Name some heavy metals you know.
Where are they in the periodic table?
Why are they called heavy?

Heavy metals

Heavy metals are metallic elements with relatively high atomic numbers. Their densities are high compared to those of other common materials. Some heavy metals are considered extremely troublesome and toxic pollutants, particularly mercury, lead, cadmium, chromium and arsenic.

Cadmium is widely used in metal plating as well as in making small batteries. Cadmium is very toxic, destroying red blood cells and damaging kidney tissue.

Lead is the most common heavy metal pollutant because of its widespread use in industry. Metallic lead is used in the manufacture of car batteries and in plumbing, and lead compounds used to be used as anticorrosive pigments in paints and as petrol additives. Exposure to lead adversely affects the neurological and reproductive system.

Mercury is employed in hundreds of applications, many of which utilize its unusual property of being a liquid metal at room temperature. Mercury or its compounds are used in electrical switches, fluorescent and mercury lamps, batteries and thermometers. When entering the environment mercury may undergo alkylation to give methylmercury and dimethylmercury, both very toxic organometallic compounds. The so-called Minamata Bay incident has been the worst case of poisoning from methylated forms of mercury in recent times. The water in Minamata Bay, Japan, was polluted by the drainage of mercury-containing wastes from a chemical plant, which in turn led to poisoning in the local people as a result of their consuming fish and seafood from the bay.

Arsenic is a metalloid (on the borderline between metals and non-metals in the periodic table), but its environmental and toxicological effects are much like those of heavy metals. Arsenic(III) oxide has been the poison of choice for murder and suicide since ancient times. Before the introduction of modern pesticides, large quantities of arsenic compounds were used to control pests on crops. Today, arsenic is one of the most serious environmental health hazards, being found in natural waters and drinking water at relatively high concentrations. Arsenic is carcinogenic to humans, and also causes cardiovascular diseases and disrupts hormonal processes.

Chromium is widely used for electroplating, corrosion protection and leather tanning. As a consequence of industrial emissions chromium is a common water pollutant. The toxicity of chromium depends on its oxidation state. Hexavalent chromium is highly toxic and chromate(VI) ions – a suspected carcinogen – readily enter cells, where they can oxidize nucleic acid bases. Trivalent chromium is considered much less harmful, even functioning as a trace nutrient.

Reading comprehension

1. What are heavy metals?
2. Which heavy metals are particularly dangerous to the environment?
3. What are the main fields of application of cadmium and lead?
4. What are the main products of the alkylation of mercury?
5. What happened in Minamata Bay?
6. Why is arsenic considered to be one of the most serious environmental health hazards?
7. Does the oxidation state of chromium affect its toxicity?

New terms and expressions

abnormal -nienormalny	**additive** -dodatek
alkylation -alkilowanie	**ancient** -antyczny
anticorrosive -przeciwkorozyjny	**aqueduct** -akwedukt
arsenic -arsen	**arsenic(III) oxide** -tlenek arsenu(III)
bay -zatoka	**cadmium** -kadm
cardiovascular disease -choroba sercowo-naczyniowa	**channel** -kanał
chemical plant -zakłady chemiczne	**chromate(VI)** -chromian(VI)
chromium -chrom	**corrosion protection** -zabezpieczenia przeciwkorozyjne
crop -uprawa, plon	**dimethylmercury** -dimetylortęć
disrupt hormonal processes -zakłócić procesy hormonalne	**drainage** -zlewanie, ściekanie, zrzucanie
electroplating -elektrogalwanizacja	**exposure** -narażenie
felt -filc	**hatter** -rzemieślnik wyrabiający kapelusze(kapelusznik)
hexavalent -sześciowartościowy	**heavy metals** -metale ciężkie
knead -ugniatać, miętosić	**kidney** -nerka
leather tanning -garbowanie skóry	**lead** -ołów
manufacture -produkować	**line** -wyłożyć, wysłać, pokryć
metalloid -półmetal	**mercury** -rtęć
monastery -klasztor	**methylmercury** -metylortęć
murder -morderstwo	**monk** -mnich
nickname -przezwać, przezwisko	**neurological** -neurologiczny
organometallic compounds -związki metaloorganiczne	**nucleic acid bases** -zasady nukleinowe
pests -szkodnik	**oxidation state** -stopień utlenienia
plumbing -przyłącza hydrauliczne	**plating** -galwanizacja
red blood cells -czerwone ciałka krwi	**poison** -trucizna
seafood -żywność pochodzenia morskiego	**reproductive** -rozrodczy
switch -przełącznik	**suicide** -samobójstwo
trivalent -trójwartościowy	**tanning** -garbowanie
tub- balia, wanna	**troublesome** -problematyczny
wine -wino	**wastes** -odpady

Exercises

1. Complete the table showing the adverse effects on humans and typical applications of heavy metals today.

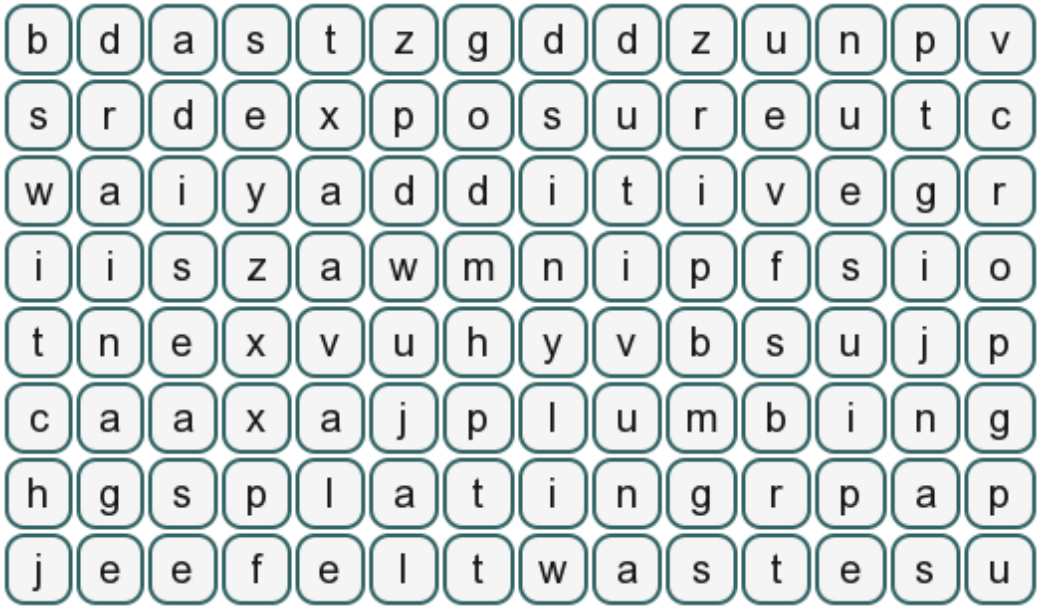
Heavy metal	Adverse effect	Typical application
Cadmium	very toxic, destroys red blood cells, ...	metal plating, ...
Lead		
Mercury		
Arsenic		
Chromium		

VOCABULARY PRACTICE

I. Complete the sentences; use PEST POISON SEAFOOD SUICIDE TANNING TUB KIDNEYS MONKS LEAD BAY

1. Have you ever seen the San Francisco ……..?
2. There are rats in my basement - I have to buy some ……..
3. He engaged in the …….. and leather trade until 1872.
4. …… are shaped like beans.
5. He committed ……. yesterday.
6. …….. can be used to produce ammunition.
7. That …….. is big enough for the two of us.
8. It wasn't really a plague, It was a kind of vine ……...
9. One of the ……. toured us around the monastery.
10. The …….. salad is one of the best in town.

II. Find ten words in the word search below, then translate them into Polish **AND** give your own definition, a synonym or an antonym for each word.



1. .....
2. .....
3. .....
4. .....
5. .....
6. .....
7. .....
8. .....
9. .....
10. .....

2. Problems and questions. Work in groups.

a. Mercury(II) nitrate used to be utilized as a tanning agent in the manufacture of hats in the 19th century. To obtain felt, a fashionable material for men's and women's hats, workers kneaded rabbit skins in mercury nitrate solution contained in large, open tubs. What do you think is the origin of the saying ‘to be as mad as a hatter’, which comes from those times?

b. The ancient Romans drank water carried to Rome from distant places along aqueducts. These water-carrying channels were lined with lead. Could this have had an effect on people's health?

c. Lead(II) acetate is sweet to taste; it even used to be known as ‘lead sugar’. The bones of monks who lived in a certain German monastery in the fifteenth century show an abnormally high content of lead. At that time the monastery was famous for its delicious, sweet wine. Given this information, can you give a possible cause of death of the monks?