

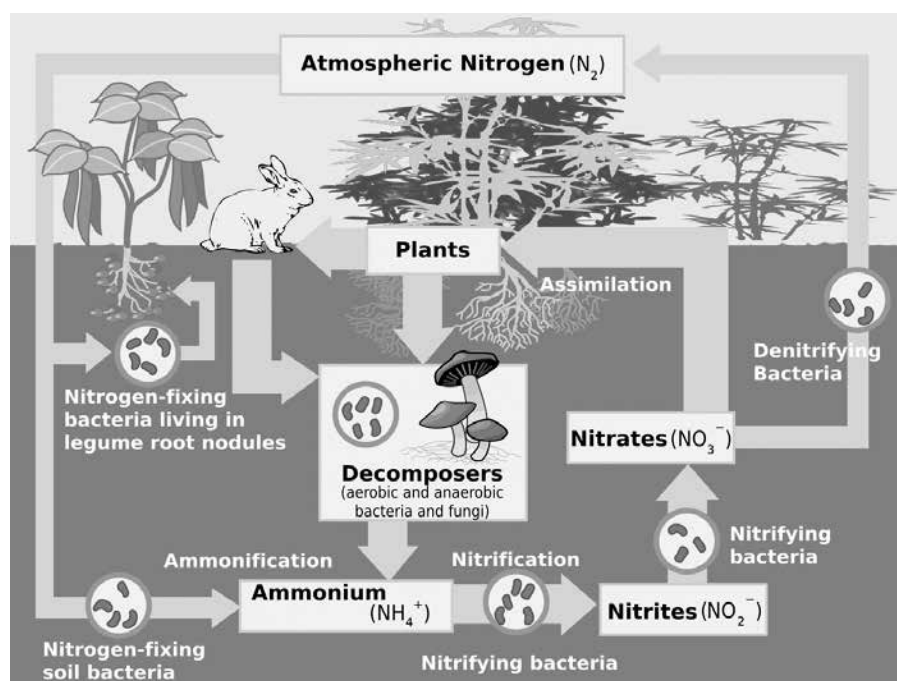
Lab 12 Reference Sheet

The Nitrogen Cycle and the Phosphorus Cycle

Figure R12.1 shows the different forms that nitrogen gets combined into as it moves through an ecosystem. Nitrogen is a basic chemical needed for life. One of the most important functions of nitrogen is being one of the elements that form DNA. DNA is the molecule that allows living things to grow and reproduce. Nitrogen is also an important piece for building proteins. All living things in an ecosystem have nitrogen, and nitrogen moves from living to nonliving parts of an ecosystem in different forms and ways.

FIGURE R12.1

The nitrogen cycle



Plants and animals move nitrogen into air, water, and soil through the waste products they make. They also release nitrogen into an ecosystem when they die and their bodies decompose. Decomposing involves the breakdown of organic material into smaller chemicals. Different kinds of bacteria are very important in changing the forms of nitrogen that move through the nonliving parts of an ecosystem. Let's look at the different forms of nitrogen found in the nitrogen cycle.

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Nitrogen gas (N_2): Nitrogen gas is the most common chemical in the air we breathe. However, plants and animals do not usually use nitrogen gas. Certain bacteria in soil can convert nitrogen gas into forms that plants and other bacteria can use. These bacteria are called *nitrogen-fixing*.

Ammonium (NH_4^+): Ammonium is a chemical you may have heard of in household cleaners. Ammonium moves into the soil when nitrogen-fixing bacteria change N_2 into NH_4^+ . Ammonium is also produced when living things decompose. Ammonium in soil can be absorbed by plants through their roots and by other kinds of bacteria. Plants use ammonium as a source for nitrogen in their proteins and DNA. High levels of ammonium in water can poison fish and other living things there.

Nitrite (NO_2^-): Nitrite is a very unstable form for nitrogen in soil. Certain bacteria, called *nitrifying bacteria*, convert ammonium in the soil into nitrite. However, nitrite is usually changed into another form known as nitrate (see the next paragraph). This change is also done by nitrifying bacteria. Nitrite can be found in water sources. High levels of nitrite can cause diseases in some fish species.

Nitrate (NO_3^-): Nitrate is a more stable nitrogen molecule found in both soil and water. Nitrates can be absorbed by plants through their roots. Plants also use nitrates as a source for nitrogen in their proteins and DNA. Nitrates can be converted back into N_2 through another kind of bacteria called *denitrifying bacteria*. Nitrates are typically found in both soil and water. Nitrate levels in water are important to monitor. High levels of nitrates in drinking water can lead to serious health conditions in babies. High nitrate levels in water can also help algae grow out of control. Overgrowing algae can decrease the amount of nutrients, like oxygen, that other plants and animals use. As the algae continue to grow, the other plants and animals will die.

Figure R12.2 shows how phosphorus moves through an ecosystem, usually in the form of phosphate. Phosphate is an important molecule that living things use to build their DNA. Phosphorus is not typically found in the air in an ecosystem. Phosphate is mostly found in rocks and soil. Phosphate present in soil can be absorbed by plants to use. Animals eat the plants to get the phosphate they need. Rocks can be worn away by water rushing over them for long periods of time. As the water wears away the rock, phosphate is released into rivers, streams, and lakes. Animals and plants in the water can absorb the phosphate for their use. Phosphate that is not used by living things will fall to the bottom of the bodies of water as sediment. Over long periods of time, the phosphate sediment will change form into rocks again. Many fertilizers used by farmers contain high levels of phosphate. Phosphate helps algae grow out of control in fresh water. Overgrowing algae can decrease the amount of nutrients, like oxygen, that other plants and animals use. As the algae continue to grow, the other plants and animals will die.

FIGURE R12.2

The phosphorus cycle

