Section 18 – Adaption and organisation in an Ecosystem

Answer Key

18.1	What is an ecosystem?	The Interaction of a community with the abiotic parts of the environment
18.2	What do organisms need to **survive and reproduce?**	**Water, food, light, space, oxygen, carbon dioxide, mates**
18.3	State 4 things that a plant competes for.	Water, space, light, carbon dioxide
18.4	State 3 things that an animal competes for.	Food, sexual mates, territory
18.5	Describe the differences between **biotic and abiotic** factors (give an example of each)	**Abiotic** is a non-living factor such as temperature or carbon dioxide. **Biotic** is a living factor such as predator or disease.
18.6	What is an extremophile? Give an example.	(micro)organisms that live in environments that are very extreme (e.g. High temp, pressure, salt concentration)
18.7	Write a 4-stage food chain and label the producer, secondary consumer, herbivore, carnivore and omnivore.	Example must start with a plant (producer). Followed by an organism that eats the plant (primary consumer), followed by a secondary consumer then a tertiary consumer.
18.8	Describe the difference between a predator and its prey.	Predator is an animal that eats prey. Prey is the animal that gets eaten.
18.9	What is biodiversity?	A **measure if the variety of all the different species of organisms within the ecosystem**
18.10	What does having greater biodiversity ensure stability in the ecosystem?	• Each species becomes less dependant on specific species for food/shelter • less pressure on certain species which could lead to extinction • all species populations are balanced
18.11	State **2 methods to determine the distribution and abundance of species** in an ecosystem.	**Random sampling using quadrat Systematic sampling using a transect**
18.12	What are the differences between random and systemic sampling?	**Random sampling** can be used to measure the distribution of one organism over a large area, **systemic sampling** can be used to see how the distribution of organisms change across one or more habitats

Section 19 – Cycles

Answer Key

19.1	Name 2 substances that can be recycled in our atmosphere?	**Carbon, and water**
19.2	State **3 process that return carbon dioxide to the atmosphere**	**Respiration, combustion, decomposition**
19.3	What uses carbon dioxide from the atmosphere?	Plants
19.4	Where does fresh water for the plants and animals come from?	Ice sheets, ice caps, glaciers, bogs, ponds, lakes, rivers, streams and underground
19.5	State 3 factors that affect the rate of decay of biological material.	Availability of oxygen, temperature and moisture levels
19.6	How do humans affect the amount of land for animals and plants?	Reduce the amount of land deforestation for farming, agriculture or building.
19.7	What is a peat bog?	Very wet areas of land without trees and where many types of moss grow. There are acidic and often have very low levels of nutrients. Lots of partially decayed organic material.
19.8	Why are peat bogs being destroyed? What is the impact of this?	To use as fuels or for agriculture. The impact is that when they are destroyed, they no longer take in large amounts of carbon and store it so contribute to the greenhouse effect and increased carbon dioxide levels.
19.9	As population increases what is happening to a) resources and b) amount of pollution?	A) Resources are decreasing B) Pollution is increasing
19.10	How is water, air and land polluted?	Water – litter, fertiliser, chemicals, pesticides Air – Greenhouse gases, carbon dioxide, particulates Land – litter, toxic chemicals
19.11	What is the impact of pollution on biodiversity?	Reduces biodiversity
19.12	**Why is the reduction in biodiversity concerning?**	**Reduced genetic diversity in organisms, can lead to the extinction of species**

Section 20 - Biodiversity

20.1	Give 3 causes to deforestation.	1. **Provide land for cattle or rice fields** 2. **Grow crops for biofuels** 3. **To clear space for building**
20.2	Which 2 gasses are increasing in the atmosphere that are contributing to global warming?	1. **Carbon dioxide** 2. **Methane**
20.3	State **3 consequences of Climate change.**	1. Increased spread of pathogens 2. **Affecting migration patterns of animals** 3. **Melting of polar ice caps, causing flooding** 4. **Reduced habitats in polar regions** 5. Reduced Biodiversity
20.4	State 3 positives and 3 negatives about human interaction in an ecosystem.	POSITIVE 1. Breeding programme for endangered species 2. Protection of regeneration of rare habitats 3. Reintroduction of field margins and hedgerows in agricultural areas where farmers grow only one type of crop 4. Reduction of deforestation and carbon dioxide emissions by some governments 5. Recycling resourcing rather than dumping waste NEGATIVE 1. Clearing of land for agriculture buildings and/or transport 2. Hunting of rare species 3. Mining from the land
20.5	What is a trophic level?	The position a species occupies in the food chain.
20.6	What type of organisms are found in a trophic Level 1?	Plants and Algae
20.7	What **group of organisms break down dead, organic materials?**	**Decomposers (**microorganisms)
20.8	What do pyramids of biomass represent?	The relative amount of biomass in each level of food chain
20.9	**State 2 ways in which biomass is lost through the food chain.**	1. **Not all the ingested material is absorbed, some is egested as faeces** 2. **Some absorbed material is lost as waste, such as carbon dioxide and water in respiration and water in urea and urine**
20.10	Approximately how much energy is transferred between each trophic level?	10%
20.11	What is global dimming?	**Global dimming** is defined as the decrease in the amounts of solar radiation reaching the surface of the Earthy

Foundation Tier

Q1.

This question is about carbon dioxide emissions.

The following table shows information about carbon dioxide emissions in the UK.

| Year | Mass of carbon dioxide in kg × 10^5 | | |
	Emitted from electricity production	Emitted from paper production	Total emitted from all sources
2006	1263	54	6314
2009	902	32	55
2012	1258	29	5567
2015	768	27	5043

(a) Suggest **two** reasons why carbon dioxide emissions from paper production decreased from 2006 to 2015.

1 _____

_____

2 _____

_____

(2)

(b) Suggest **two** reasons why carbon dioxide emissions from electricity production decreased from 2012 to 2015.

1 _____

_____

2 _____

_____

(2)

(c) Calculate the percentage of the total carbon dioxide emissions in 2006 that was from electricity production.

_____

_____

_____

Percentage = _____ %

(2)

(d)   Explain the possible consequences of a future increase in carbon dioxide emissions.

_____

_____

_____

_____

_____

_____

_____

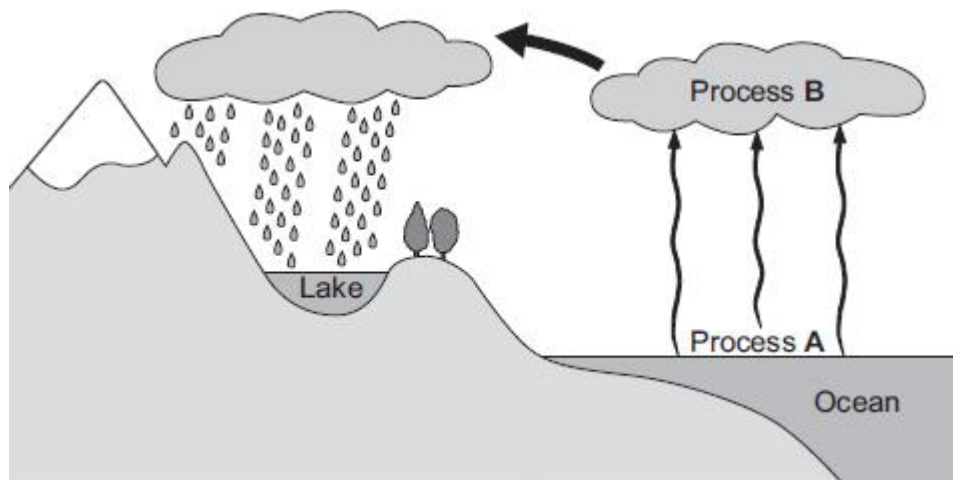_____

_____

_____

_____

_____

(6)
(Total 12 marks)

Q2.

Figure 1 shows some of the processes in the water cycle.

Figure 1
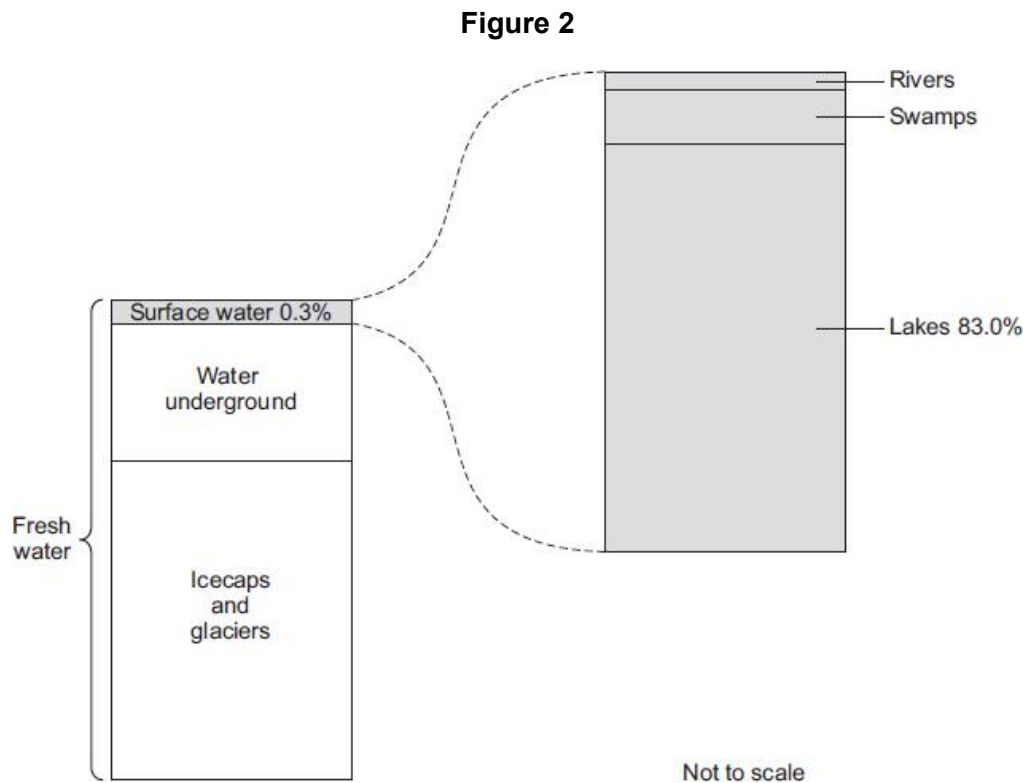

(a)   Name process **A** and process **B**.

A _____

B _____

(2)

(b) **Figure 2** shows the locations of fresh water on Earth.

Figure 2

Not to scale

Calculate the amount of fresh water in lakes as a percentage of the total amount of fresh water.

_____

_____

_____

Percentage = _____ %

(2)

(c) Give **two** ways humans pollute the water in lakes.

Do **not** refer to litter, plastic pollution or rubbish.

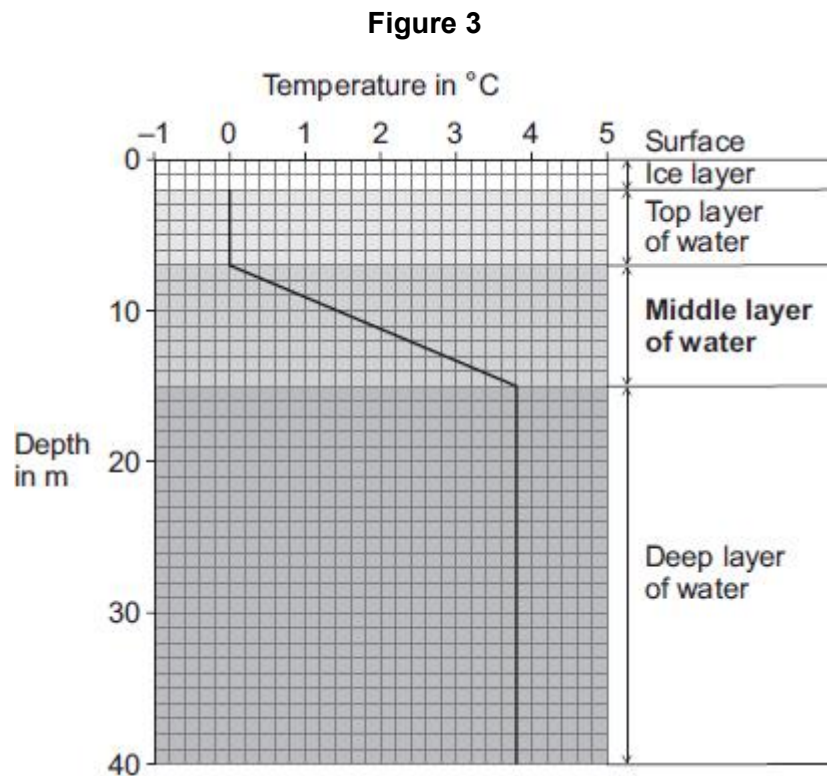1 _____

_____

2 _____

_____

(2)

The surface of a lake can freeze if the water at the surface of the lake cools to 0 °C.

Figure 3 shows the temperature of the water at increasing depth in a lake in winter.

Figure 3

(d) Suggest why organisms in the lake can survive in winter.

Use **Figure 3**.

_____

_____

(1)

(e) The middle layer of water is from 7 metres below the surface to 15 metres below the surface.

The temperature at a depth of 7 metres below the surface is 0 °C.

Determine the change in temperature per metre in the middle layer of water.

Use the equation:

$$\text{change in temperature per metre} = \frac{\text{change in temperature}}{\text{change in depth}}$$

Change in temperature = _____ °C/m

(3)

(f)   Write down the equation which links density (ρ), mass (m) and volume (V).

_____

(1)

(g)   The density of ice is 920 kg/m^3.

Calculate the volume of 2.3 kg of ice.

_____

_____

_____

_____

_____

Volume = _____ m^3

(3)

(h)   Describe a method to measure the mass and volume of a liquid.

_____

_____

_____

_____

_____
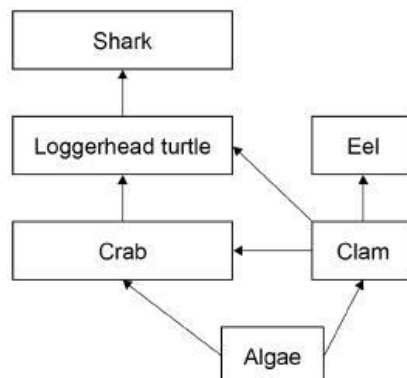
_____

_____

_____

_____

_____

(4)
(Total 18 marks)

Higher Tier

Q3.

The diagram below shows part of a food web.

(a) There are four levels of feeding relationship shown in the food web in the diagram above.

Algae are at level 1 in the food web.

Why is it difficult to identify the level of the loggerhead turtle in the food web?

_____

_____

(1)

(b) Explain the effects a decrease in the population of clams could have on the other organisms in the diagram above.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(6)

(c)   Female loggerhead turtles lay their eggs in nests on sandy beaches.

The table below shows how the temperature of the nest affects the sex of the loggerhead turtles.

Temperature of nest in °C	Sex of loggerhead turtles hatching from eggs
> 29	more females than males
29	equal numbers of males and of females
< 29	more males than females

Explain how the continued use of fossil fuels could affect the population of loggerhead turtles.

Use information from table above.

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

_____

(4)

(Total 11 marks)

Q4.

Field studies can be used to investigate the abundance and distribution of a species.

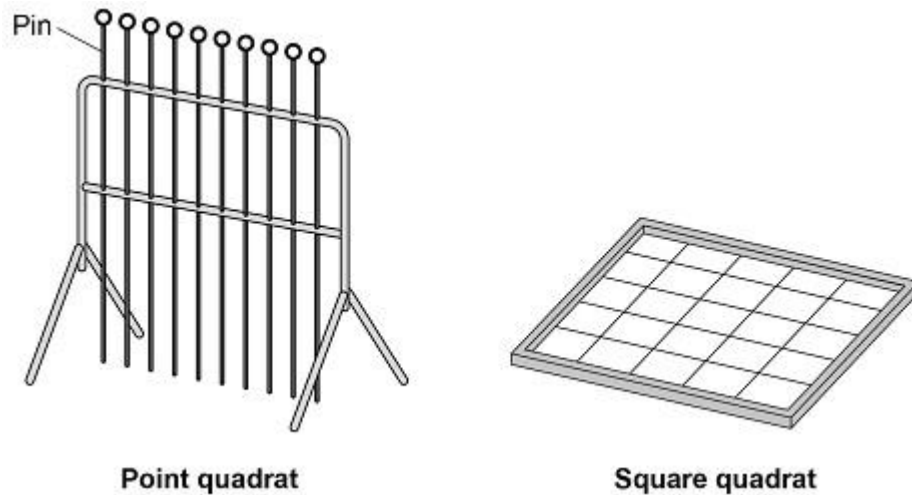(a) Define the following biological words.

Abundance _____

_____

Distribution _____

_____

(2)

Quadrats can be used to estimate the percentage cover of plants in an area.

A point quadrat can be used instead of a square quadrat.

The figure below shows a point quadrat and a square quadrat.

Point quadrat   **Square quadrat**

When using a point quadrat, any plant species touching a pin is recorded.

Students investigated the percentage cover of different plant species at increasing distances from a school building.

(b) Describe how students could collect data for this investigation using a point quadrat.

_____

_____

_____

_____

_____

_____

_____

(4)

(c)   The percentage cover of each species can be estimated using the equation:

$$\text{percentage cover} = \frac{\text{number of times a pin touches a species}}{\text{total number of pins used}} \times 100$$

30 students each collected results from 80 pins. The students then put all their results into one results table.

Dandelions had a mean percentage cover of 6.25%

Calculate the number of times dandelions touched a pin.

_____

_____

_____

_____

Number of times dandelions touched a pin = _____

(3)

(d)   Describe why this investigation would only give an estimate of the percentage cover of dandelions.

_____

_____

(1)

(e)   Point quadrats give a more accurate estimate of percentage cover than square quadrats.

What is a **disadvantage** of using point quadrats rather than square quadrats?

Tick (✓) **one** box.

Results collected using point
quadrats are more biased   ☐

Plants at all heights are recorded   ☐

Point quadrats need a judgement
of percentage cover   ☐

Rare species are less likely to be
sampled   ☐

(1)

(f)   Describe the process of evolution by which some plants survive in fields where
        animals eat the plants.

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

        _____

(4)
(Total 15 marks)

Mark schemes

Q1.

(a) any **two** from:
- increased use of electronic devices (for reading / working)
  allow less paper used
- increased recycling of paper
  ignore less paper produced
- paper production processes are more efficient / modern (and produce less carbon dioxide)
  ignore references to re-planting trees
  ignore carbon offset

2

(b) any **two** from:
- decreased use of fossil fuels
  allow named example

- increased use of renewable sources for electricity production
  allow named example

- increased electricity production from nuclear power stations

- increased use of carbon capture / carbon storage

- less electricity produced / used (in the UK)
  allow idea of greater use of energy efficient appliances / devices

- to comply with government regulations

2

(c)

*an answer of 20 scores **2** marks*

$$\frac{126\ 300\ 000}{631\ 400\ 000} \times 100$$

allow $\frac{1263}{6314} \times 100$

1

20 (%)

1

(d) **Level 3**: Relevant points (reasons / causes) are identified, given in detail and logically linked to form a clear account.

5-6

Level 2: Relevant points (reasons / causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3-4

Level 1: Points are identified and stated simply, but their relevance is

not clear and there is no attempt at logical linking.

No relevant content

Indicative content

mechanism:
* rise in greenhouse gases
* carbon dioxide / greenhouse gases absorb (long-wavelength) radiation
* (causing) an increase in temperature
* (causing) global warming
* (causes) climate change

consequences of global warming:
* melting of ice caps
* (causing) sea levels to rise
* (causes) flooding (of low-lying land masses)

* (causes) habitat destruction
* leading to extinction
* (causing) reduction in biodiversity

* increase in extreme weather
* changes in rainfall
* (causes) drought / water shortage
* (causes) changes to yield of crops in some areas
* (may lead to) food shortages

* changes to migratory patterns of animals
* changes in species distributions
* (causes) changes in food webs

* increased (geographical) range of tropical diseases
* increased absorption of carbon dioxide into the seas and oceans
* (causes) acidification of oceans
* (which) could lead to changes in species abundance

For Level 3 mechanism and linked consequences needed

[12]

Q2.

(a) (**A**) evaporation

this order only

1

(**B**) condensation

1

(b) $0.3 \times \dfrac{83}{100}$

allow $\dfrac{0.3}{100} \times 83$

1

0.249 (%)

allow 0.25 / 0.2 (%)

1

(c) any **two** from:
- sewage
- toxins
- fertilisers

2

(d) deep(er) / middle layer is warmer (than surface)

or

deep(er) / middle layer does not freeze

allow deep(er) layer is insulated by ice
allow only the surface freezes

or

(organisms) move to deep(er) / middle layer

1

(e) 3.8 °C (at 15 m)

1

$\left(\dfrac{\text{change in temperature}}{\text{change in depth}} = \right)$

$\dfrac{3.8 - 0}{15 - 7}$

allow $\dfrac{3.8}{8}$

1

= 0.475 (°C/m)

1

(f) $\text{density} = \dfrac{\text{mass}}{\text{volume}}$

or

$\rho = \dfrac{m}{V}$

allow any correct rearrangement

1

(g) $920 = \dfrac{2.3}{V}$

1

$V = \dfrac{2.3}{920}$

1

$V = 0.0025$ (m^3)

1

(h) **Level 2:** The method would lead to the production of a valid outcome. The key steps are identified and logically sequenced.

3−4

Level 1: The method would not lead to a valid outcome. Some relevant steps are identified, but links are not made clear.

1−2

No relevant content

0

Indicative content
- measure mass of empty measuring cylinder **or** other vessel **or** place measuring cylinder on balance and zero
- measure volume with a measuring cylinder **or** 10 / 20 cm^3 pipette
  or volumetric pipette **or** volumetric flask.
  Not beaker.
- measuring to lowest point on meniscus
- view level with meniscus / liquid
- pour liquid into vessel
- measure mass of liquid with balance
- subtract mass of measuring cylinder

[18]

Q3.

(a) any **one** from :

- the loggerhead turtle is at level 3 **and** level 4

- the loggerhead turtle is a secondary consumer **and** a tertiary consumer

1

(b) **Level 3:** Relevant points (reasons/causes) are identified, given in detail and logically linked to form a clear account.

5−6

Level 2: Relevant points (reasons/causes) are identified, and there are attempts at logical linking. The resulting account is not fully clear.

3−4

Level 1: Points are identified and stated simply, but their relevance is not clear and there is no attempt at logical linking.

1−2

No relevant content

0

Indicative content

- eel population will decrease
- because less clams to eat

- algae levels will increase
- because less algae being eaten

- crabs may decrease
- because less clams to eat

- crabs may stay the same
- because more algae but less clams

- crabs may decrease
- because more eaten by loggerhead turtles

- crabs may increase
- because more algae

- loggerhead turtles may decrease
- because less clams to eat

- loggerhead turtles may stay the same
- because more crabs but less clams

- loggerhead turtles may increase
- because more crabs

- shark may decrease
- because loggerhead turtles may decrease

- shark may stay the same
- because the loggerhead turtle is unaffected

- shark may increase
- because the loggerhead turtle may increase

For Level 3, relevant points must be given for several organisms directly linked within the food chain and the causes for the change.

(c)   (use of fossil fuels) increases greenhouse gases
or
increase in carbon dioxide (released)

1

(causing) an increase in global temperature
or
global warming causes temperature to rise
or
greenhouse effect causes temperature to rise

1

(so there) is an increase in number of females born
or
decrease in number of males born

max 3 marks if information in the table not used

1

leading to decrease in the population / extinction

Q4.

(a) (Abundance)
number of organisms / individuals (of a species) in an area
or
percentage cover in an area

*allow the population (of a species) in an
area*

1

(Distribution)
where the organisms (of a species) are found (in an area)

1

(b) place tape measure from school building
or
use a transect from the school building

*allow place line / string from school
building*

1

place (point) quadrat at regular / known intervals (along the line)
allow a description of certain distances

1

record / count the number of each plant species (touching pins)

1

repeat along different transects / lines (from school building)

1

(c)
*an answer of 150 scores **3** marks*

$$6.25 = \frac{n}{30 \times 80} \times 100$$

1

$$n = \frac{6.25}{100} \times 2\,400$$

$$\text{allow } n = \frac{6.25}{100} \times 80$$

1

n = 150

*allow correct calculation using 80 as the
total number of pins*

1

(d) only a sample of data was collected
allow the percentage cover was not

1

(e)   rare species are less likely to be sampled

1

(f)   (genetic variation in plants arising from) mutation for a beneficial characteristic

1

such as to be flatter to withstand trampling / nibbling
or
to grow again quickly from the roots
or
poisons / thorns / taste to deter herbivores

1

those with gene(s) for named adaptation more likely to survive and breed

1

to pass on (favourable) genes repeated over many generations until the characteristic is in all / most of the population

1

[15]