**LESSON 4: PERIODIC TABLE OF THE ELEMENTS (**by courtesy of A.Rozkošná)

**Useful website: www.webelements.com**

1. **For one minute try to write down as many elements in English as you can.**
2. **Listening. Listen to the song of the elements by Tom Lehrer and fill in the gaps.**

**(e.g.** [**http://www.youtube.com/watch?v=zGM-wSKFBpo**](http://www.youtube.com/watch?v=zGM-wSKFBpo)**)**

|  |  |
| --- | --- |
| There’s antimony, arsenic, aluminum, selenium, And hydrogen and and nitrogen and rhenium.And nickel, neodymium, neptunium, germanium, And , americium, ruthenium, uranium, Europium, zirconium, lutetium, vanadium,And lanthanum and osmium and astatine and \_\_\_\_\_\_\_\_\_\_\_\_\_ . And gold, protactinium and indium and gallium, And and thorium and thulium and thallium. | There’s holmium and helium and hafnium and erbium, And and francium and fluorine and terbium. And manganese and mercury, molybdenum,\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ Dysprosium and scandium and cerium and cesium, And lead, praseodymium, and platinum, plutonium, Palladium, promethium, , polonium, Tantalum, technetium, titanium, tellurium, And cadmium and and chromium and curium. |
| There’s yttrium, ytterbium, actinium, . And boron, gadolinium, niobium, iridium. And strontium and and silver and samarium, And bismuth, bromine, lithium, beryllium and barium. | There’s sulfur, californium and fermium, berkelium, And also mendelevium, einsteinium and nobelium. And argon, , neon, radon, xenon, zinc and rhodium, And chlorine, carbon, cobalt, copper, Tungsten, tin and . |
|  | These are the only ones of which the news has come to Harvard, And there may be many others but they haven’t been discovered. |

**3. Practice reading from phonetic transcription.**

/´ælyə’mɪniəm/ /’ɒzmiəm/ /’mɜrkyəri/

/’kælsiəm/ /ru’bɪdiəm/ /’niɒn/

/’kɑrbən/ /’soʊdiəm/ /ɪ’tɜrbiəm/

/’aɪərn/ /tɪn/ /’nɪkəl/

/lɛd/ /yʊ’reɪniəm/ /zɪŋk/

<http://dictionary.reference.com/help/luna/IPA_pron_key.html>

**4. Speaking. Work in small groups. Try to answer these questions:**

a) Which element makes more than 90 % of the universe?

b) What is the lightest element? What is the heaviest element?

c) What elements are present in the air? Do you know the percentages?

d) Which element is used as rocket fuel and as alternative fuel for cars?

e) What elements are present in the human body?

f) What are the three forms of carbon? What are their uses?

g) What is an isotope? Do you know any isotopes? Which ones?

h) Do you know any alloys (combinations of metals)? Which ones? What metals are they made of?

i) Which elements can be dangerous? How are they dangerous?

**5. What do you know about arsenic?**

**Listening / Watching. ARSENIC. Watch the video and note down the uses of arsenic.**

<http://www.youtube.com/watch?v=a2AbKwAvyos>

**Vocabulary:**

sample (n) dispose of (v+prep)

mould (n) feed livestock (v)

volatile (adj) powder (n)

poisonous (adj)

common (adj)

high-profile (adj)

**Uses of arsenic:**

**6. Reading: ARSENIC**2

**Study the words below and then read the text about Arsenic. After you have read the text complete the table with suitable information**

**Vocabulary:** element (n), metal (n), non-metal (n), steel (n), brittle (adj.), crystalline (adj.), condense (v), sublime (v), solid (adj.), gaseous (adj.), liquid (adj.), mass (n)

**New vocabulary:**

compound (n) – sloučenina amount (n) - množství

symbol (n) – značka molecular structure (adj+n) – molekulární struktura

[atomic number](http://en.wikipedia.org/wiki/Atomic_number) (adj+n) – protonové číslo stable isotope (adj) – stabilní izotop

half**-**life (n) – poločas rozpadu cause (v) - způsobit

environment (n) – životní prostředí combines with … to form (v) reaguje s … a vytvoří…

occur (v) – vyskytovat se be exposed to/exposure (v/n) být vystaven / vystavení [metalloid](http://en.wikipedia.org/wiki/Metalloid) (n) - polokov treat (v) – ošetřovat

alloy (n) - slitina high/low levels (adj+n) –vysoké / nízké hladiny

**ARSENIC**

**Adapted from Wikipedia**

|  |  |
| --- | --- |
| **Arsenic** is the [chemical element](http://en.wikipedia.org/wiki/Chemical_element) that has the symbol **As**, [atomic number](http://en.wikipedia.org/wiki/Atomic_number) 33 and atomic mass 74.92. Arsenic was first documented by [Albertus Magnus](http://en.wikipedia.org/wiki/Albertus_Magnus) in 1250. The element is a steel grey, very brittle, crystalline solid.Arsenic is a poisonous element that occurs in the earth’s crust. It is [metalloid](http://en.wikipedia.org/wiki/Metalloid) with many [allotropic](http://en.wikipedia.org/wiki/Allotropy) forms, including a yellow (molecular non-metallic) and several black and grey forms (metalloids). Three metalloidal forms of arsenic, each with a different crystal structure, are found free in nature. The most stable of arsenic'sisomers is 68mAs with a half**-**life of 111.In the environment, arsenic is combined with oxygen, chlorine, and sulphur to form inorganic arsenic compounds. Arsenic in animals and plants combines with carbon and hydrogen to form organic arsenic compounds. The most common [oxidation states](http://en.wikipedia.org/wiki/Oxidation_state) for arsenic are −3 ([arsenides](http://en.wikipedia.org/wiki/Arsenide): usually alloy-like intermetallic compounds), +3 (arsenates(III) or [arsenites](http://en.wikipedia.org/wiki/Arsenite), and most organoarsenic compounds), and +5 ([arsenates](http://en.wikipedia.org/wiki/Arsenate): the most stable inorganic arsenic oxycompounds. Arsenic and its compounds are used as [pesticides](http://en.wikipedia.org/wiki/Pesticides), [herbicides](http://en.wikipedia.org/wiki/Herbicide), [insecticides](http://en.wikipedia.org/wiki/Insecticide) and in various [alloys](http://en.wikipedia.org/wiki/Alloy).Arsenic is made on an industrial scale by heating appropriate minerals in the absence of air. The arsenic is condensed out as a solid. FeAsS (700°C) → FeS + As(g) → As(s) Upon heating arsenic sublimes (transfers from the solid to the gaseous state, without passing through the liquid state).You may be exposed to arsenic by: Taking in small amounts in food, water or air / Burning smoke from arsenic-treated wood / Living in an area with high levels of arsenic in rock / Working in a job where arsenic is made or used Exposure to arsenic can cause many health problems. Being exposed to low levels for a long time can change the colour of your skin. Exposure to high levels of arsenic can cause death. | **1****2****3****4****5****6****7** |

|  |  |
| --- | --- |
| **Symbol**  |  |
| **Atomic number**  |  |
| **Atomic mass**  |  |
| **Properties** |  |
| **Occurrence****(Where is it found?)** |  |
| **Forms**  |  |
| **Half-life**  |  |
| **Oxidation states**  |  |
| **Compounds** |  |
| **Uses** |  |
| **Production / lab preparation**  |  |
| **Ways of Exposure** |  |
| **Effects of Exposure** |  |

**7. Now read the text again and complete the second chart with words needed for a description of an element.**

|  |  |  |
| --- | --- | --- |
| **Nouns** | **Verbs** | **Adjectives** |
| ***symbol*** | ***occurs*** | ***crystalline*** |

**8. Speaking. Work in pairs. Without looking at the text, try to summarize all the facts that you have learnt about arsenic according to the tables in exercise 7. and 8.**

**9. Speaking. Work in pairs. Each student should choose 2-3 elements from the periodic table. Try to describe the position in periodic table, properties, occurrence, forms, compounds, uses, reactions etc. Use the standard phrases, structures and vocabulary. The other one has to guess which element it is.**

**You can use these phrases:**

***This element combines with …. to form … It is used as / in ... It is made by …***

|  |
| --- |
| **Lesson 4 – Vocabulary – Periodic Table of the Elements (+Words from HW)** |
| magnify under a microscope | zvětšovat pod mikroskopem |
| transmit radio signals | přenášet rádiové signály |
| process vast amounts of data | zpracovat velké množství dat |
| convert energy (v+n) | přeměnit energii |
| renewable energy sources | obnovitelné zdroje energie |
| rotate (v) | otáčet se |
| fluid (n) | tekutina |
| compounds (n) mixtures (n) | sloučeniny a směsi |
| boiling / melting point (adj+n) | bod varu / tání |
| point of condensation (n+prep+n) | bod kondenzace |
| freezing point (adj+n) | bod mrazu |
| evaporate (v) / evaporation (n) | vypařovat se / vypařování |
| condense (v) / condensation (n) | kondenzovat / kondenzace |
| liquefy (v) / liquefaction (n) | zkapalnit / zkapalnění |
| melt (v) / melting (n) | tát / tání |
| solidify (v) / solidification (n) | tuhnout / tuhnutí |
| sublimate (v) / sublimation (n) | sublimovat / sublimace |
| desublimate (v) / desublimation (n) | desublimovat / desublimace |
| alkali metals (adj+n) | alkalické kovy |
| alkaline earth metals (adj+n) | kovy alkalických zemin |
| halogens (n) | halogeny |
| chalcogens (n) | chalkogeny |
| noble gases (adj+n) | vzácné plyny |
| chemical symbol (adj+n) | chemická značka |
| [atomic number](http://en.wikipedia.org/wiki/Atomic_number) (adj+n) | protonové číslo |
| half**-**life (n) | poločas rozpadu |
| relative atomic mass (adj+adj+n) |  relativní atomová hmotnost |
| poisonous (adj) | jedovatý |
| occur (v) | vyskytovat se |
| metal (n) / [metalloid](http://en.wikipedia.org/wiki/Metalloid) (n) / non-metal (n) | kov / polokov / nekov |
| alloy (n) | slitina |
| amount (n) | množství |
| molecular structure (adj+n) | molekulární struktura |
| stable isotope (adj+n) |  stabilní izotop |
| common (adj) | obvyklý |
| environment (n) |  životní prostředí |
| combines with … to form | reaguje s … a vytvoří… |
| be exposed to (v+prep) / exposure (n) | být vystaven (chemikálii)/ vystavení se |
| treat (v) | ošetřit |
| cause (v)  | způsobit |
| high/low levels (adj+n) | vysoké / nízké hladiny |
| sample (n)  | vzorek |
| volatile (adj) | těkavý |
| dispose of (v+prep) | zbavit se |
| powder (n)  | prášek |

**HOMEWORK: Circle the synonym (=word that means the same):**

1. Chemists study the composition of natural *substances*.

a. materials b. machines

2. Plastic products are hard to dispose of because they are almost *indestructible*.

a. unable to be destroyed b. unable to be constructed

3. Silicon is a nonmetallic element that is inexpensive because it is so *abundant* in minerals and rocks.

a. rare b. plentiful

4. When exposed to air and moisture, iron will *corrode*.

a. rust b. shine

5. After the fire, the police investigated the cause of the *combustion*.

a. burning b. excitement

6. Gasoline should be stored carefully because it is *flammable*.

a. fireproof b. able to catch fire easily

7. Heat can *convert* a solid to a liquid.

a. condense b. change

8. The ammonia was *diluted* in water to make it weaker.

a. thinned b. thickened

9. A *catalyst* speeds up a chemical reaction.

a. chemical agent b. forest animal

10. To obtain aluminum, metallurgists must *extract* it from bauxite.

a. remove b. destroy

11**.** The temperature on a Fahrenheit fever thermometer *ranges* from 94° to 108°.

a. extends b. contracts

12**.** The *volume* of air in a room can be measured in cubic feet.

a. quality b. quantity

13**.** Ten *minus* four equals six.

a. less b. plus

14. Newton *computed* the weights of the planets.

a. measured b. calculated

15. Water contains hydrogen and oxygen in a *ratio* of two to one.

a. proportion b. size

16. The price of gasoline was *quadrupled*, and there were fears it would go even higher.

a. multiplied by four b. divided by four

**The lesson was adapted from materials by Milada Pavlovová.**

**Sources: 1** Available at <http://www.privatehand.com/flash/elements.html> , Transcript http://www.edu- cyberpg.com/iec/elementsong.html

**2** Adapted from [www.wikipedia.org](http://www.wikipedia.org) 3Available at <http://www.youtube.com/watch?v=a2AbKwAvyos>