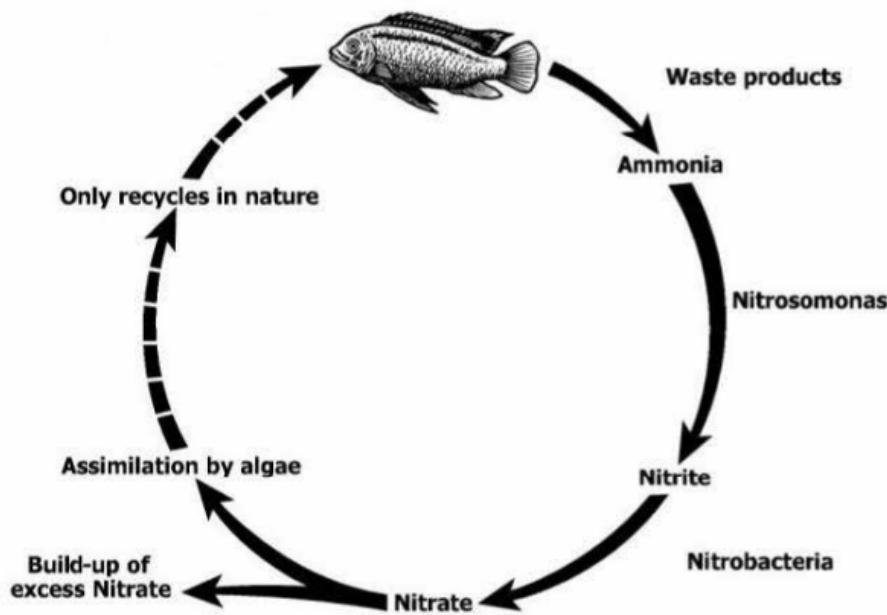


# nitrogen cycle

Water is as vital to fish as air is to land animals. Fish need clean, filtered water to survive. To understand what is required to keep an aquarium environment healthy, you need to understand the nitrogen cycle, which is sometimes referred to as “biological filtration.”

## The nitrogen cycle:

The nitrogen cycle is a chain of biological reactions that produces chemical results. Then nitrogen cycle begins with fish waste material, which produces ammonia. Ammonia is very toxic to fish and, in the small confines of an aquarium, could eventually kill them. But fortunately, ammonia is “food” for nitrifying bacteria, which are always present in water.



The nitrifying bacteria “eat” the ammonia, producing nitrite. Other nitrifying bacteria “eat” the nitrite, producing nitrate. Since nitrate is relatively harmless to fish unless it accumulates in large quantities, the toxic effects of the ammonia and nitrite are

canceled out by the biological food chain. You need to filter aquarium water and change a portion of the water regularly in order to keep the nitrate levels low. The nitrogen cycle is what keeps the chemical balance of water at life-sustainable levels for plants and fish. That's why you must test your aquarium's water often and make necessary adjustments by adding activated carbon, ammonia neutralizers or water softeners as your water test levels indicate.

### **Using the nitrogen cycle to prepare an aquarium:**

Unaided by special products, the nitrogen cycle takes between six and seven weeks to complete and stabilize. The chart below shows how the cycle works and the approximate time before ammonia turns into nitrite and the nitrite turns into nitrate in both freshwater and saltwater environments. After the first six to seven weeks of setting up an aquarium, the tank's nitrogen cycle should be stabilized. During those first few weeks, only a few hearty fish should be placed in the tank to initiate the nitrogen cycle and the water must be monitored closely for the following readings:

- During the first two weeks, ammonia should be kept under 0.06 p.p.m. (parts per million). Water should be tested every two days until ammonia is controlled.
- After two weeks, ammonia levels should read 0.0 p.p.m. and nitrites should increase and be maintained below 0.75 p.p.m.
- After the fifth or sixth week, nitrites should decrease again and nitrates should increase, approaching a reading of 25.0 p.p.m.

The nitrogen cycle is complete when the water readings are as follows:

	0 to 2 weeks	2 to 4 weeks	5 to 6 weeks	Complete
Ammonia	< 0.06	0.0	0.0	0.0
Nitrites	0.0	<0.75	<0.75	0.0
Nitrates	0.0	0.0	25.0	25.0+

Once the nitrogen cycle has stabilized as indicated by the above readings, you can introduce more fish into the tank gradually. Water tests should still be taken weekly, or whenever the water appears murky or when problems are suspected. Increasing the number of fish will alter the chemical readings temporarily. This illustration is based on adding a "few hearty fish" to begin the stabilization process. If you add a larger number of fish in the tank during the initial few weeks, you are endangering your aquatic life and it will take longer to stabilize the nitrogen cycle. It is important to have your aquarium well-oxygenated. Nitrosomonas bacteria need oxygen to develop and grow. Without the oxygen, harmful ammonia and nitrites build up more quickly.

### **New Tank Syndrome:**

This is one of the most critical stages in setting up an aquarium and the most common area of failure for beginners. If you do not allow your tank to complete the nitrogen cycle before adding fish, they will get New Tank Syndrome or ammonia and nitrite poisoning. Common symptoms of New Tank Syndrome include loss of coloring, hiding in corners with clamped fins and lying near the bottom of the aquarium. Ultimately, New Tank Syndrome is lethal to your fish.

## Resources and recommended supplies:

- Aquarium test kit for fresh or saltwater aquarium (or bring a water sample in to Petco, which offers free water testing).
- Nitrifying bacteria additive
- Starter fish (ask a store partner for help)
- Books and websites with information on common fish diseases and how to treat them
- Petco Care Sheets: Setting Up an Aquarium (Freshwater or Saltwater)
- Petco Care Sheet on Water Quality

To learn more, go to **petco.com** and download your free Aquatic Success Kit.