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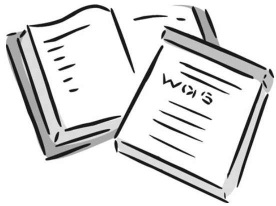
# *KÉMIA IDEGEN NYELVEN*



Az idei tanév későbbi számaiban tervezzük elindítani a német nyelvű szakszövegek fordítási versenyét.

## Kémia angolul

### *Szerkesztő: Tóth Edina*

**Kedves Diákok!**

A *Kémia angol nyelven* verseny a 2020/2021-as tanévben is folytatódik; várjuk fordításaitokat.

A fordításokat a KÖKÉL 2010/4. számának 281-282. oldalán megjelent irányelvek alapján pontozzuk ebben a tanévben is.

Maximálisan **100 pontot** lehet kapni hibátlan fordításra. Ha valaki nem tudja befejezni a teljes szöveget határidőre, dolgozatát akkor is küldje be, hiszen a részszöveg fordításával elért pontok is beleszámítanak a pontversenybe.

A pontversenyre benevezni, és megoldásokat beküldeni **a http://kokel.mke.org.hu** weblapon keresztül lehetséges.

A pontverseny első három helyezettje jutalomban részesül.

A formai követelményekre (lásd a Gondolkodó rovatot) ügyeljetek: **minden egyes lapon szerepeljen a beküldő neve!**

**Beküldési határidő: 2021. november 28.**

Jó fordítást, jó versenyzést kívánok!

**Előszóban**

Amikor szervetlen kémiával foglalkozunk, mindig felmerül a diákokban, hogy mi van azzal a sok elemmel, amivel nem, illetve alig tanulunk. Ezek egy része „esszenciális”, azaz szükséges az élő szervezetek normális növekedéséhez és fejlődéséhez. Más elemek pedig mérgezőek. Ezért az évindító feladatban esszenciális és mérgező elemekkel ismerkedünk.

## The Essentiality of Boron

Boron is an essential micronutrient in plants. The element is believed to play a major role in the synthesis of one of the bases for RNA formation and in cellular activities, such as carbohydrate synthesis. After zinc, boron is the most common soil deficiency worldwide. The class of plants known as dicots have much higher boron requirements than monocots. Crops most susceptible to boron deficiency and that often require boron supplements are alfalfa, carrot, coffee, cotton, peanut, sugar beet, sunflower, rutabaga (swede) and turnip.

There is growing evidence that boron is an essential element for mammals, possibly in bone formation.

## The Toxicity of Aluminum

Aluminum is the third most abundant element in the lithosphere. Despite its ubiquitousness in the environment, it is a highly toxic metal. Fortunately, under near-neutral conditions aluminum ion forms insoluble compounds, minimizing its bioavailability. Fishes are particularly at risk from aluminum toxicity. Research has shown that the damage to fish stocks in acidified lakes is not due to the lower pH but to the higher concentrations of aluminum ion in the water that result from the lower pH. In fact, an aluminum ion concentration of 5 micromol/$dm^3$ is sufficient to kill fish.

Human tolerance of aluminum is greater, but we should still be particularly cautious of aluminum intake. Part of our dietary intake comes from aluminum containing antacids. Tea is high in aluminum ion, but the aluminum ions form inert compounds when milk or lemon is added. It is advisable not to inhale the spray from aluminum-containing antiperspirants because the metal ion is believed to be absorbed easily from the nasal passages directly into the bloodstream.

Aluminum is the most common metal ion in soils; hence, it is also a concern in 30 to 40 percent of the world's arable soils, where acid soil releases aluminum ions. For some crops, such as corn, it is second only to drought as a factor decreasing crop yields—sometimes by as much as

80 percent. The aluminum ion enters the plant root cells, inhibiting cell metabolism. Farmers in poorer countries cannot afford the regular application of powdered limestone to increase soil pH and immobilize the aluminum as an insoluble hydroxo compound. Some plants are naturally resistant to aluminum because their roots excrete citric or malic acids into the surrounding soil. These acids form complexes with the aluminum ion, preventing it from being absorbed into the roots. Genetic engineers are now working on the introduction of citric acid–generating genes into important food crop species, which will hopefully lead to better crop yields.

## The Essentiality of Silicon

Silicon is the second most abundant element in the Earth's crust, yet its biological role is limited by the low water solubility of its common forms, silicon dioxide and silicic acid, $H_4SiO_4$. At about neutral pH, silicic acid is uncharged and has a solubility of about 2 millimol/dm$^3$. As the pH increases, polysilicic acids predominate, then colloidal particles of hydrated silicon dioxide. Although the solubility of silicic acid is low, on the global scale it is enormous, with about 2x$10^{11}$ tonnes of silicic acid entering the sea per year. It is the continuous supply of silicic acid into the sea that enables marine organisms such as diatoms and radiolaria to construct their exoskeletons of hydrated silica.

On a smaller scale, plants require the absorption of about 600 L of water to form about 1 kg of dry mass; thus, plants consist of about 0.15 percent silicon. The silica is used by the plants to stiffen leaves and stalks. In some plants, it is also used for defense. Farther up the food chain, herbivores ingest considerable amounts of silica. A sheep consumes about 30 g of silicon per day, though almost all is excreted. Humans are estimated to consume about 30 mg per day, about 60 percent from breakfast cereal and 20 percent from water and drinks. It is the water-dissolved silicic acid that is bioavailable to our bodies.

The most convincing way to illustrate the essentiality of an element is to grow an organism in the total absence of that element. This is a very difficult but not impossible task. Studies with both rats and chicks showed that silicon-free diets resulted in stunted growth for both animals. Addition of silicic acid to the diet rapidly restored natural growth. The question obviously arose as to the function of the silicon. Chemical studies showed that silicic acid did not react or bind with organic molecules. Thus, incorporation into some essential biosynthetic pathway seemed highly unlikely. The answer seems to lie with its inorganic chemistry. Aluminum is ubiquitous in the environment and this element is highly toxic to organisms. Addition of silicic acid to a saturated neutral solution of aluminum ion causes almost complete precipitation of the aluminum in the form of insoluble hydrated aluminosilicates.

Evidence that silicon did act in a preventative role was provided by a study of young salmon. Those in water containing aluminum ion died within 48 hours. Those in water containing the same concentration of aluminum plus silicic acid thrived. It is now generally accepted that indeed silicon is essential to our diet to inhibit the toxicity of the naturally present aluminum in our foodstuffs.

Although silicon is an essential element, lung-absorbed silica is highly toxic. The hazards of asbestos are well-known. It can cause two serious lung diseases: asbestosis and mesothelioma. The dust of any silicate rock will also cause lung damage, in this case, silicosis. The fundamental cause of the lung problems is due to the total insolubility of the silicates. Once the particles stick in the lungs, they are there for life. The irritation they cause produces scarring and immune responses that lead to the disease state.

**The Toxicity of Tin**

Although the element and its simple inorganic compounds have a fairly low toxicity, its organometallic compounds are very toxic. Compounds such as hydroxotributyltin, $(C_4H_9)_3SnOH$, are effective against fungal infections in potatoes, grapevines, and rice plants. For many years, organotin compounds were incorporated into the paints used on ships' hulls. The compound would kill the larvae of mollusks, such as barnacles, that tend to attach themselves to a ship's hull, slowing the vessel considerably. However, the organotin compound slowly leaches into the surrounding waters, where, particularly within the confines of a harbor, it destroys other marine organisms. For this reason, its marine use has been curtailed.

Source: Geoff Rayner-Canham, Tina Overton - Descriptive Inorganic Chemistry, Fifth Edition -W. H. Freeman (2009)