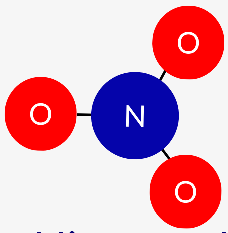
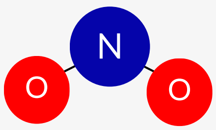
NITRATE AND NITRITE

Community Science Institute
Partnering with Communities to Protect Water



Nitrate = NO_3^-



Nitrite = NO_2^-

WHAT ARE NITRATE AND NITRITE?

Nitrate, NO_3^-, and nitrite, NO_2^-, are two inorganic (meaning they contain no carbon) forms of nitrogen. These can enter the environment naturally as a result of plant decay or when nitrogen in the atmosphere is converted to a form that can be used by plants. Nitrate and nitrite can also be present as a result of excess fertilizer application, discharge from sewage systems or animal waste getting in streams.

WHY DO WE MEASURE NITRATE AND NITRITE?

Nitrite is readily converted into nitrate in the environment, so it is rare to detect even low levels of nitrite in streams. Because of this, nitrate and nitrite are measured together and reported as a sum. On CSI's database, this water quality indicator is written as "Nitrate-+Nitrite-Nitrogen (as N)."

Nitrate is the form of nitrogen that is most available for plants to use, making it an effective component of many fertilizers. However, this same quality can be a drawback if nitrate reaches our streams and lakes, as it can contributing to excessive growth of aquatic plants, algae, and cyanobacteria. Excess nutrients, such as nitrate, may contribute to Harmful Algal Blooms (HABs) or excessive growth of non-toxic algae. Both can reduce oxygen levels when they die and decompose. Either of these examples can have detrimental affects on aquatic ecosystems through toxins produced and/or simply depleting oxygen levels for fish. The New York State Department of Environmental Conservation considers surface water classes A and AA to be impaired if they have nitrate + nitrite levels exceeding 10 mg/L. Nitrate and nitrite are also dangerous for humans when consumed in drinking water. They have no taste or smell, and they affect the ability of blood to carry oxygen, making them especially harmful to babies.

April 2023

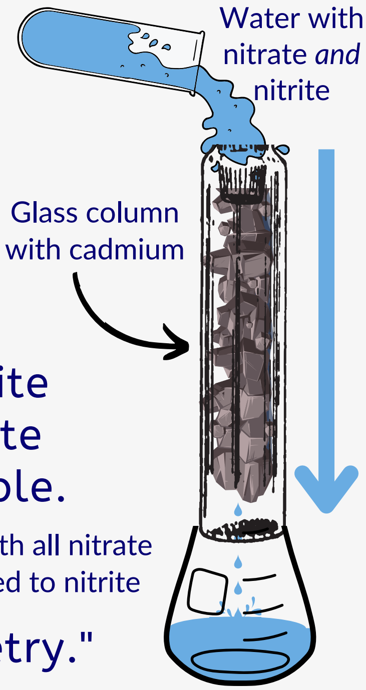
HOW DO WE MEASURE NITRATE AND NITRITE?

Nitr**ite** can be measured directly. But nitr**ate** has to first be reduced to nitrite. The two can be reported as a sum by reducing all nitrate to nitrite and then testing the concentration of nitrite. Or, nitrate can be calculated on its own by measuring nitrite directly, measuring nitrate + nitrite, then subtracting nitrite from nitrate + nitrite. At CSI, what is reported is the concentration of *nitrogen* in nitrate + nitrite, not the chemical compounds (NO_2^- or NO_3^-), which contain oxygen in addition to nitrogen.

Reducing nitrate to nitrite

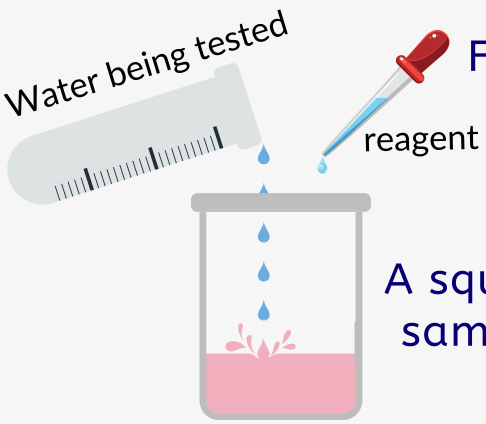
Nitrate (NO_3^-) in a water sample can be reduced to nitrite (NO_2^-) by running it through a column filled with copper-coated cadmium fillings. This process causes all the nitrate in the water to be converted to nitrite (but does not affect the nitrite).

From there, measuring the concentration of nitrite reveals the concentration of nitrogen from nitrate *and* nitrite (as a sum) in the original water sample.



Measuring nitrite

Nitrite is measured using a process called "colorimetry."



First, a color-changing chemical (the "reagent") is added to the water sample. Water with *more* nitrite turns a deeper shade of pink than water with *less* nitrite.

A square vial (a "cuvette") of the now-pink water sample is placed into a machine that measures how light interacts with it.

The amount of light the sample absorbs at a given wavelength (the "absorption") is directly proportional to the concentration of nitrite in the sample.

In other words, a sample that absorbs *more* light (a pinker sample) has a greater concentration of nitrite than a sample that absorbs *less* light (a less pink sample).