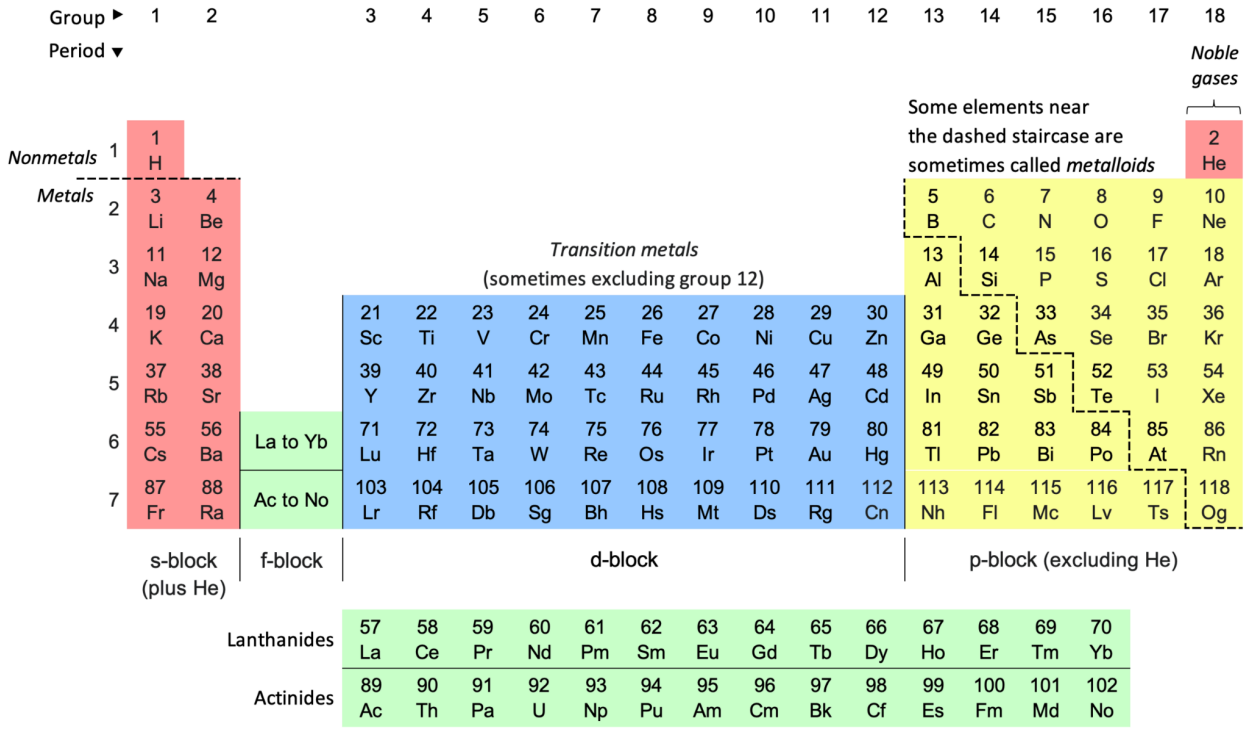
Background Knowledge on Elemental Concentrations in Drinking Water Samples

What Is an Element?

Every element is made up of its own type of atom. This is why the elements are all different from each other. Everything in the universe contains the atoms of at least one or more elements. Everything is made of elements. Hydron is an element; Carbon is an element, too.



Where Do Elements Come From?

Elements were all made inside stars, during the explosion, or formed after the explosion. 14 billion years ago in the ‘Big Bang’, only the lightest elements were formed – hydrogen and helium along with trace amounts of lithium and beryllium. The other elements found in nature were created in nuclear reactions in stars and in huge stellar explosions (known as novae and supernovae).

Stars fuse elemental hydrogen into helium in their cores. Four atoms of hydrogen are combined in a series of steps to create helium-4. These reactions account for nearly all of our Sun’s energy. When a star’s core runs out of hydrogen, the star begins to die out. The dying star begins to manufacture carbon atoms by fusing helium atoms, and begins a further series of nuclear burning or reaction stages. The elements formed in these stages range from oxygen through to iron. During an explosion, the star releases very large amounts of energy as well as neutrons, which allows elements heavier than iron to be produced. In the explosion, all of these elements are expelled out into space.

How We Get Elemental Concentrations in Drinking Water Samples?

ICP-MS is an analytical technique used to determine the concentrations of elements and their isotopes by ionizing atoms in the samples with extremely high-temperature Argon (Ar) plasma and then using a mass spectrometer to measure the number of ions based on their mass-to-charge ratio (m/z).

ICP-MS can measure elements at concentrations at the level of parts per million (ppm), parts per billion (ppb), or even parts per trillion (ppt). One thousand ppm is 0.1%, and the concentration ranges from 0.1 ppt to 0.1% covers 10 orders of magnitude.

We investigate elemental concentrations and distributions of elements in water samples (drinking water sample and natural water samples). We study the behavior of elements through the investigation and predict the behaviors of most of the trace elements in hydrosystems.