

Decay and Recycling

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Why is nitrogen so important?

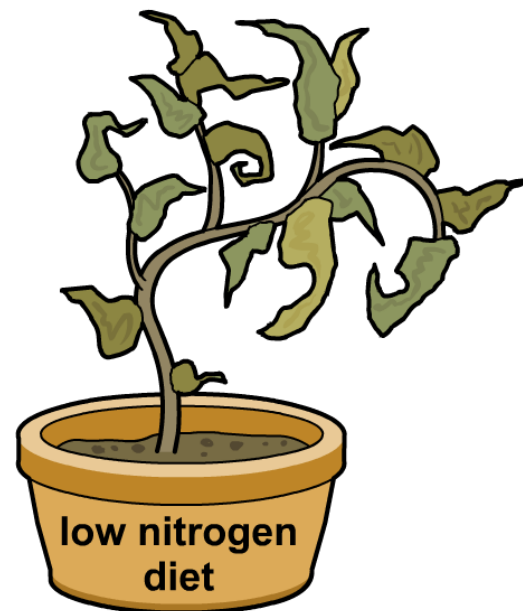
Nitrogen is essential for growth because it is used by plants and animals to make proteins.

Nitrogen makes up about 78% of the atmosphere. However, nitrogen deficiency is the most common cause of poor plant growth.

Why are plants unable to use the nitrogen straight from the air?

Nitrogen gas (N_2) is unreactive and is not easily converted into other compounds. Most plants can only take up nitrogen in the form of ammonia or nitrate.

How is atmospheric nitrogen changed into a useable form?





What is the nitrogen cycle?



The nitrogen cycle

Click "**play**" to find out how nitrogen is recycled through the environment.

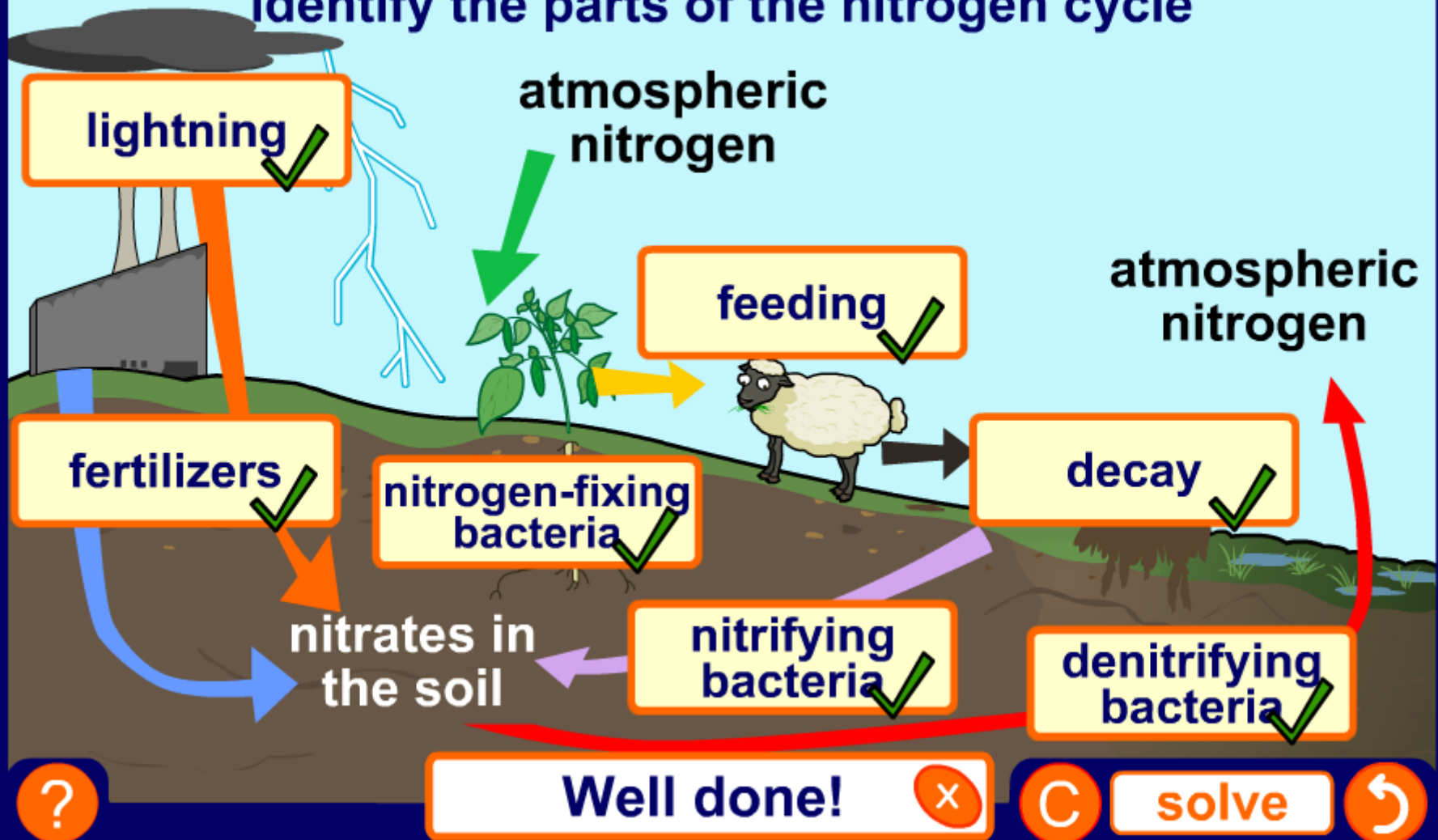




Labelling the nitrogen cycle



Identify the parts of the nitrogen cycle





Match the components of the nitrogen cycle to their role

lightning strikes

convert atmospheric nitrogen to nitrates

nitrifying bacteria

live in the root of legumes and fix nitrogen

denitrifying bacteria

convert ammonia compounds to nitrates

nitrogen-fixing bacteria

break down waste and dead matter

decomposers

convert nitrates into nitrogen



solve



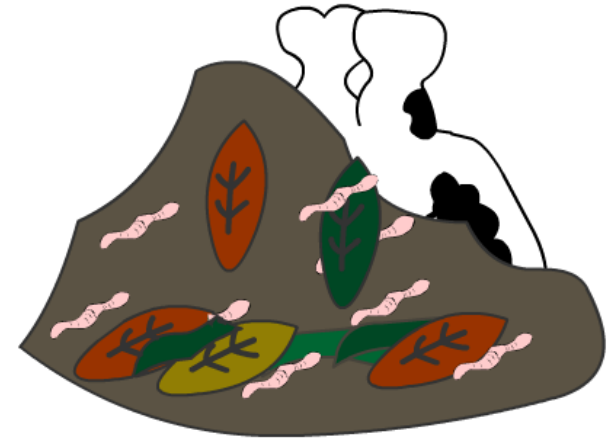


How are nitrates produced?

Nitrates are important because they are a form of nitrogen that plants can absorb. Nitrogen is used to make protein, and is passed from plants to animals along food chains.

What processes add nitrates to the soil?

- Decomposers release ammonium compounds from waste (such as urine) and dead matter. Nitrifying bacteria then convert the ammonium compounds into nitrates.
- Some nitrogen compounds form during lightning strikes and are washed into the soil by rain water. Lightning provides the high level of energy required for nitrogen to react and form compounds.



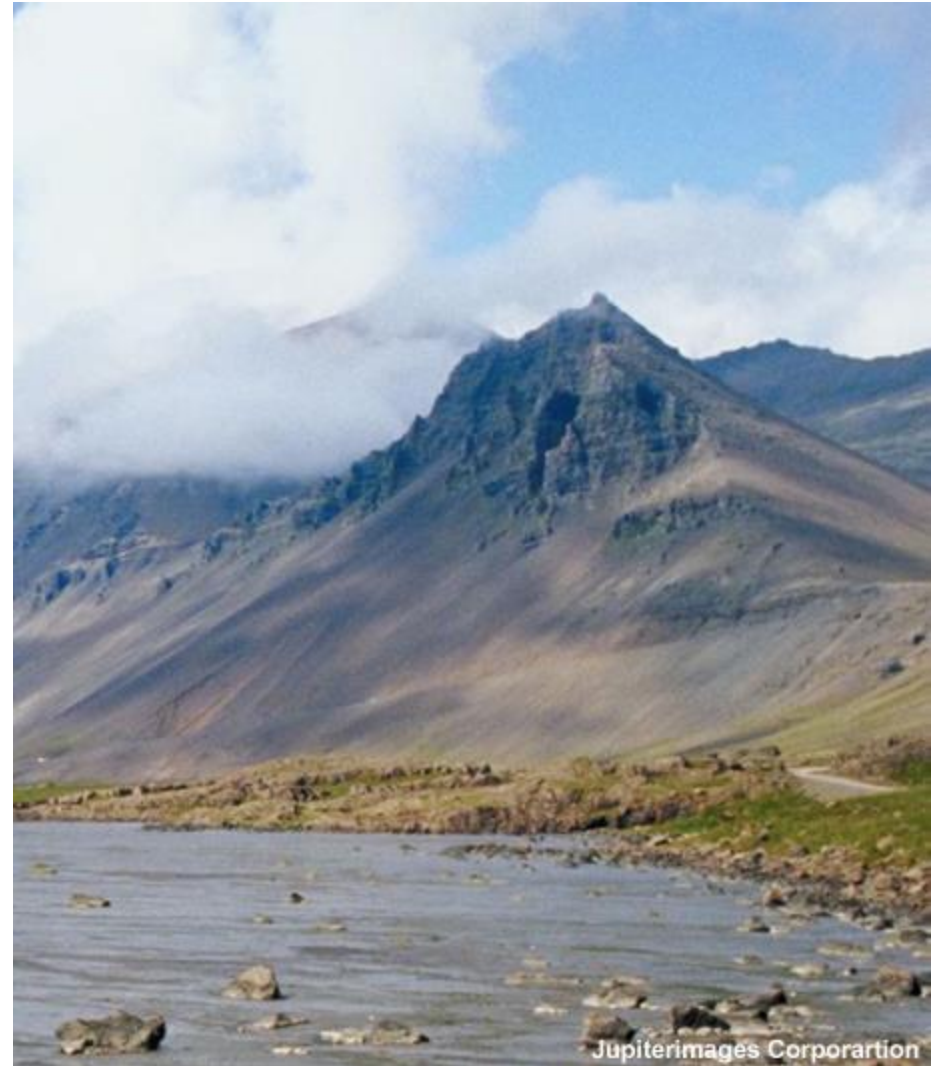


Can plants add nitrogen to the soil?

This rugged place is in Iceland. Deforestation by the original settlers and high levels of volcanic activity have left much of the country as bare lava or sand; an environment in which few plants grow.

In the 1960s, the country began to manage its soil, and dropped millions of lupin seeds from the air.

Why might lupins survive where nothing else grows?



Jupiterimages Corporation



What are legumes?



Most plants need nitrates from the soil because the nitrogen in air is too unreactive. These plants rely on the presence of nitrifying bacteria in the soil or artificial fertilizers.



By contrast, lupins and other **legumes**, such as clover and peas, are self-sufficient.

Nitrogen-fixing bacteria living in the root nodules of legumes convert nitrogen gas into nitrates, improving the fertility of poor-quality soils.





How can nitrates be added to soil?



Nitrates are vital for plant growth, but levels in the soil are gradually depleted as crops grow.

What methods can farmers use to increase soil nitrate levels?



- Modern, intensive farming uses artificial fertilizers. These are made by the **Haber process**. However, run-off into nearby rivers and lakes can cause **eutrophication**.
- Organic farming uses manure – a natural fertilizer. Crop rotation, a system that varies the crops planted each season, is also used to maintain soil fertility.





How do these processes affect soil nitrate levels?

increases nitrates

add decomposers ✓

add nitrifying bacteria ✓

expose to lightning ✓

add animal manure ✓

decreases nitrates

expose to heavy rain ✓

add denitrifying bacteria ✓

grow fast-growing crops ✓

Well done! ✕



solve



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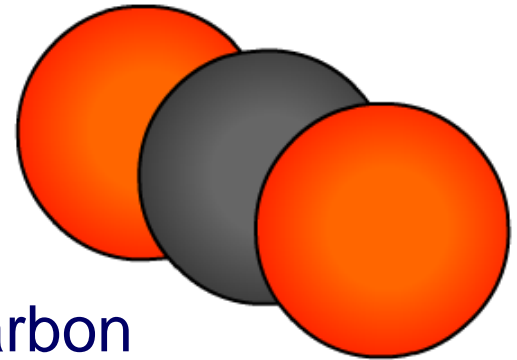




Why is carbon important?

Proteins, fats and sugar all contain **carbon**. Life without carbon would be very different and might be impossible.

Carbon is present in the atmosphere as **carbon dioxide**.



Plants use carbon dioxide during photosynthesis to produce sugars. The carbon is then transferred to animals along food chains.

What happens to the carbon in organisms when they die?

- As dead matter decomposes, carbon is released back into the atmosphere in the form of carbon dioxide.
- The carbon from dead organisms can also form fossil fuels and sedimentary rocks such as limestone. These are **long-term carbon stores**.



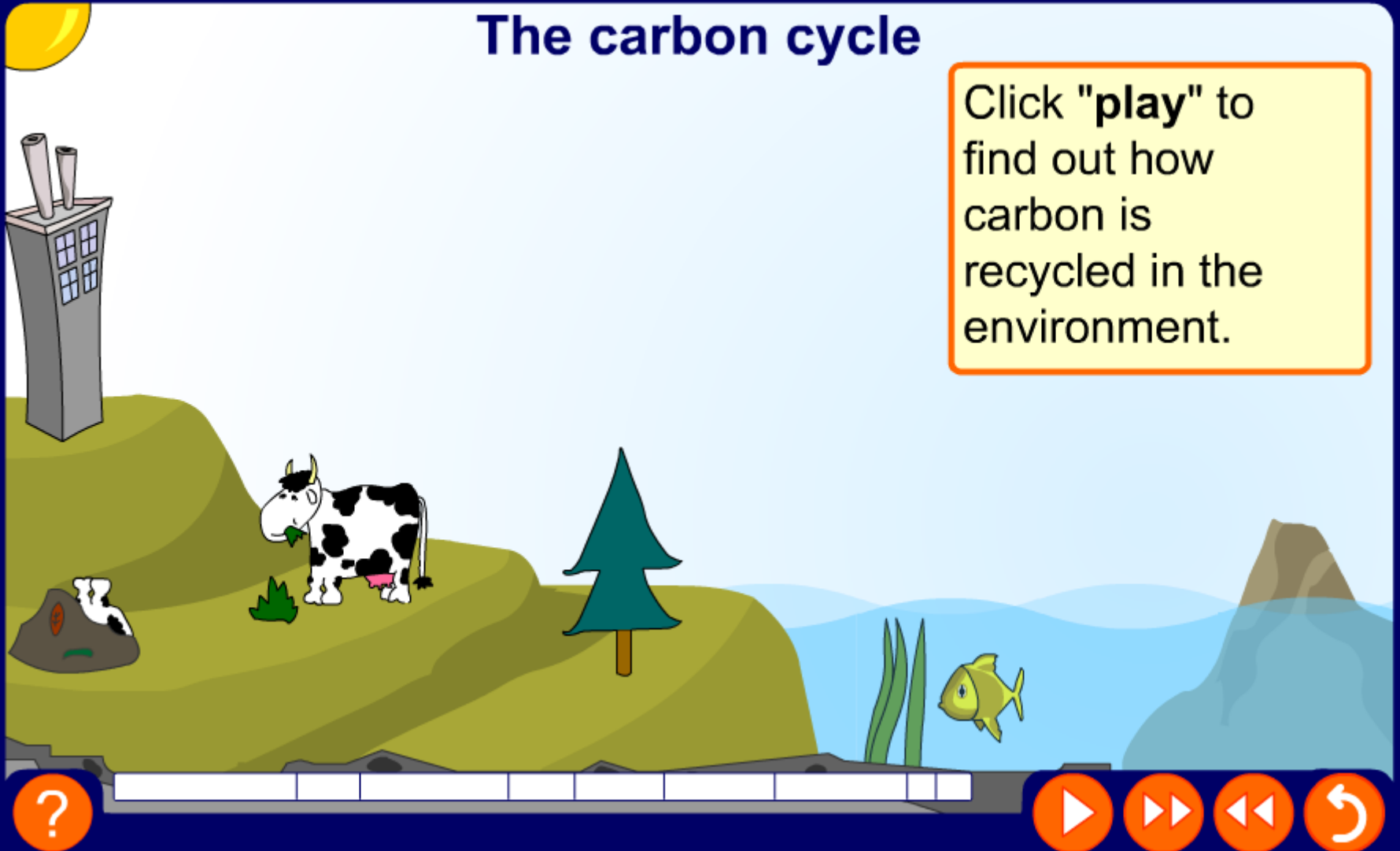


What is the carbon cycle?



The carbon cycle

Click "**play**" to find out how carbon is recycled in the environment.

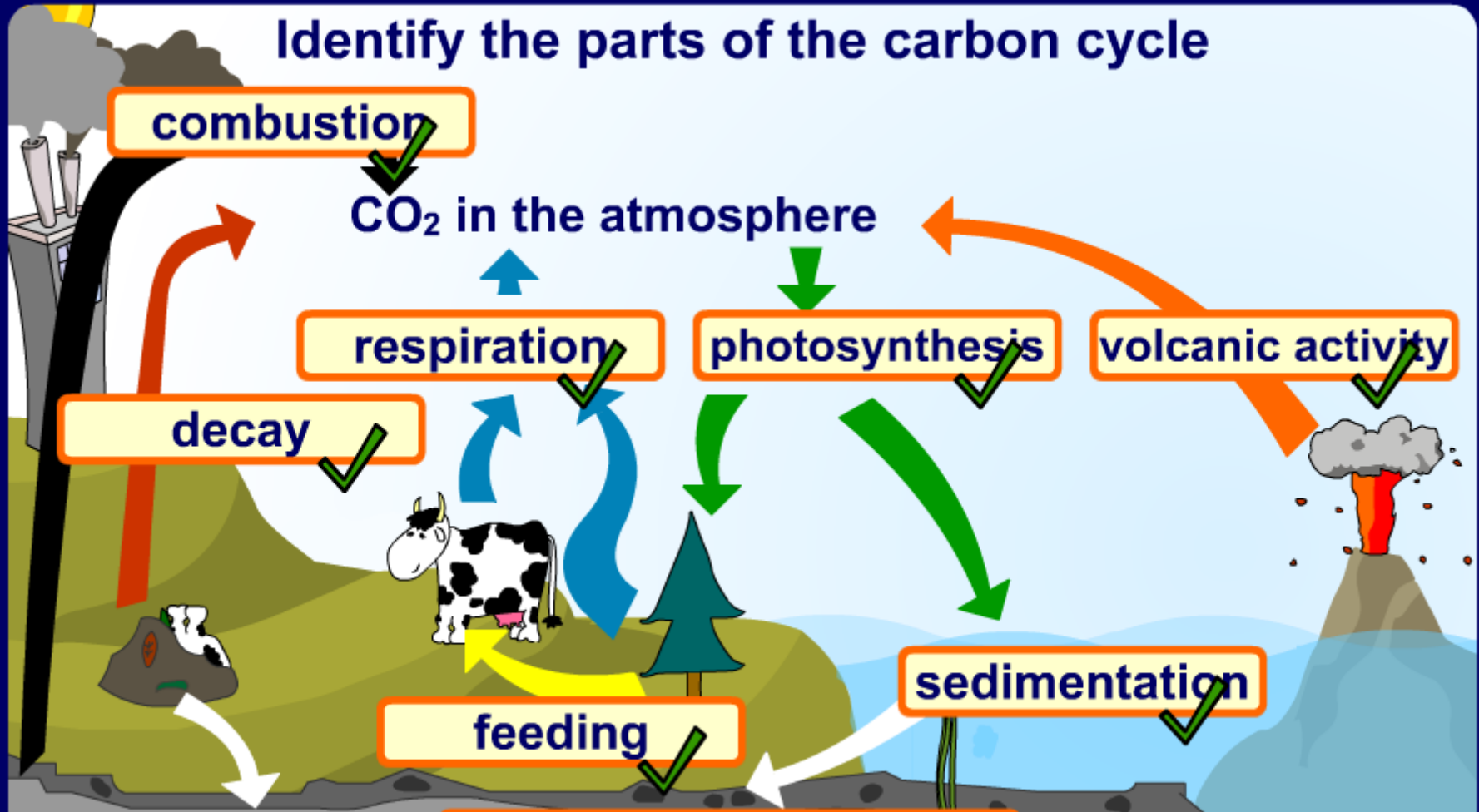




Labelling the carbon cycle



Identify the parts of the carbon cycle



Well done!



solve





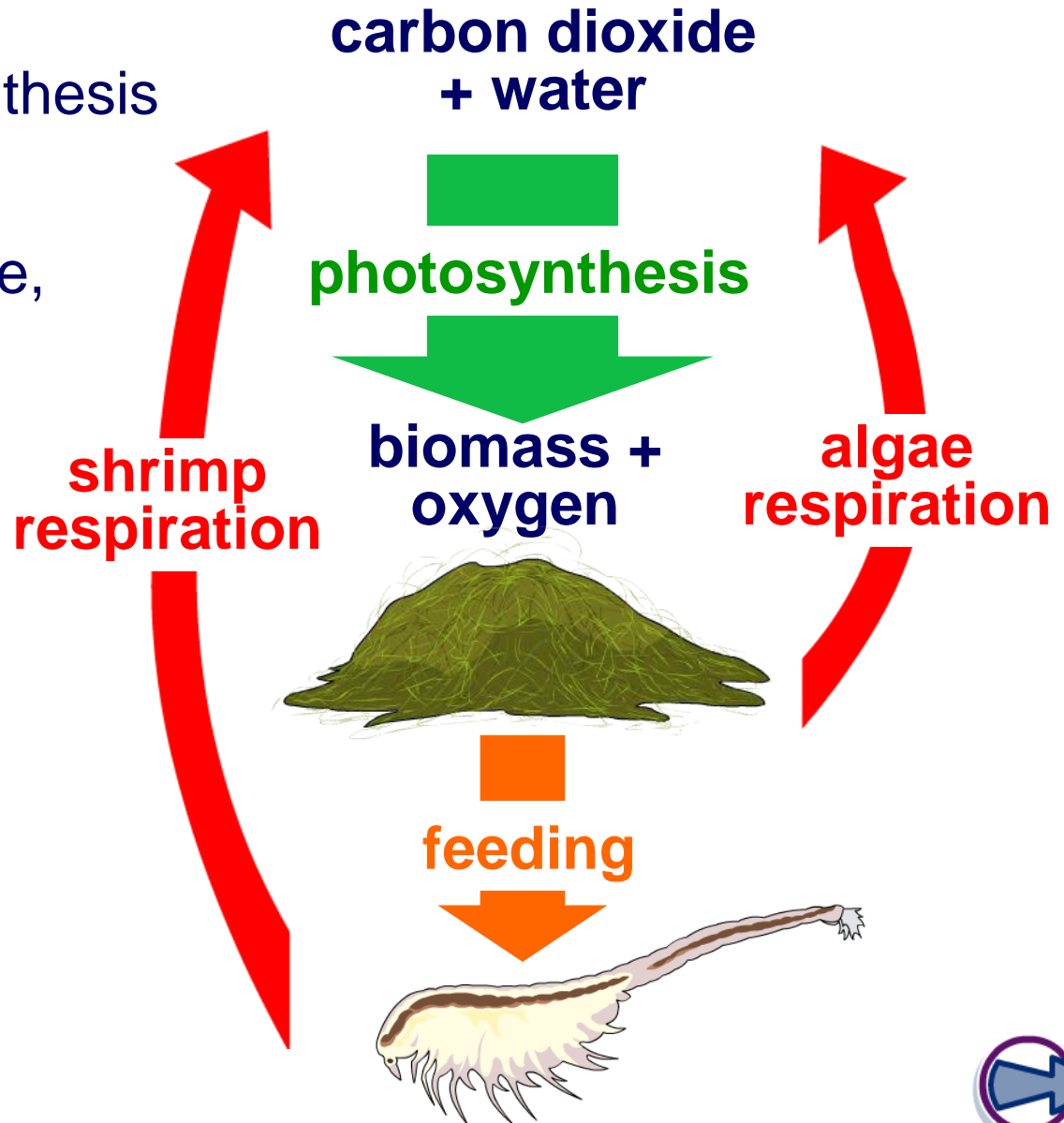
How is carbon recycled?



Carbon is constantly recycled by photosynthesis and respiration.

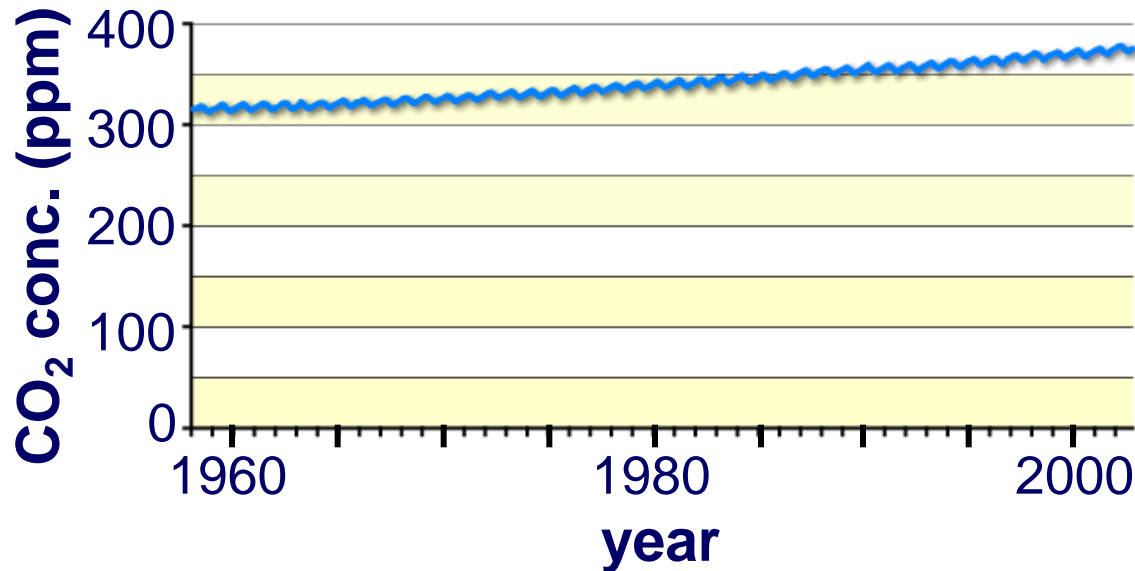
In a sealed ecosphere, carbon dioxide concentrations fluctuate but the mean level does not change.

How are carbon dioxide levels changing in the atmosphere of the Earth?



Are carbon dioxide levels rising?

Although the total amount of carbon in the environment is fixed, carbon dioxide levels are constantly fluctuating.



Currently, the general trend shows an increasing level of carbon dioxide. Why might this be happening?

Many scientists believe that human activity, such as burning fossil fuels and making cement from limestone, is responsible for increasing carbon dioxide levels. What environmental problems might this cause?





Are these statements about carbon true or false?

1.	Carbon dioxide makes up 78 % of the atmosphere.	
2.	Plants give out carbon dioxide when they respire.	
3.	Photosynthesis converts water and carbon dioxide into oxygen and sugar.	
4.	Coal and oil do not contain carbon.	
5.	Carbon dioxide is stored during the manufacture of cement.	
6.	Limestone is a long-term carbon store.	

true

false



solve





The water cycle

Over 70% of the Earth's surface is covered by water.

The vast majority of this is stored in the oceans and seas of the world.

Water is neither created nor destroyed.

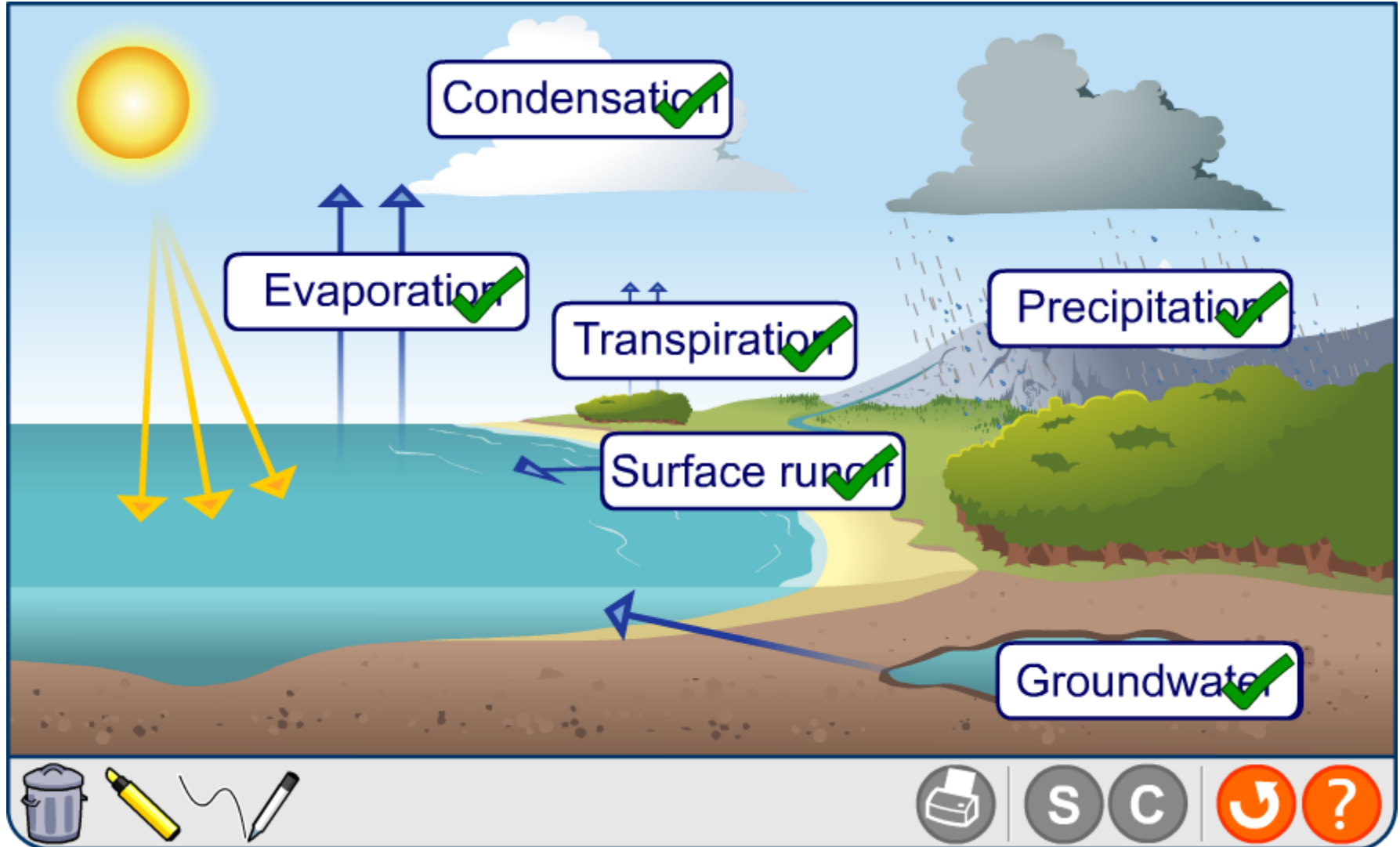
It is cycled round over and over again in the Earth's atmosphere.

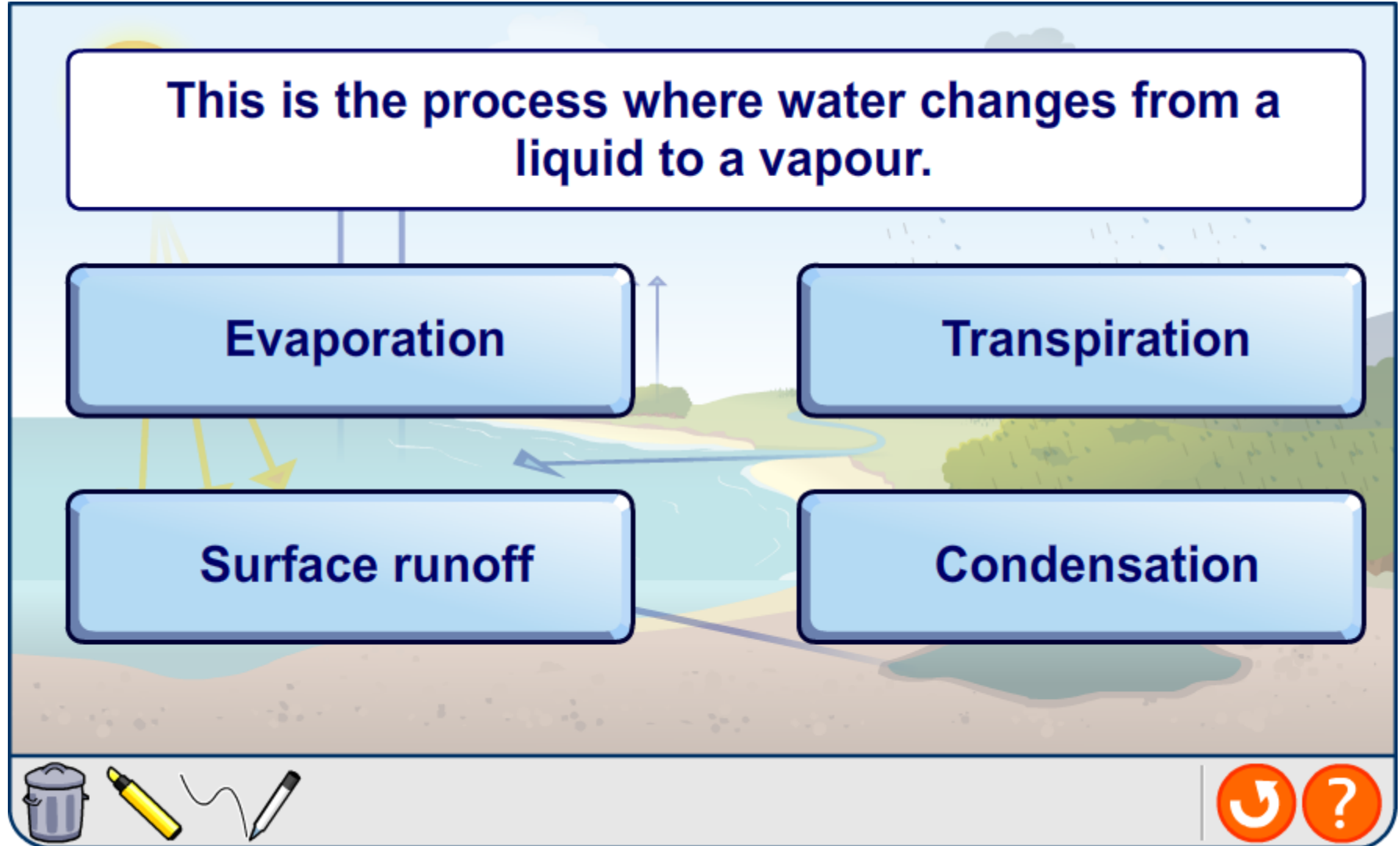


This recycling of water is called the **water cycle**.



The water cycle





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- **carbon cycle** – The process by which carbon is continuously recycled in the environment.
- **detritus** – Dead or decaying organic matter.
- **detritivore** – An animal, such as an earthworm or maggot, that feeds on waste and dead matter.
- **denitrifying bacteria** – Soil bacteria that convert nitrates into nitrogen gas.
- **fertilizer** – A chemical added to soil to provide essential mineral salts supporting plant growth.





- **legume** – A group of plant species that contain nitrogen-fixing bacteria in their roots and can therefore make their own nitrates.
- **nitrifying bacteria** – Soil bacteria that convert ammonium ions from protein decomposition into nitrates.
- **nitrogen cycle** – The process by which nitrogen is continuously recycled in the environment.
- **nitrogen-fixing bacteria** – Bacteria that live in the roots of legumes and convert nitrogen gas into nitrates.
- **saprotroph** – An organism that feeds by breaking down dead organic matter.





How quickly can you unscramble
anagrams of words about

d e c a y

a n d

r e c y c l i n g ?

start





Multiple-choice quiz



board
works

How good are you at decomposing
this quiz on decay and recycling?



start

