

Cycles within ecosystems

Revision notes · The carbon cycle with photosynthesis, respiration, decomposition and combustion, and the roles of bacteria in the nitrogen cycle.

For Pearson Edexcel International GCSE Biology 4BI1 and Science (Double Award) 4SD0. **Biology only** is not in the Double Award and is only examined on Paper 2.

Cycles within ecosystems Spec 4.10–4.11B

The carbon cycle Spec 4.10

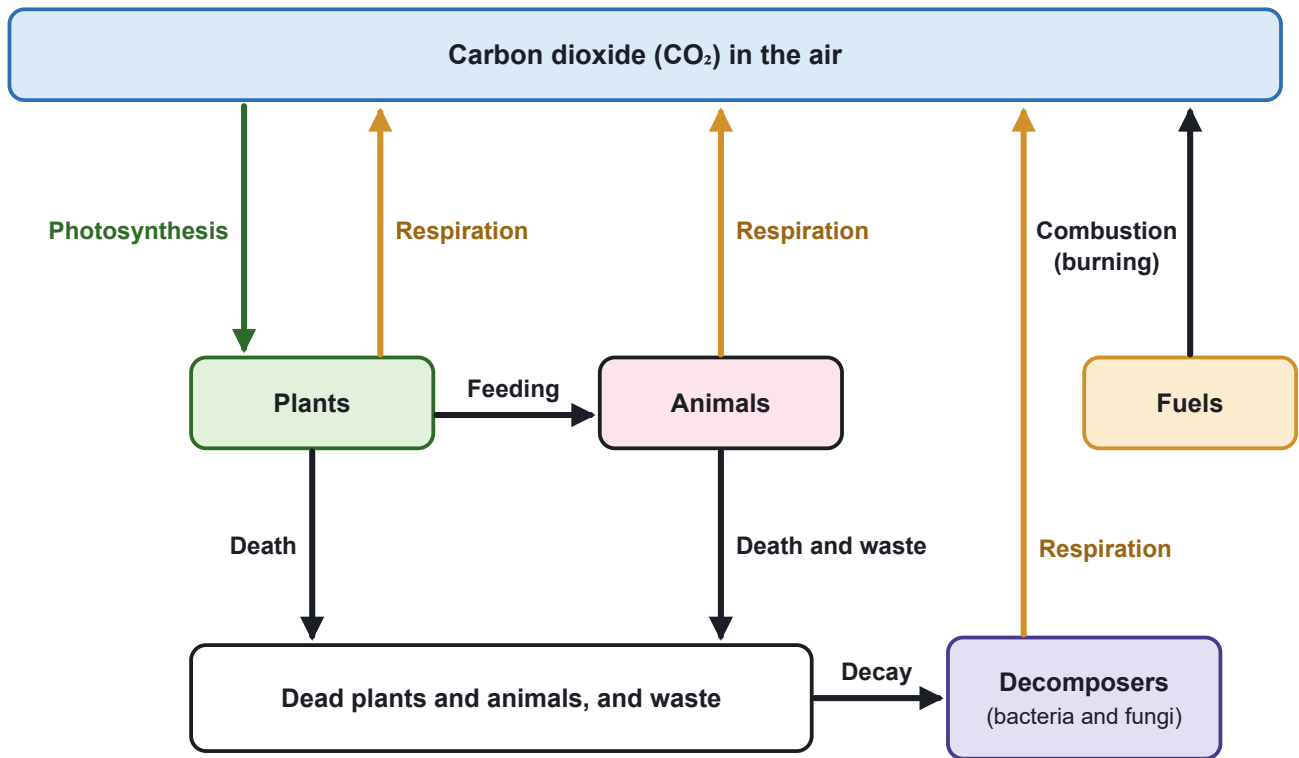
All living things are made of carbon compounds. The **carbon cycle** returns carbon to the atmosphere as carbon dioxide, so that it is available for plants to use in photosynthesis again. Carbon is also stored in fossil fuels, which are the remains of long-dead organisms.

1. Plants and algae take carbon dioxide from the air and use it in **photosynthesis** to make carbon compounds such as glucose, starch and proteins.
2. The carbon compounds pass along the food chain when animals feed.
3. All living organisms (plants, animals and decomposers) release carbon dioxide into the air by **respiration**.
4. When plants and animals die, and when they produce waste, **decomposition** by bacteria and fungi breaks down the material. The decomposers release carbon dioxide into the air by respiration.
5. Burning fuels such as wood, coal, oil and natural gas (**combustion**) releases carbon dioxide into the air.

The role of decomposers

Decomposers are bacteria and fungi. They break down dead plants, dead animals and waste, and they respire as they do so, releasing carbon dioxide. Without decomposers, dead material would pile up and the carbon in it would be locked away. The supply of carbon dioxide for photosynthesis would eventually run out.

Exam tip: Name the process at each arrow. Photosynthesis takes carbon dioxide out of the air. Respiration, decomposition and combustion put it back.



The carbon cycle: **photosynthesis** takes carbon dioxide in; **respiration**, **decomposition** and **combustion** put it back.

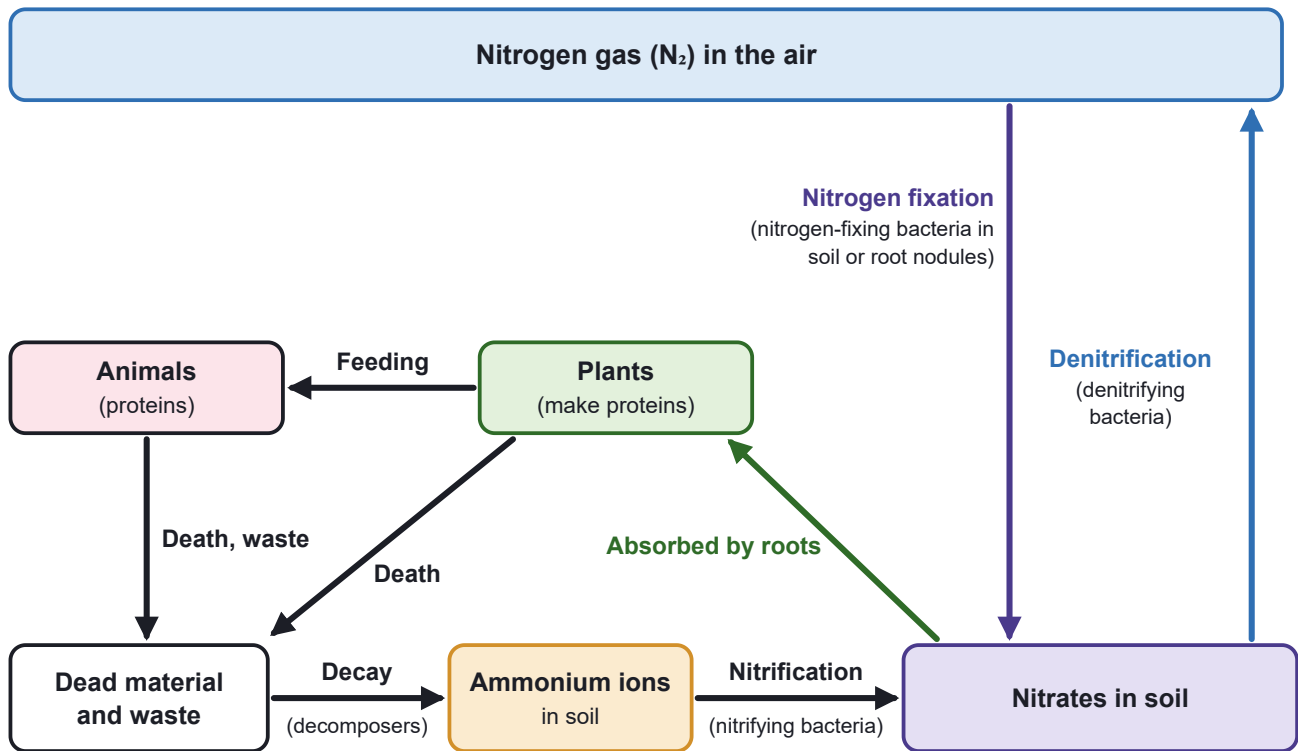
The nitrogen cycle Spec 4.11B Biology only

Plants need **nitrates** from the soil to make amino acids and proteins. Although about 78% of the air is nitrogen gas, plants cannot use it directly. Bacteria in the soil have key roles in making nitrates available. You need to know what each type of bacteria does, but not the names of the species.

Bacteria in the nitrogen cycle		
Process	Organisms	What happens
Decay	Decomposers (bacteria and fungi)	Break down proteins and urea in dead material and waste, releasing ammonia (ammonium ions)
Nitrification	Nitrifying bacteria	Convert ammonium ions in the soil into nitrates, which plants absorb
Nitrogen fixation	Nitrogen-fixing bacteria , in the soil or in root nodules of legumes	Convert nitrogen gas from the air into nitrogen compounds, which become nitrates
Denitrification	Denitrifying bacteria	Convert nitrates in the soil into nitrogen gas, which returns to the air and reduces soil fertility

Plants take up nitrates through their roots and build them into proteins. Animals get nitrogen by eating plants or other animals. Nitrogen compounds return to the soil in waste and when organisms die.

Common mistake: Nitrogen-fixing bacteria are not the bacteria that make ammonia from dead material. That is decay. Fixing means turning nitrogen gas into nitrogen compounds.



The nitrogen cycle: bacteria carry out **nitrogen fixation**, **nitrification** and **denitrification**; decomposers carry out **decay**.

Quick check

1. Which process removes carbon dioxide from the air?
2. Name three processes that return carbon dioxide to the air.
3. Why are decomposers important in the carbon cycle?
4. **Biology only** What do nitrogen-fixing bacteria do?
5. **Biology only** What do denitrifying bacteria do?

Quick check answers

Cycles within ecosystems

1. Photosynthesis.
2. Any three of: respiration, decomposition, combustion.
3. They break down dead material and release carbon dioxide by respiration.
4. Convert nitrogen gas from the air into nitrogen compounds.
5. Convert nitrates in the soil into nitrogen gas.