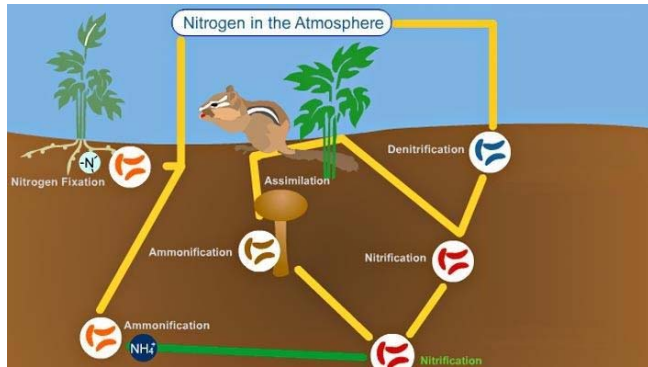


Name \_\_\_\_\_



## Unlocking the Secrets of the Nitrogen Cycle

The nitrogen cycle is a vital process that ensures nitrogen, an essential element, is continuously recycled and made available to living organisms. This cycle involves various steps, each facilitated by different organisms and environmental factors.

### Nitrogen Fixation

The cycle begins with nitrogen fixation, where specialized bacteria called nitrogen-fixing bacteria convert atmospheric nitrogen ( $N_2$ ) into a form that plants can use, such as ammonia ( $NH_3$ ) or nitrate ( $NO_3^-$ ). These bacteria live in the soil or form symbiotic relationships with certain plants, like legumes.

### Nitrification

Once nitrogen is in a usable form for plants, it undergoes nitrification. During this process, nitrifying bacteria convert ammonia into nitrites ( $NO_2^-$ ) and then into nitrates ( $NO_3^-$ ). Nitrates are the primary source of nitrogen for most plants and are readily absorbed through their roots.

### Assimilation

Plants take up nitrates from the soil and use them to build proteins, DNA, and other essential molecules. Animals obtain nitrogen by consuming plants or other animals that have consumed plants, incorporating nitrogen into their own tissues through the consumption of organic matter.

### Ammonification

When plants and animals die, or when waste products are excreted, nitrogen is returned to the soil in the form of organic matter. Decomposer bacteria break down this organic matter, releasing ammonia back into the soil through a process called ammonification.

### Denitrification

Finally, denitrifying bacteria convert nitrates in the soil back into atmospheric nitrogen, completing the cycle. This occurs under anaerobic conditions, such as in waterlogged soils or sediments, where oxygen is limited.

The nitrogen cycle is crucial for maintaining soil fertility, supporting plant growth, and sustaining the balance of ecosystems. However, human activities such as agriculture and industrial processes have significantly altered this cycle, leading to environmental issues like nutrient pollution and ecosystem degradation.