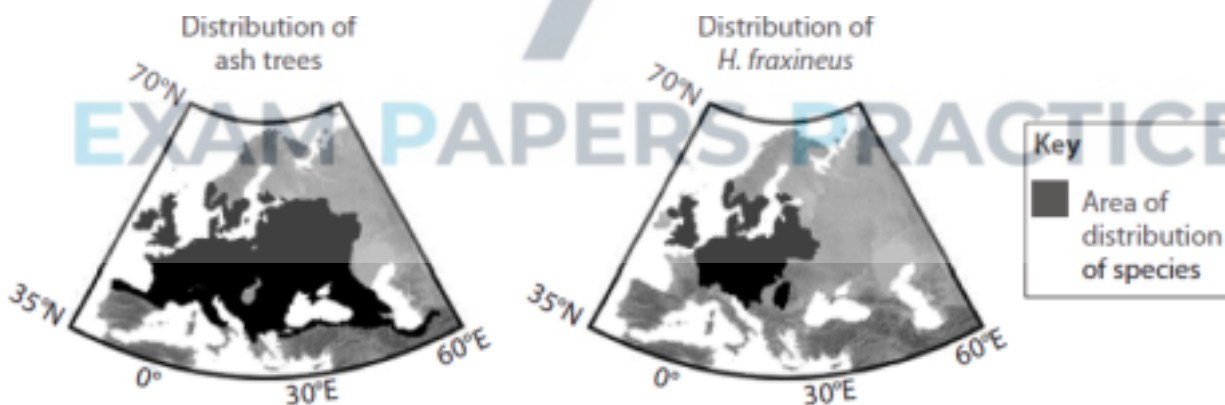
(1)

- A light-dependent reaction
- B light-independent reaction
- C photolysis
- D photophosphorylation

Q6.

Hymenoscyphus fraxineus (*H. fraxineus*) is the fungus that causes ash dieback. This disease usually kills all the ash trees that it infects.

The diagrams show the distribution of ash trees and *H. fraxineus* in 2007.



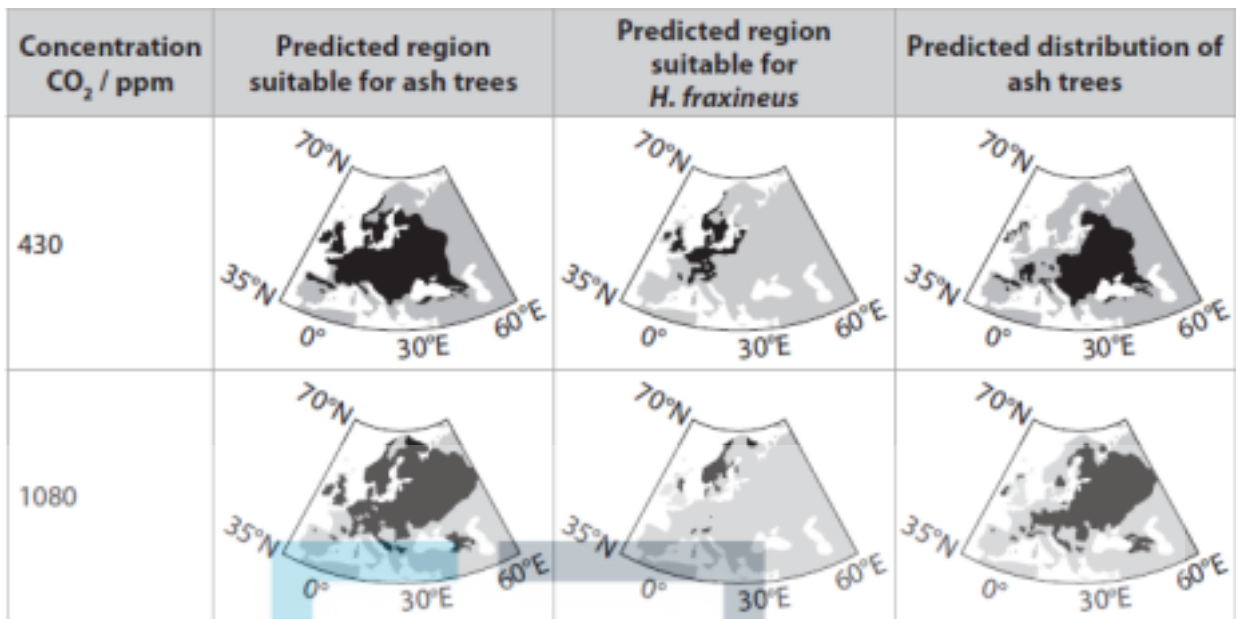
In 2007 the mean atmospheric carbon dioxide concentration was 398 ppm.

Models have been used to predict the effect of increasing atmospheric carbon dioxide concentration on the distribution of ash trees and *H. fraxineus*.

The table shows these predictions.



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(i) Which of the following is an abiotic factor that should be considered in the model?

(1)

A ash tree resistance to *H. fraxineus*

B *H. fraxineus* pathogens

C humidity

D ocean pH

(ii) Which of the following could be caused by an increase in atmospheric carbon dioxide from 398 ppm to 1080 ppm?

(1)



- A decreased photosynthesis
- B global warming
- C increased plant respiration
- D ozone depletion

(iii) Analyse the data to explain the predicted effect of climate change on the distribution of ash trees.

(5)

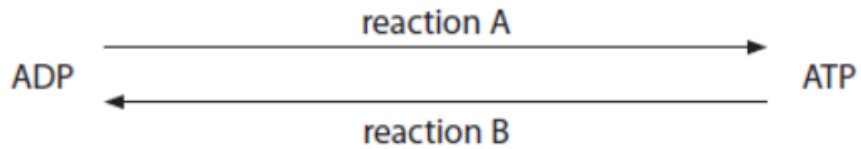


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(Total for question = 7 marks)

Q7.

Phagocytosis requires a source of energy in the form of ATP.
The diagram below shows the relationship between ATP and ADP.



Place a cross in the box next to the name of reaction A and reaction B.

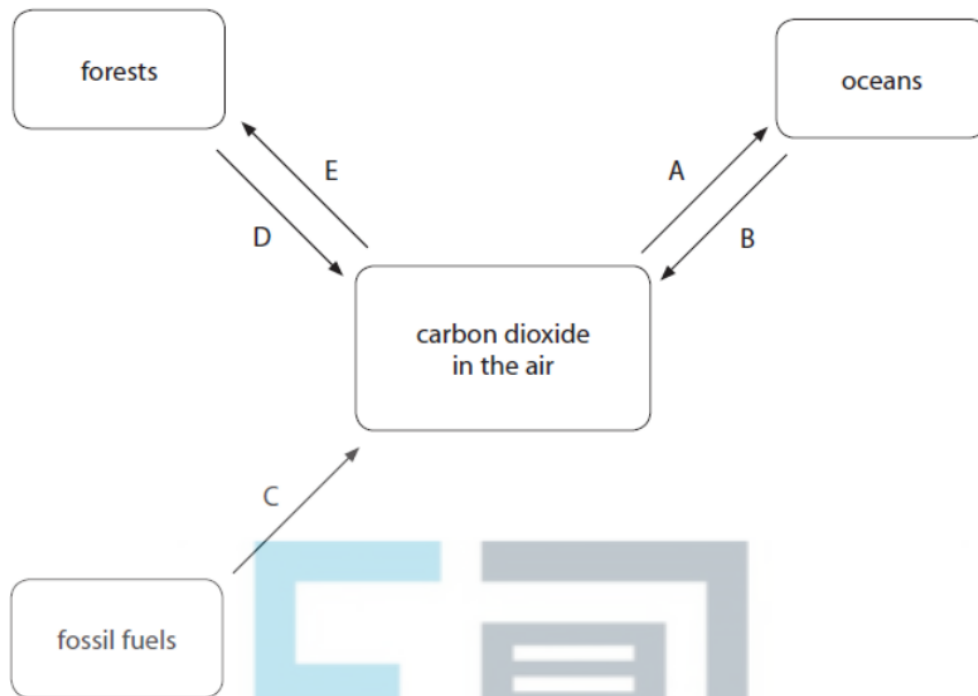
(2)

Reaction	Name of reaction				
	autolysis	decarboxylation	hydrolysis	phosphorylation	polymerisation
A	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>
B	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/>	<input type="checkbox"/>	<input type="checkbox"/>	<input checked="" type="checkbox"/>

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Q8.

The diagram below shows part of the carbon cycle. The processes A, B, C, D and E, transfer carbon.



Place a cross in the box next to the gases produced by process C.

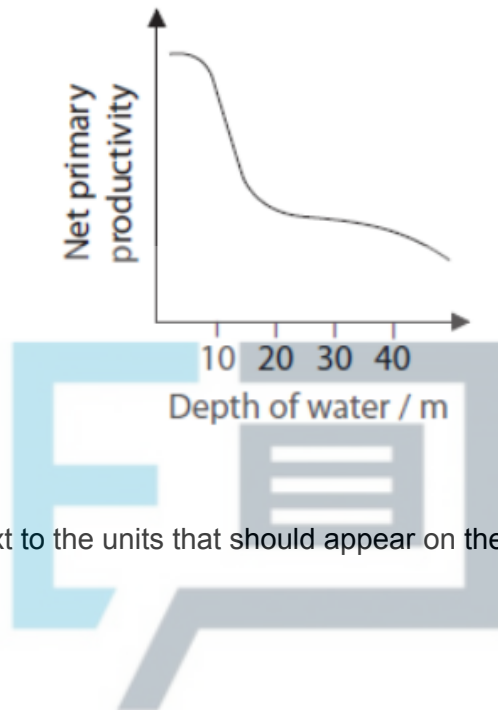
(1)

- A** carbon dioxide and methane
- B** carbon dioxide and water vapour
- C** carbon dioxide, methane and water vapour
- D** carbon dioxide, oxygen and water vapour



Q9.

The graph below shows how the depth of water in a freshwater lake affects the net primary productivity (NPP).



Place a cross in the box next to the units that should appear on the y-axis of this graph.

- A kg
- B kJ m^{-1}
- C $\text{kJ m}^{-2} \text{year}^{-1}$
- D $\text{kg m}^{-1} \text{year}^{-1}$

(1)

Q10.

Answer the questions with a cross in the boxes you think are correct . If you change your mind about an answer, put a line through the box and then mark your new answer with a cross .

Photosynthetic plants use light as a source of energy for the synthesis of organic molecules.
Photosynthesis is a two-stage process.

The light-dependent reactions take place in the chloroplast.

(i) Which of the following describes where, in the chloroplast, the light-dependent reactions take place?

(1)

- A cristae
- B matrix
- C stroma
- D thylakoids

(ii) Which of the following are the products of the light-dependent reactions? (1)

- A carbon dioxide and reduced NADP
- B glucose and oxygen
- C reduced NAD, ATP and oxygen
- D reduced NADP, ATP and oxygen

(iii) Which of the following is the source of the hydrogen produced by the light-dependent reactions?

(1)



- A glucose
- B reduced NAD
- C reduced NADP
- D water

(Total for question = 3 marks)

Q11.

The golden snub-nosed monkey (*Rhinopithecus roxellana*) is endemic to high mountainous regions of China.

This endangered species of monkey feeds on seeds.

Golden snub-nosed monkeys live in areas with very cold winters.

The seeds in their diet contain lipids and carbohydrates.

Climate change is reducing seed production by plants in their habitat.

Discuss the impact of climate change on the monkey population.

(4)



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EXAM PAPERS PRACTICE (Total for question = 4 marks)

Q12. The coffee husks, shown in the photograph, are a waste product of coffee plantations.

Composting has been suggested as an environmentally friendly way of decomposing these coffee husks.



The effect of adding cow dung to coffee husks, before they are composted, has been investigated.

The table shows the percentages of organic carbon and nitrogen in two compost heaps at the start of composting and after 90 days.

	Husks alone		Husks with added cow dung	
Days composting	0	90	0	90
Organic carbon (%)	54.50	41.70	48.10	35.40
Nitrogen (%)	1.84	2.31	2.76	3.19

* The changes in the compost heaps are due to the activity of decomposers and other organisms.

Devise an investigation to determine the effect of the carbon to nitrogen ratio on the succession of species in these compost heaps.

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(Total for question = 6 marks)

Q13.

Glycolysis is inhibited by acidic conditions.

Devise an investigation to determine the effect of acidic conditions on the initial rate of reaction of phosphofructokinase.

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(Total for question = 4 marks)

Q14.

The scientific article you have studied is adapted from *The Biologist*.

Use the information from the scientific article and your own knowledge to answer the following question.

Human cells can be grown in monolayers using tissue culture (Figure 1).

Devise a procedure to investigate the effect of temperature on the growth rate of a monolayer of human cells.

(5)

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(Total for question = 5 marks)

Q15.

A student investigated the light-dependent reactions of photosynthesis in spinach leaves. The leaves were cut into pieces and ground in a cold solution of sucrose and a buffer.

The mixture was filtered and centrifuged. The liquid in the tube was poured off and kept in an ice water bath.

The pellet at the bottom of the tube was suspended by mixing with fresh sucrose and buffer and stored in an ice water bath.

Four tubes were then set up as follows:

Tube	Liquid poured off after centrifuging / cm ³	Resuspended pellet / cm ³	Sucrose and buffer solution / cm ³
1	-	0.5	-
2	-	-	0.5
3	-	0.5	-
4	0.5	-	-

The tubes had 5 cm³ of DCPIP added to them. Tube 3 was kept in the dark and the others kept in the light.

After twenty minutes, the colour in each tube was recorded. The results are shown in the table below.

Tube	Colour in tube
1	pale green
2	blue
3	blue
4	blue



(a) (i) Give **two** reasons why a cold solution containing sucrose and a buffer was used in this investigation.

(2)

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(ii) Give a reason why tube 3 was used in this investigation.

(1)

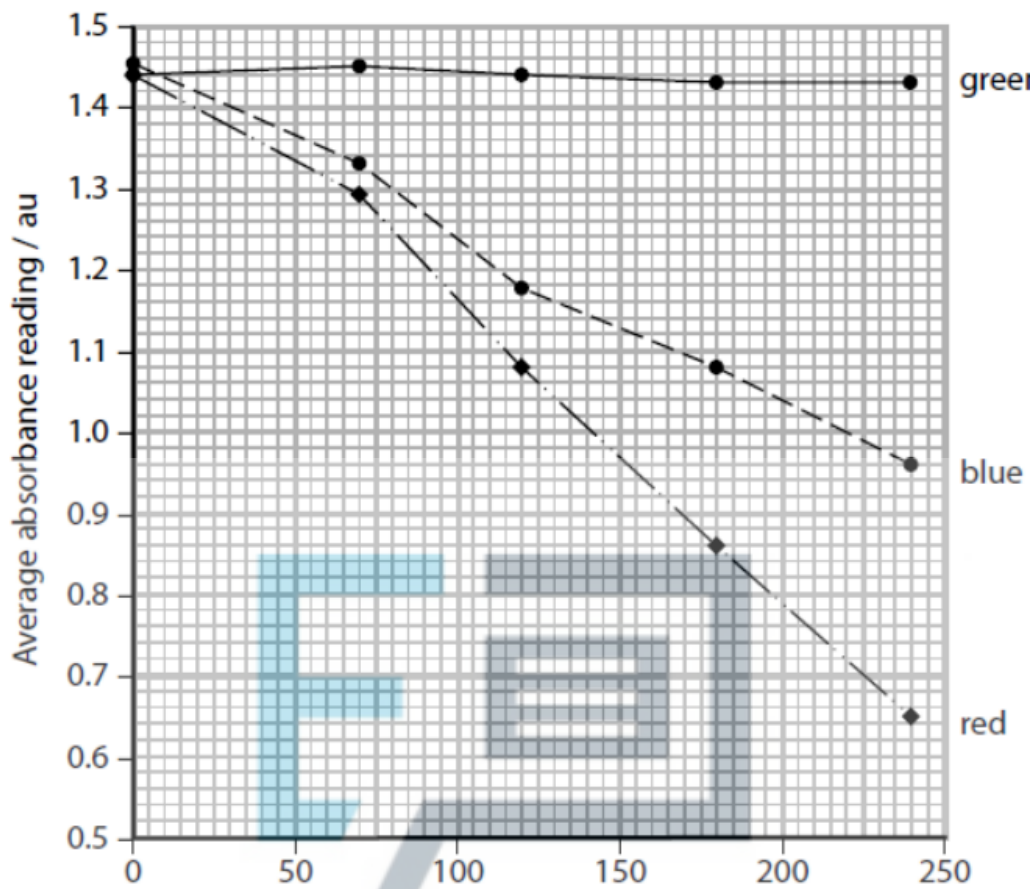
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(iii) In another investigation, the student wanted to determine the effect of different wavelengths of light on the light-dependent stage of photosynthesis.

The student modified her first investigation to obtain results.

The graph shows the results of her modified investigation.



Explain how the student modified the practical procedure of the first investigation to enable these results to be obtained.

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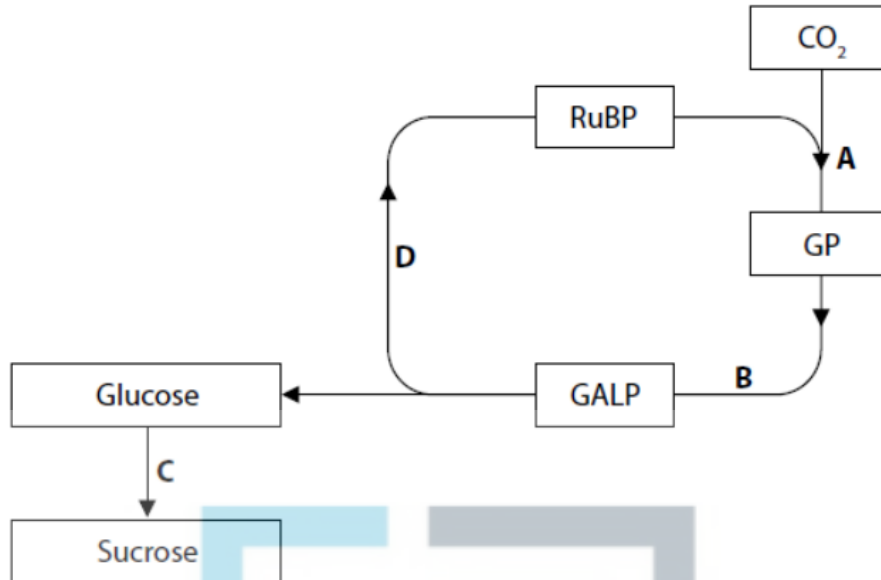
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(b) The diagram shows part of the Calvin cycle (light-independent reactions) of photosynthesis.



Place a cross in the box which indicates the correct stage (A – D) for the following statements.

(i) The stage which involves a condensation reaction and fructose.

(1)

A

B

C

D

(ii) The stage where the enzyme RUBISCO is involved.

(1)

A

B

C

D

(Total for question = 9 marks)



Q16.

A student investigated the effect of salt concentration on the growth of one species of brine shrimp.

The student placed 100 shrimp eggs in a beaker containing 1dm^3 of 3% salt solution. Three days after the eggs hatched, 10 shrimps were collected and their lengths measured. Seven days after hatching, another 10 shrimps were collected and their lengths measured.

The procedure was repeated using a 5% salt solution. All other variables were kept constant. The results are shown in the table.

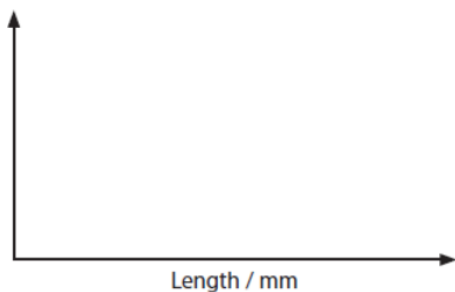


Specimen number	Length of specimen in 3% salt solution / mm		Length of specimen in 5% salt solution / mm	
	3 days after hatching	7 days after hatching	3 days after hatching	7 days after hatching
1	0.75	1.00	0.75	0.98
2	0.78	1.25	0.73	0.95
3	0.66	1.10	0.61	0.93
4	0.73	1.03	0.63	0.83
5	0.85	1.15	0.53	0.98
6	0.78	1.08	0.60	1.08
7	0.90	1.13	0.52	0.95
8	0.90	1.05	0.81	1.03
9	0.80	1.18	0.58	0.88
10	0.85	1.05	0.68	0.88
Mean	0.800	1.102		0.949

The student carried out a statistical test to see if there was a significant difference between the mean lengths of brine shrimps in these two salt solutions. The student used the 7 days after hatching data.

The student selected the t -test because the data are normally distributed.

(i) Draw a line on the graph to show a normal distribution for a population of brine shrimp.



(1)



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(ii) Complete the table by filling in the missing value for specimen 7 and then calculate the value for

$$\Sigma x_1^2$$

(1)

Specimen number (n)	3% salt solution		5% salt solution	
	Length of specimen (x_1)	Square of length of specimen (x_1^2)	Length of specimen (x_2)	Square of length of specimen (x_2^2)
1	1.00	1.000	0.98	0.960
2	1.25	1.563	0.95	0.903
3	1.10	1.210	0.93	0.865
4	1.03	1.061	0.83	0.689
5	1.15	1.323	0.98	0.960
6	1.08	1.166	1.08	1.166
7	1.13	0.95	0.903
8	1.05	1.103	1.03	1.061
9	1.18	1.392	0.88	0.774
10	1.05	1.103	0.88	0.774
Sum (Σ)	$\Sigma x_1 = 11.020$	$\Sigma x_1^2 =$	$\Sigma x_2 = 9.490$	$\Sigma x_2^2 = 9.055$
Mean	$\bar{x}_1 = 1.102$		$\bar{x}_2 = 0.949$	



(iii) The variances are used in the calculation of a *t*-value.

The variance for the 3% salt solution $S_1^2 = 0.0059$.

Calculate the variance for the 5% salt solution (S_2^2) using the formula

$$S_2^2 = \frac{\sum x_2^2 - \frac{(\sum x_2)^2}{n}}{n-1}$$

n = the number of specimens



(2)

(iv) Calculate the *t*-value using the formula.

Give your answer to an appropriate number of significant figures.

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$$t = \frac{\bar{x}_1 - \bar{x}_2}{\sqrt{\frac{s_1^2}{n_1} + \frac{s_2^2}{n_2}}}$$

(3)

t =

(v) The calculated *t*-value is greater than the critical value at *p* = 0.05.

Describe what this result indicates about the effect of salt concentration on the length of brine shrimp.

(2)



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(Total for question = 9 marks)



Q17.

The pigment content of mountain plants can be affected by various environmental factors. These factors include altitude (height up a mountain), exposure to ultraviolet radiation (UV-B) and temperature.

These pigments include chlorophyll, found in chloroplasts, and flavonoids that are found in sap vacuoles.

Flavonoids can protect plants from ultraviolet radiation (UV-B) that can damage DNA. State the location of chlorophyll in a chloroplast.

(1)

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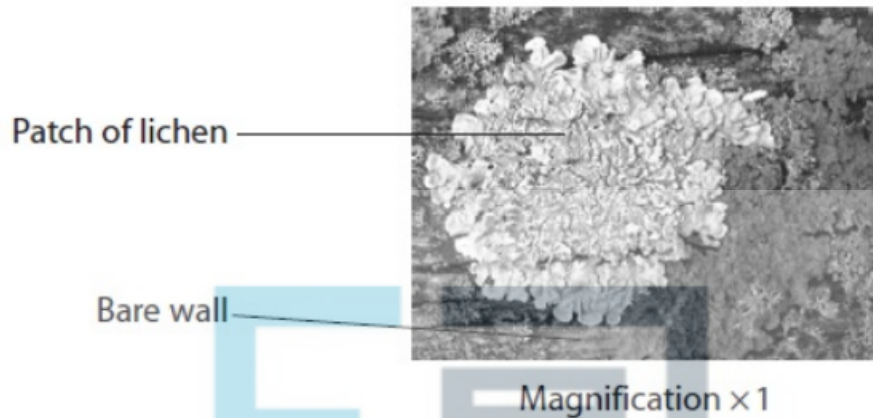
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Q18.

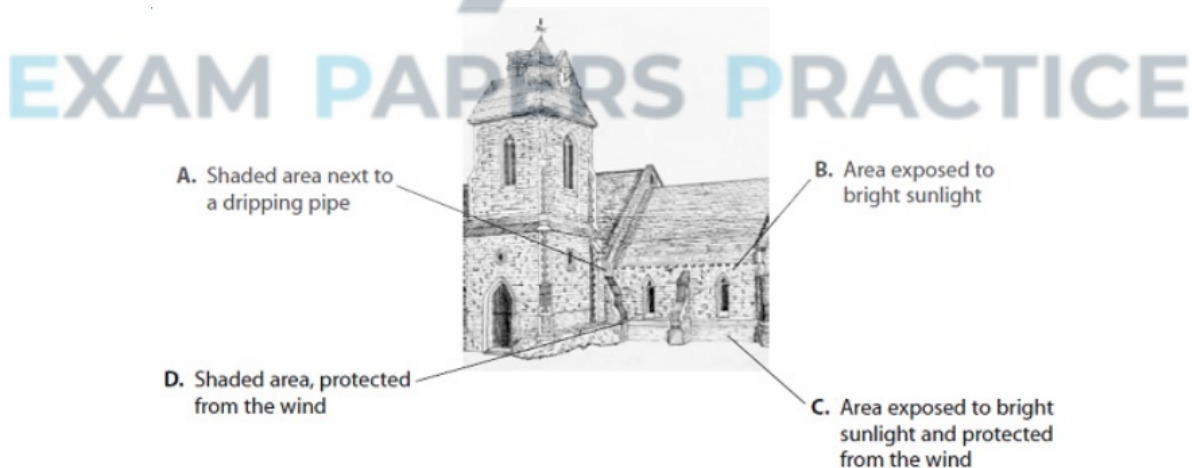
Lichen consists of two organisms, an alga and a fungus, growing together. The alga photosynthesises producing carbohydrate for the two organisms and the fungus absorbs and retains water so that the lichen does not dry out.

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



Algae and fungi are eukaryotic organisms.

(a) Place a cross



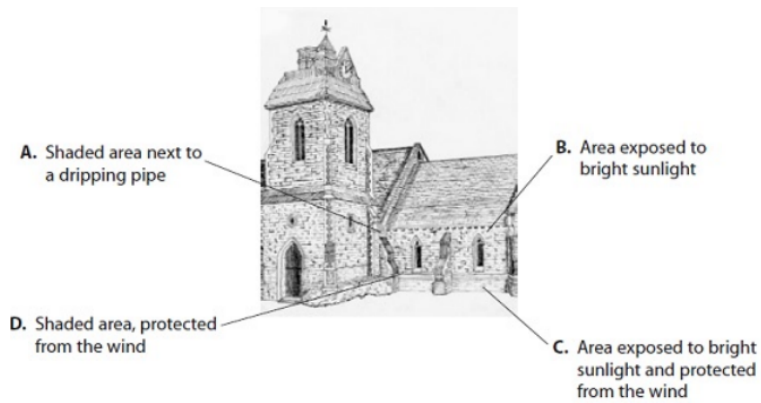
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next to the names of cell structures that would be used to classify algae and fungi as eukaryotic organisms.

(1)

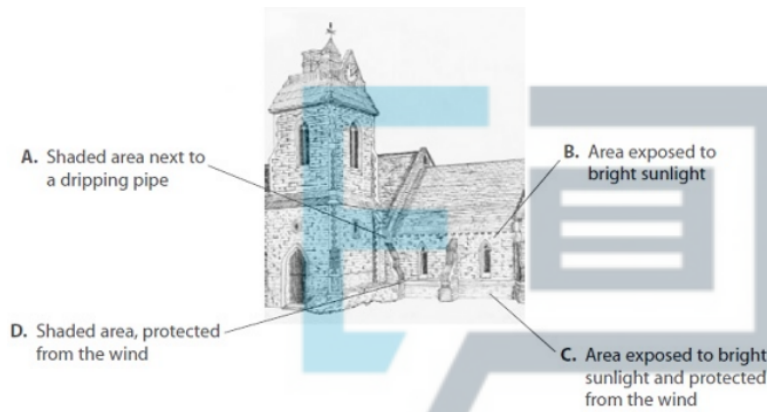


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A cytoplasm and large

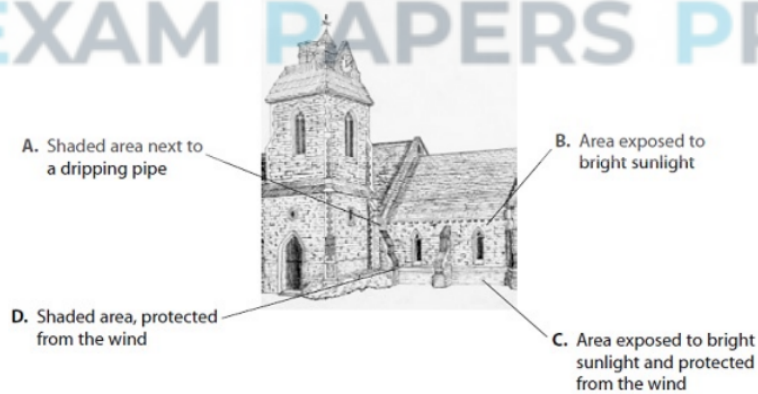
(80S) ribosomes



B cytoplasm and small

(70S) ribosomes

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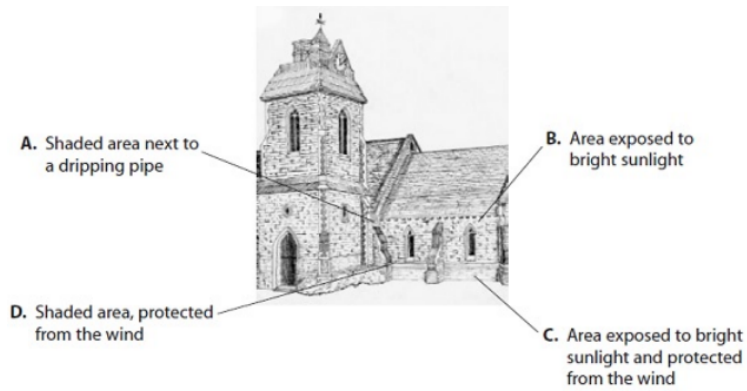


C nucleus and large (80S)

ribosomes



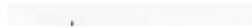
EXAM PAPERS PRACTICE



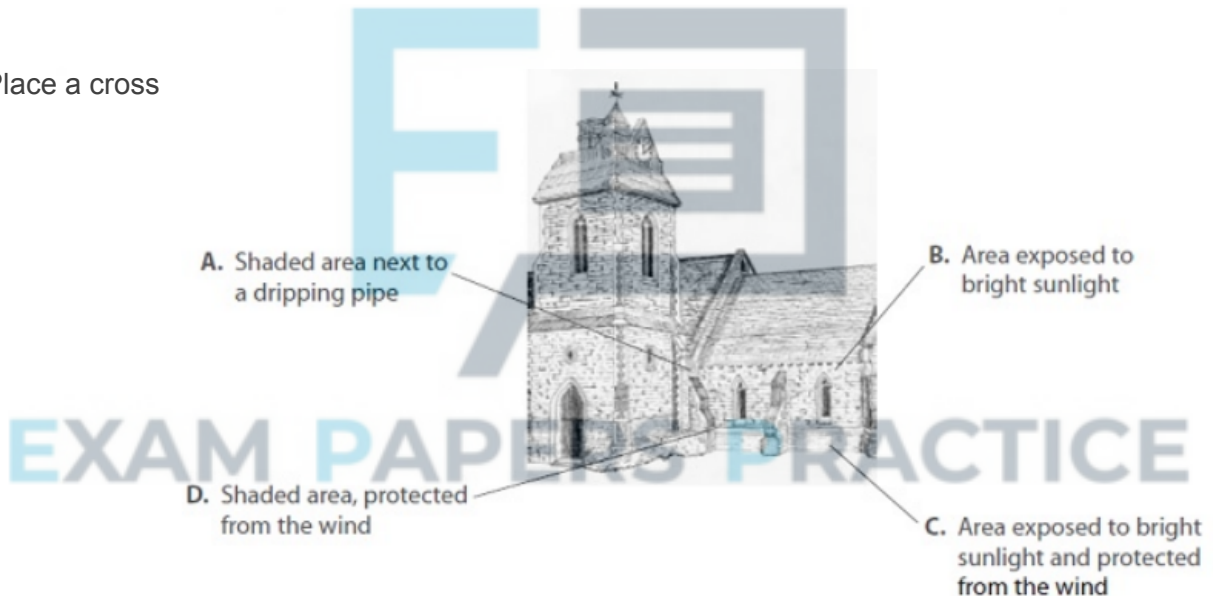
D nucleus and small (70S)

ribosomes

(b) Place a cross



(b) Place a cross



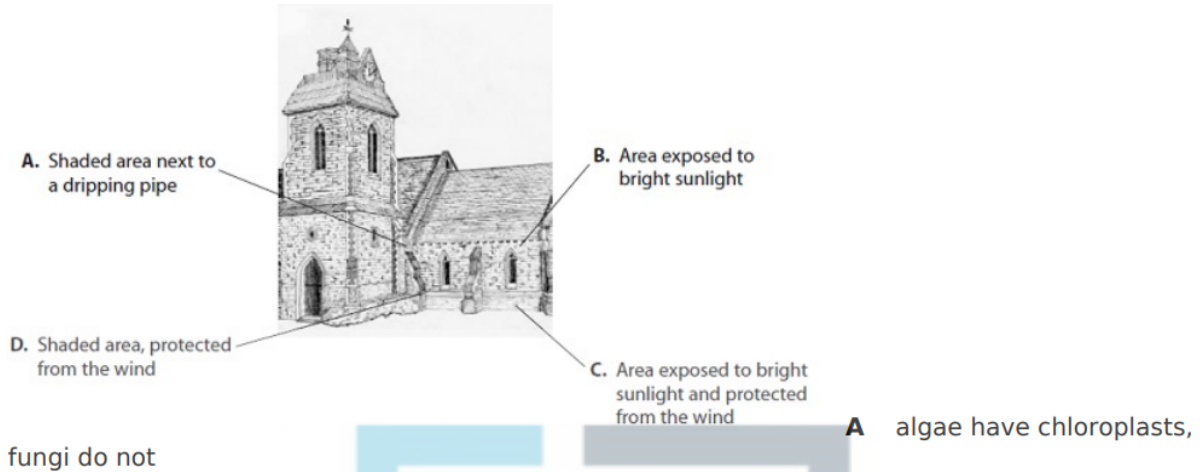
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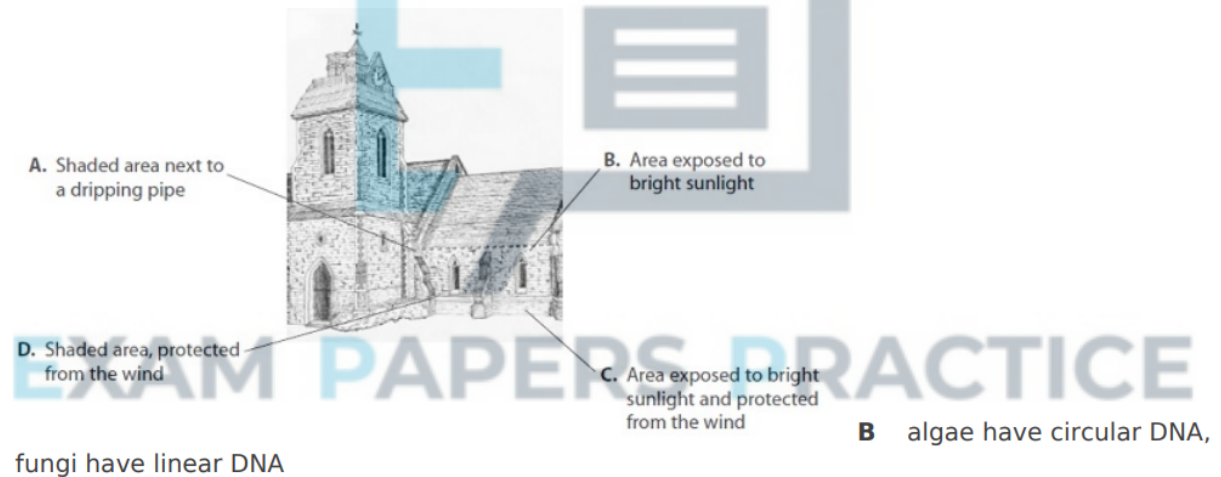
EXAM PAPERS PRACTICE

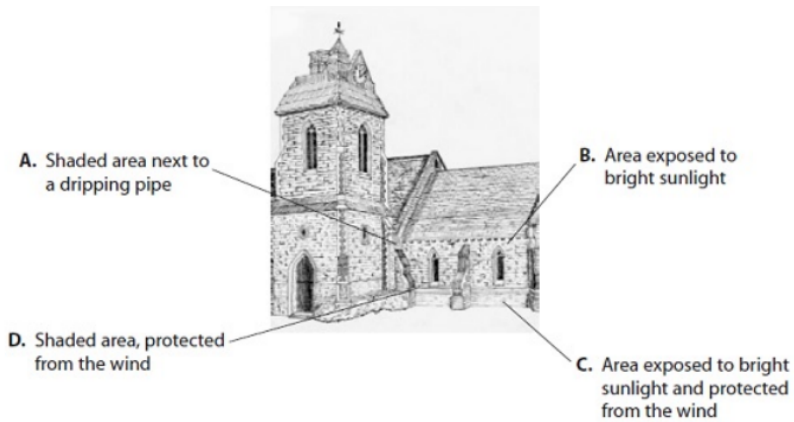
next to one difference in cell structure between these two eukaryotic organisms.

(1)



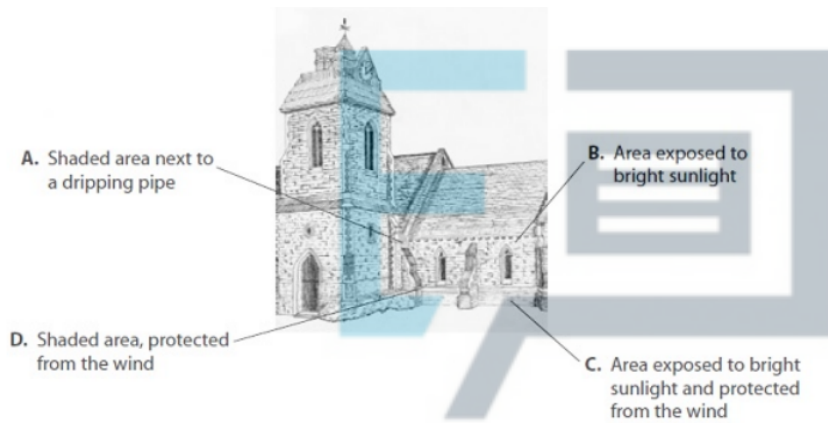
fungi do not





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.

(2)

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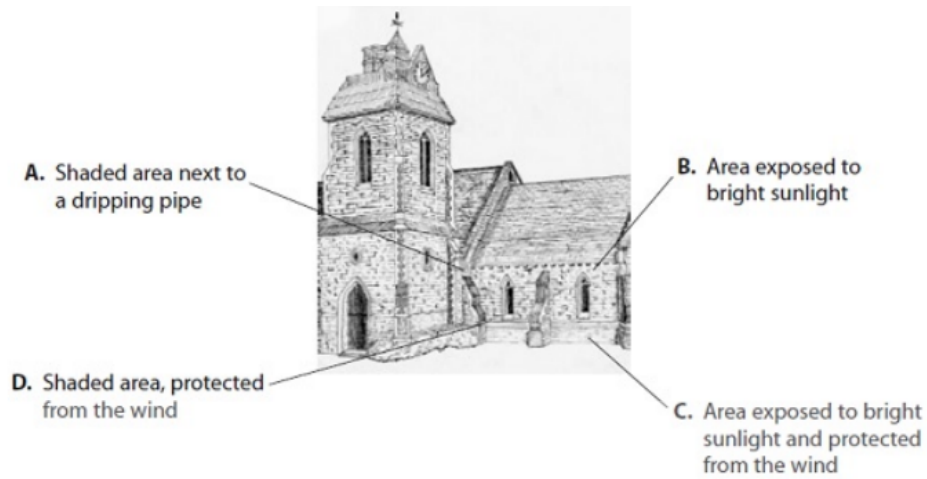
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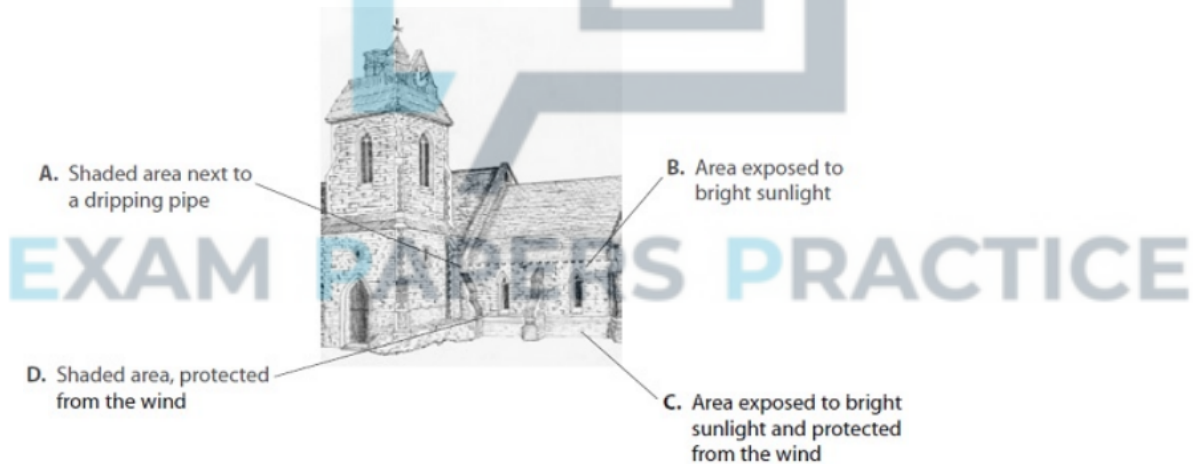


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(d) The diagram below shows the conditions at four positions, A, B, C and D, on a building.



(i) Place a cross



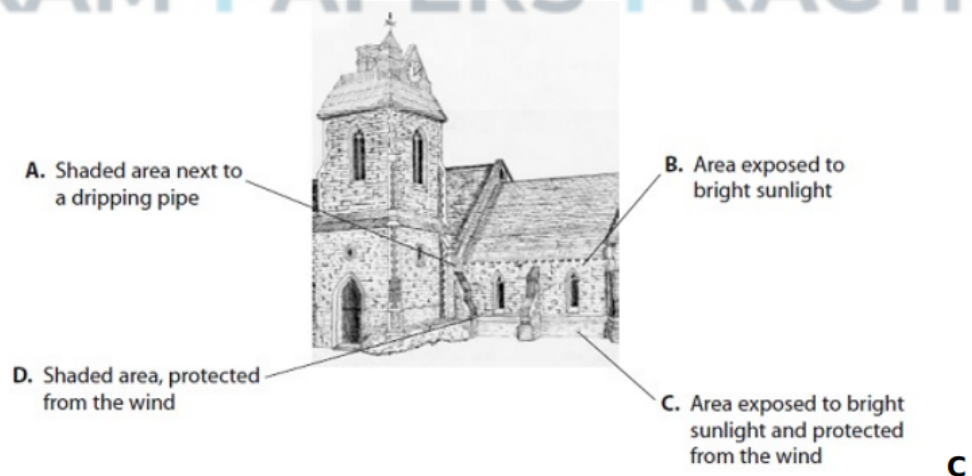
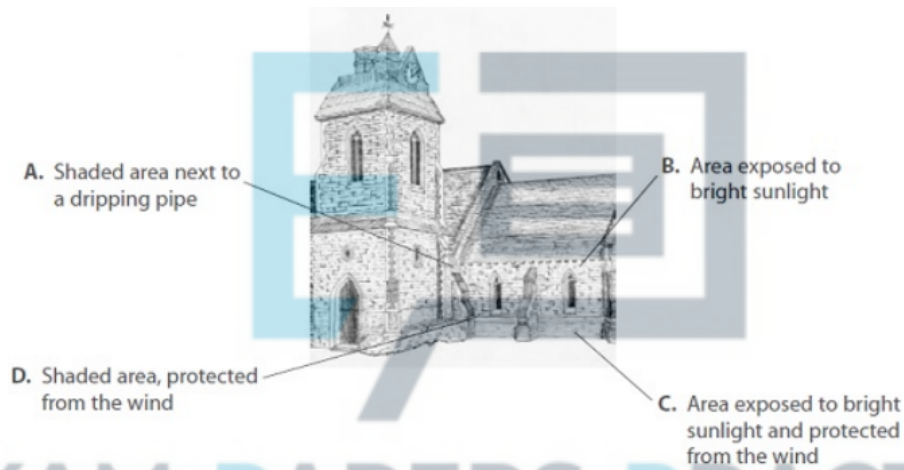
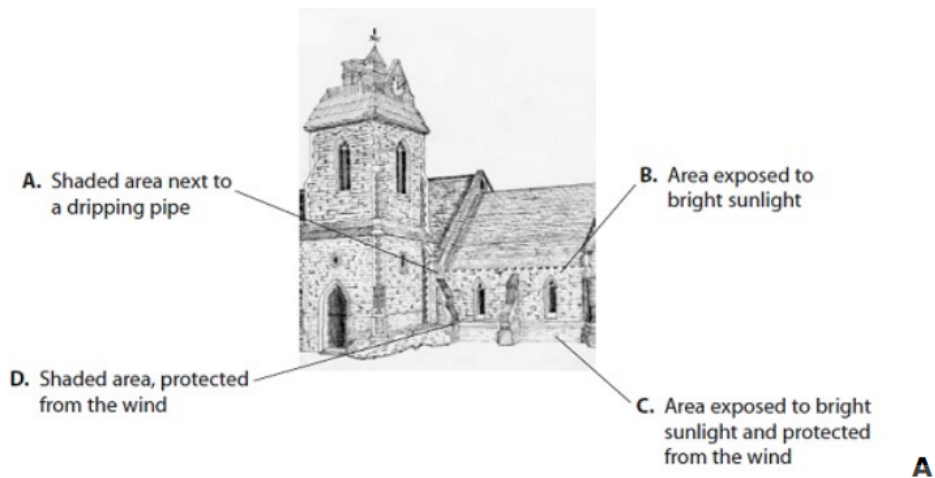
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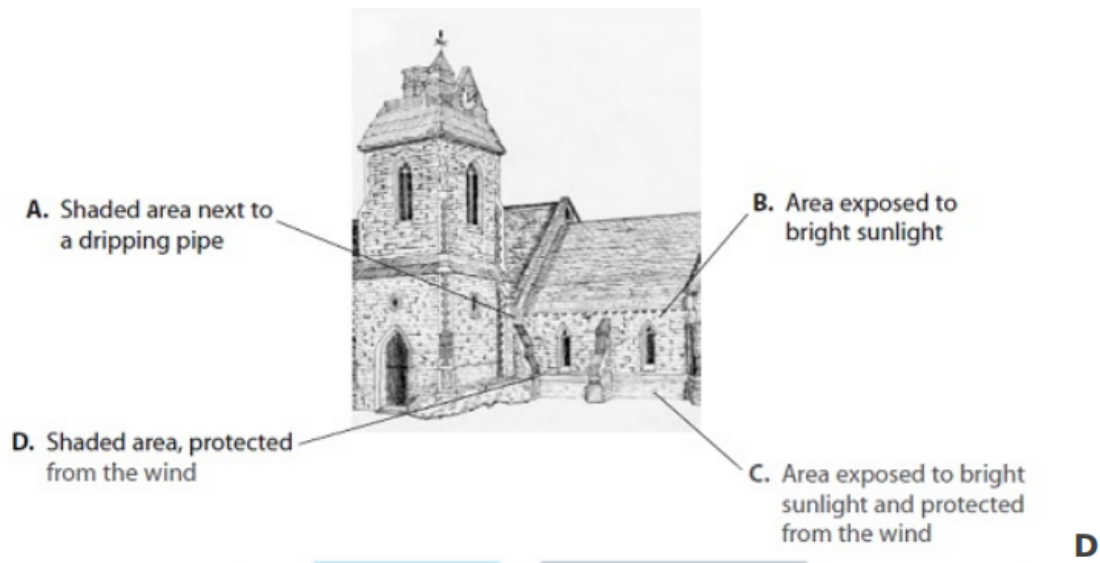
next to the position where the lichen is likely to be most abundant.

(1)



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(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.

(3)



(Total for Question = 13 marks)

Q19.

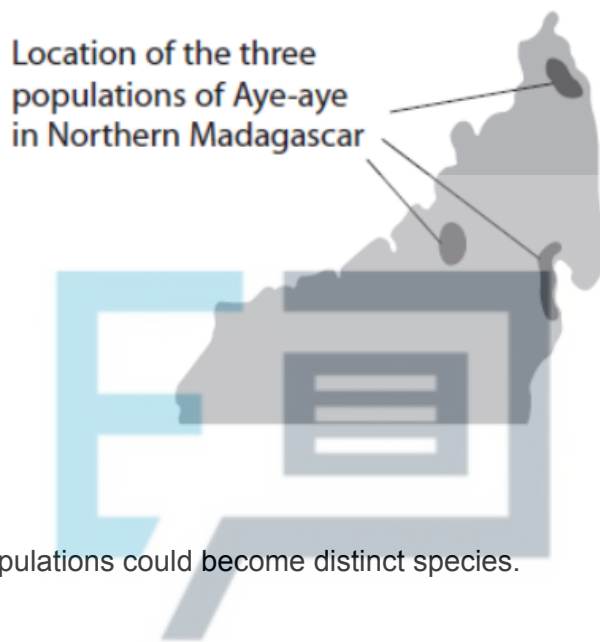
Madagascar is an island rich in biodiversity.

Lemurs are a diverse group of primates endemic to Madagascar.



Scientists suggest there may be as many as 100 different species of lemur. One species of lemur, the Aye-aye, is found throughout the forests of Northern Madagascar. Deforestation is taking place in this part of Madagascar.

Scientists have identified three separate populations of Aye-aye in this area, as shown on the map.



Explain how these three populations could become distinct species.

(3)

EXAM PAPERS PRACTICE

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Q20.

The scientific article you have studied is adapted from several sources.

Use the information from the scientific article and your own knowledge to answer the following questions.

Name one process that would have validated Pettersson's paper before it was published in the journal known as the Proceedings of the National Academy of Science (paragraph 58).

(1)

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(Total for question = 1 mark)

EXAM PAPERS PRACTICE

Q21.

The scientific article you have studied is adapted from *Scientific American*.

Use the information from the scientific article and your own knowledge to answer the following question.

Explain why natural selection took place in Darwin's Galapagos finches (paragraph 3).

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(Total for question = 3 marks)

Q22.

During the civil war in Mozambique, from 1977 to 1992, 90% of the African elephants were killed for the ivory in their tusks.

Since 1992, the elephant population in Mozambique has increased.



© ALEXANDER JOE/Staff/Getty Images

The photograph shows a group of elephants in Mozambique.

A study of an elephant population in Mozambique was carried out in 2017. The elephants studied were all born before 1992.

The table shows the number of elephants with and without tusks.



EXAM PAPERS PRACTICE

Elephants	Number of elephants
with tusks	98
without tusks	102

In most African elephant populations, 2% to 4% of elephants do not grow tusks.

(i) Explain why the percentage of elephants without tusks in Mozambique will probably increase in the future.

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(ii) Describe how the Hardy-Weinberg equation can be used to provide evidence for changes in the elephant population in Mozambique.

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(Total for question = 5 marks)

Q23.

Climate change has been linked to the release of carbon dioxide from some power stations. Net primary productivity (NPP) is a measure of the increase in biomass of a plant. Explain why respiration affects the production of biomass.

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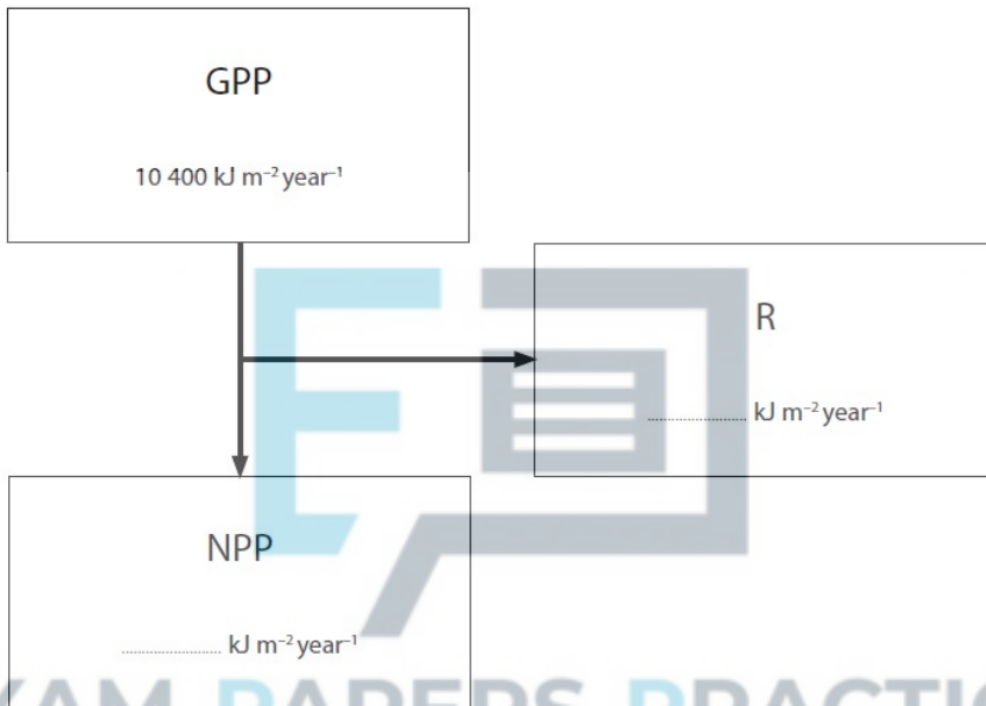
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(Total for question = 2 marks)

Q24.

Farmers find it helpful to know the productivity of their land.

The diagram below shows the relationship between GPP (gross primary productivity), NPP (net primary productivity) and R (plant respiration) for an area of grassland.



(a) The efficiency of the transfer of energy from GPP to NPP for this grassland is 45%.

(i) Calculate the values for NPP and R. Write your answers in the diagram above.

(2)

(ii) Using the information given, explain the relationship between GPP and NPP.

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(b) Suggest why NPP values would be of use to a farmer who wanted to use this land for cattle.

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(c) The units ($\text{kJ m}^{-2} \text{year}^{-1}$) used in the diagram show a rate of energy production. Suggest why this is more useful than measurements of biomass in the grassland on a particular day.

(2)

EXAM PAPERS PRACTICE

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(Total for Question = 10 marks)

Q25.
There are two main types of woodland in the UK. One consists of broadleaved deciduous trees, the other contains coniferous trees that have needle-like leaves.

In a study of two woodlands, 11 species of plant were found in a deciduous woodland and 4 different species in a coniferous woodland.

The table shows the other data recorded in this study.



EXAM PAPERS PRACTICE

Factor	Deciduous woodland	Coniferous woodland
Mean light intensity 10 cm above soil level / lux	1075	543
Mean pH of soil	7	5
Mean air temperature 10 cm above soil level / °C	18	18
Mean soil moisture content (%)	45	47

Assess the reasons for the differences in the number of species between these two types of woodland.

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(Total for question = 4 marks)