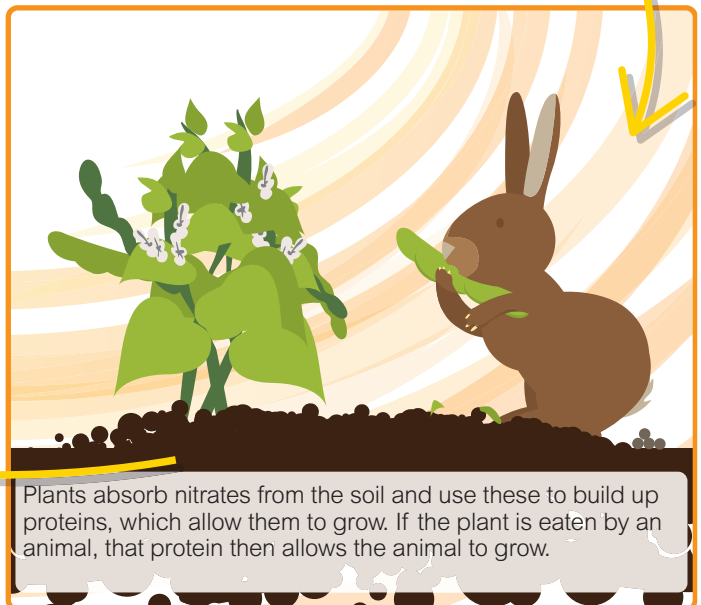
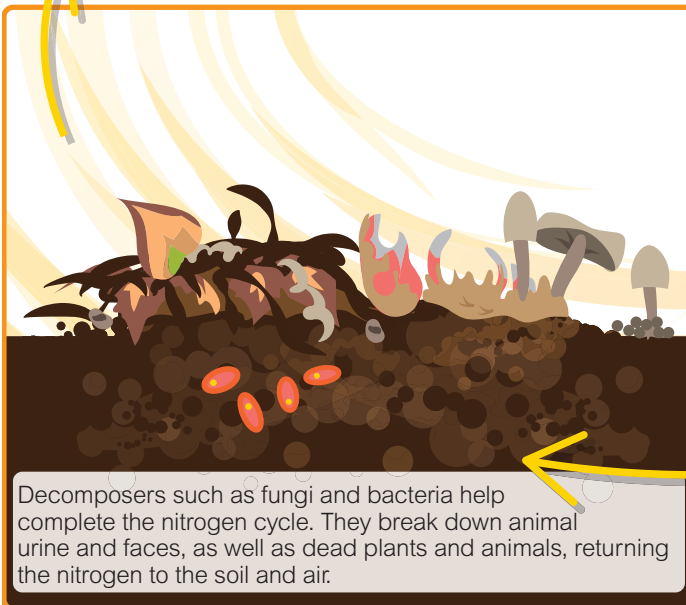
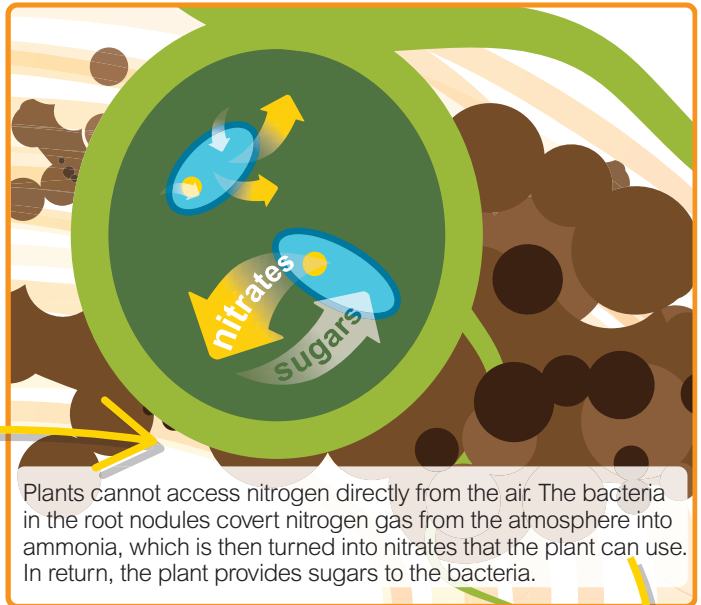
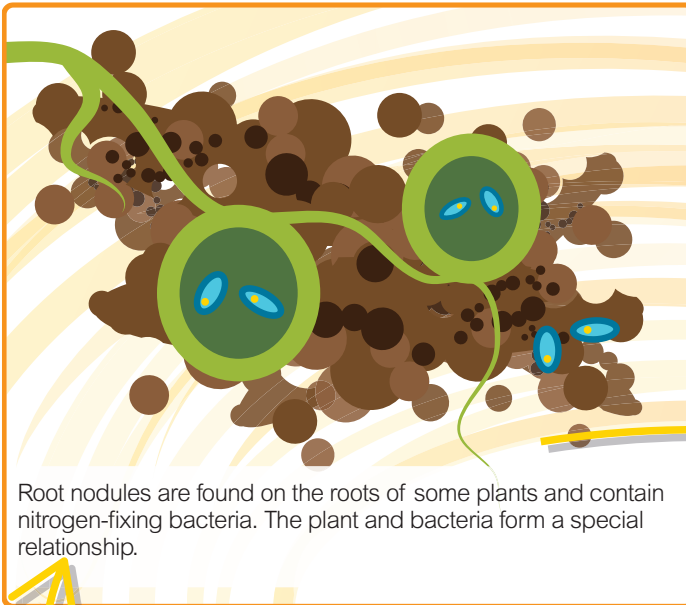
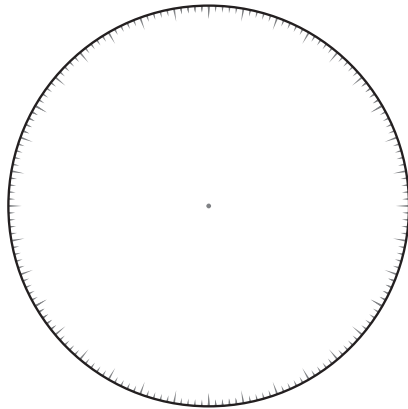


Ecosystems are communities of living organisms and the environment they live in, with many different parts that all contribute to their overall function. These different parts often depend on each other to work properly. If any of these parts are changed or do not function as they should, a whole ecosystem can break down.

Nitrogen is extremely important to life on Earth. It helps form the building blocks of life. Around 78% of Earth's atmosphere is made up of nitrogen but cannot be directly accessed by living organisms. Most animals get the nitrogen they need by eating other living things but plants are responsible for removing nitrogen from the air and storing it in a form that is useful (fixing) but they cannot do this on their own.



Task 1: Complete the pie chart to show the percentage of the Earth's atmosphere that is made up of nitrogen. Use a ruler and make sure you fill each section with the correct pattern to match the key and label the percentages of each section.



**Pie chart to show
percentage of
nitrogen in Earth's
atmosphere**

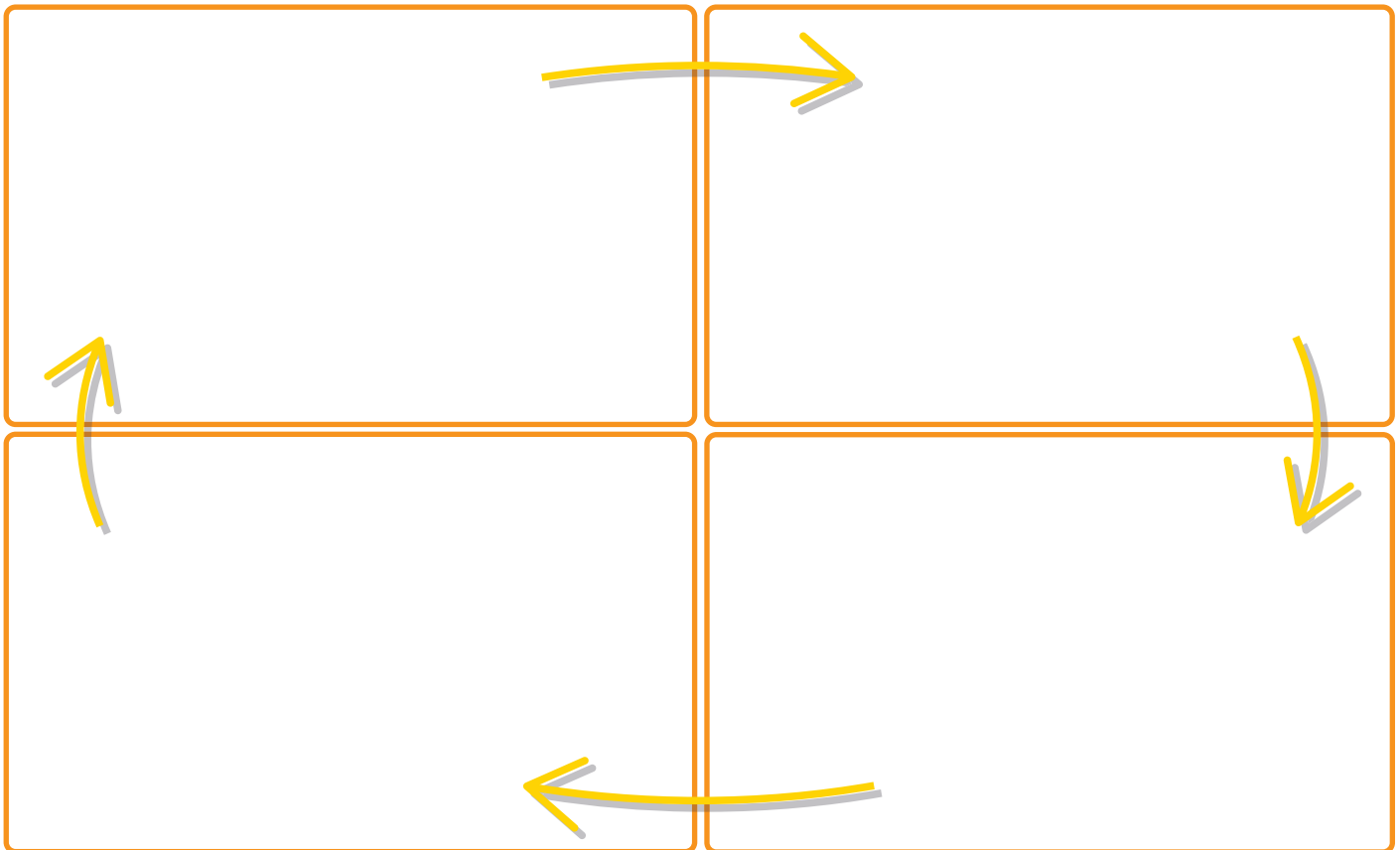


Nitrogen



Other gases

Task 2: Write out your own version of the nitrogen cycle, but shorten each stage to five words or fewer (Extra challenge: create your own illustrations for each box too).



Human impacts on the nitrogen cycle

Nitrogen is essential for growing plants, therefore it is essential for growing our food and the food that we feed to our animals. To ensure there is enough nitrogen available in the soil to grow crops, farmers can choose to manage the land in different ways.

Option 1: Using fertilisers

Farmers can apply natural fertilisers, such as manure or compost, to an area of land to help plants to grow better. Alternatively, farmers can apply artificial fertilisers, manufactured to contain the exact nutrients needed for plant growth.

Using fertilisers allows farmers to grow the same crop, over large areas, year after year. This allows the crop to be produced more cheaply as large machinery can be used to make sowing and harvesting more efficient. This allows farmers to make more profit and shoppers to buy food more cheaply.

Fertilisers can be expensive to buy and expensive machinery is needed to spread it on the fields. Fertilisers can also find their way into rivers and lakes which can cause huge amounts of algae to grow, blocking sunlight and killing other plants. This removes oxygen from the water and kills any other animals living there. Using artificial fertilisers means that farmers do not have to grow traditional nitrogen fixing crops, for example legumes like clover or beans, which can provide great food for bumblebees. This can have a negative impact on wildlife as there are fewer flowers to feed from.

Option 2: Crop rotation

Farmers can use plants such as clover or beans, which have root nodules with nitrogen-fixing bacteria, to increase the levels of nitrogen in an area of land. The following year, the farmer can plant a different food crop and the all of the nutrients required for growth will be present in the soil. The farmer would change the type of crop grown in a certain area each year, to ensure there was always enough nitrogen for growth.

When a farmer rotates crops, they tend to use smaller areas of land. This means that it is more difficult to use large machinery and therefore managing crops is slower and requires more labour. This normally means that it costs more money to produce food and is more expensive to buy in the shop. By planting a crop of flowers in part of their land, a farmer sacrifices space that could have been used to grow a more profitable crop. The natural nitrogen fixing achieved by plants is less predictable than using fertilisers and therefore can result in less reliable crop size and health.

Smaller fields tend to be divided by hedgerows or dry stone walls, which provide shelter and habitat for wildlife. The flowers grown to help fix nitrogen to the soil provide an amazing source of food for pollinators, such as bumblebees, as well as many other insects and larger animals. Larger animals also feed on the smaller ones, creating a food web and lots of diversity. This natural process also removes any risk of polluting any rivers or lakes and harming the wildlife within them.



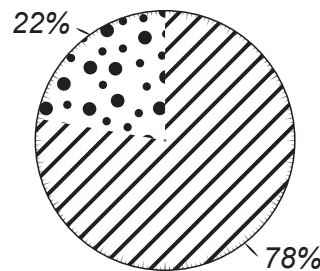
Overview

This lesson explores the processes involved in the nitrogen cycle and why it is important to life on Earth. Students are encouraged to consider the positives and negatives of nitrogen management in food production and come to their own conclusions.

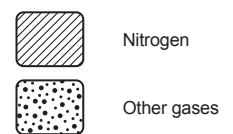
Task 1

Students are asked to complete a pie chart to show the percentage of the Earth's atmosphere that is made up of nitrogen. The marks on the pie chart can be used as a guide, so students will not need protractors. They should use a ruler and clearly mark each section to correspond with the key given. Each section should also be clearly labelled with the percentage.

Answers



Pie chart to show percentage of nitrogen in Earth's atmosphere



Task 2

Students are required to read through the stages of the nitrogen cycle and then summarise each stage into five words or fewer.

Answers

The answers given below are only examples and student's answers could be very different but still be correct.

Stage 1 – Roots have relationship with bacteria. Stage 2 – Bacteria give ammonia, receive sugars.

Task 3

Students should read through the two land management options. This can be done individually or as a class/group. Students should then list any negatives or positives for each management option, in the tables provided. Points can be written as bullet points but should include adequate evidence to help construct an argument.

Answers

For example, for 'Using fertilisers':

Positives

- *Exact nutrients for growth can be added*

Negatives

- *Expensive to buy*

Task 4

Students are asked to create an argument, justifying why one option of land management is better. This should include positives and negatives from each side of the argument and a conclusion. Students should aim to include more than one example from each option.

Answers

For example: Land managers have different options when ensuring there is enough nitrogen in the soil to grow their crops. The use of fertilisers allows land managers to ensure that there is exactly the right amount of nitrogen for healthy growth but it can be very expensive. Crop rotation can provide enough nitrogen for healthy growth and can be a great option for wildlife but it can be less reliable than using fertilisers. Overall I feel that crop rotation is a better option as it is less harmful to the environment.