

Biodiversity Notes

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Biodiversity: is the variety of living organisms in an area or habitat.

Life on earth is dependent on the interactions between billions of living things. The grazers are dependent on the growth of grasses. Predators are dependent on their prey. Decomposers are dependent on breaking down dead organisms & plants depend on these nutrients to grow. The circle of life as Mufasa would say 😊

How do humans cause the loss of biodiversity?

1. **Agriculture:** intensive farming reduces biodiversity by:
 - Using herbicide (chemicals that kill all plants) to reduce the competition between crops and weeds.
 - Using pesticides (chemicals that kill insects) to reduce insect damage to the crops. This leaves fewer insects for birds to eat, therefore there would be fewer birds.
2. **Deforestation:** the permanent removal of large areas of forest. This reduces biodiversity by:
 - Reducing the habitats available to animals and plants.
 - Reducing the food available to animals that rely on the forest for food.
3. **Overfishing:** continually fishing on populations of fish. This reduces their population.
 - Fewer fish means fewer predators can survive. This affects the entire food chain.
4. **Pollution:** this can poison an environment or make the animals very sick. This reduces biodiversity by:
 - Killing or reducing the number of animals in a habitat.
 - Reducing the fertility of organisms in a habitat. Lower fertility means fewer healthy offspring are produced. Decreasing the microbial flora of the habitat.

What can humans do to maintain/increase biodiversity?

Do less intensive agriculture, stop deforestation, stop over fishing and reduce pollution.

Conservation

Conservation: protecting the natural environment to ensure that habitats and organisms are not lost.

What can humans do to help in conservation?

1. Establish wildlife preserves or national parks – these will preserve habitats and food sources for many species.
2. Captive breeding and release programs – this will increase the number of endangered animals and if they are released this could increase the numbers of the animals in an area. The reintroduction of red kites to England has been a huge success 😊 Recently they have reintroduced beavers to the UK. Many reintroduction programs are working very hard to bring all of these incredible animals back.
3. Reforestation – replanting large areas of woodland to provide a valuable habitat for thousands of animal and plant species.
4. Reintroducing field margins and hedgerows – leaving wild margins around the edges of fields and planting hedgerows, farmers provide habitats and food sources for wild flowers, insects, birds, and mammals.

What do I need to know about conservation?

The benefits	The negatives
• <u>Maintaining biodiversity</u> – this allows the largest number of <u>species to survive and thrive</u>. • <u>Ecotourism</u> – people travel all over the world to see animals in their natural habitat. <u>This creates a lot of jobs and opportunities for some countries</u>. • <u>Further discovery</u> – we do not know everything about the habitats that we study, <u>there is so much more to learn</u>. This may allow us to develop <u>new medicines in future</u>.	• <u>Conservation work costs money</u> – it can cost money to set up and get going and maintain. • <u>Monitoring</u> – conservation work requires constant monitoring to <u>see if it is working</u>. • <u>Lack of understanding</u> – local people in one area might wish to get rid of the animals if they are disrupting their way of life. <u>Education programs would be required to help the local people</u>.

Decomposition

Decomposition: is the breakdown of dead materials, this is often called rotting.

Decomposers: are organisms that gain their energy by feeding on dead or decaying matter.

Decomposers are often bacteria or fungi. These can secrete enzymes onto the material and absorb the digested products.

A question in an exam could ask you to explain the effects of temperature, water content and oxygen on the rate of decomposition. Let's have a look at each so we're ready if a question on them comes up 😊

Temperature	
How does low temperature affect rate?	How does high temperature affect rate?
• <u>Low temperatures will decrease the rate of decomposition.</u> • <u>Freezing temperatures (below 0°C) will stop decomposition.</u>	• <u>Warm temperatures (between 15°C and 25°C) will increase the rate of decomposition.</u> • <u>Higher temperatures will reduce the rate of decomposition.</u>

Why does temperature affect the rate of reaction?

Decomposition is an enzyme-controlled reaction. Enzymes work very well near their optimum temperature. If the temperature is too high for too long then the enzymes will denature. This means the active site of the enzyme has changed shape and the substrate can no longer bind to it. Therefore, no products are produced.

Food preservation: cold temperatures slow down the action of decomposers. This is why we use fridges.

Composting: the production of compost is decreased by cold temperatures.

Water content/ moisture	
How does low water content affect rate?	How does high water content affect rate?
• <u>Lack of water will decrease</u> the rate of decomposition.	• <u>Having enough water will increase</u> the rate of decomposition.

Food preservation: lack of water will help preserve food. This is why dried meat and fruit can last.

Composting: the production of compost is decreased by lack of water.

Oxygen availability	
How does low oxygen availability affect rate?	How does high oxygen availability affect rate?
• <u>Lack of oxygen will decrease</u> the rate of decomposition.	• <u>Having enough oxygen will increase</u> the rate of decomposition.

Why does oxygen availability affect the rate of reaction?

Decomposers use aerobic respiration to break down dead decaying materials. If oxygen is not present or is not present in enough of a quantity then the decomposers will do anaerobic respiration instead. This will keep them alive but they will not be able to break down the materials. **Anaerobic decay produces methane gas. Biogas generators can be used to produce methane gas as a fuel.**

Food preservation: some food is stored in nitrogen gas, crisps for example. This keeps them fresh for longer.

Composting: the production of compost is decreased by a lack of oxygen.

Calculating the rate of decay of biological material

This is another bit of maths that could pop up in a biology paper. This is quite nice and straightforward 😊

$$\text{Rate of decay} = \frac{\text{change in values}}{\text{time}}$$

Like any rate of change equation, it is the change of a certain value divided by the time that it took the change to happen. This question typically has a table of data with it. Check out the example below 😊

Example 1: Three samples of milk were kept at three different temperatures. At the end of the time period a pH reading was taken. The data is presented in the table below.

	pH of the samples after they were left at that temperature for			
Degrees Celsius (°C)	12hrs	24hrs	36hrs	48hrs
5	6.8	6.6	6.4	6.2
15	6.0	5.0	4.2	4.2
30	5.2	4.2	4.2	4.2

Calculate the rate of decay for both the sample at 5°C and 15°C.

5°C	15°C
$\text{Rate of decay} = \frac{6.8 - 6.2}{36}$ $\text{Rate of decay} = \frac{0.6}{36}$ $\text{Rate of decay} = 0.017$	$\text{Rate of decay} = \frac{6.0 - 4.2}{36}$ $\text{Rate of decay} = \frac{1.8}{36}$ $\text{Rate of decay} = 0.05$

How many times greater is the rate of decay at 15°C than at 5°C?

$$\frac{0.05}{0.017} = 2.941 \approx \times 3$$

Waste management

The rapid increase in the human population in the 20th century caused large amounts of pollutants to be produced. Humans produce different types of waste during their daily activities.

Air pollution – humans burn fossil fuels and other fuels as well. Smoke from this burning can cause breathing problems for people and animals. The smoke can also mix with clouds in the sky and fall as acid rain.

Acid rain – this can damage buildings, waterways and make the land more acidic.

What do I need to know about waste management?	
Waste	How it's managed
Sewage	<u>Sewage is treated before it is pumped into a river or the sea.</u> This makes it less terrible for the environment. Still not great.
General waste	<u>Landfill.</u> Most waste is put into landfill (massive hole in the ground). This slowly fills up over time. <u>Chemicals from the landfill can pollute water systems.</u>

Why is pollution bad? Pollution can kill animals in a habitat or make them very ill. This can reduce the numbers of animals in a habitat and cause many to leave an area, this reduces biodiversity. Pollution can make humans very sick.

Changing Land Use

Humans have had a huge impact on how land is used around the world. Think of all the cities and towns and roads and farms that exist now, none of that existed 10,000 years ago!

What have humans done?	What impact has this had?
Destroyed peat bogs	This has reduced the habitat available to certain animals. It reduced biodiversity. The burning of peat bogs releases CO ₂ into the atmosphere.
Quarrying	This has reduced the habitat available to certain animals. It reduced biodiversity. The burning of fossil fuels releases CO ₂ into the atmosphere.
Farming	This has reduced the habitat available to certain animals. It reduced biodiversity.
Dumping waste	This has reduced the habitat available to certain animals. It reduced biodiversity. It can also kill animals or effect their ability to breed.

Deforestation – this has been done/ is being done to provide more land for cattle farming and rice fields as well as providing more land for the growing of biofuels.