LESSON4: 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. **In your groups read the texts given you by the teacher about classifying elements. With other people from your group prepare a short summary of what your text says.**

3. **Listening. Listen to the song of the elements by Tom Lehrer and fill in the gaps.**

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.

4. Find the following chemical elements, there are 15 of them. If you cross all of them, the remaining letters, if read from left to right, form a word. Which word is it?

	A	B	C	D	E	F	G	H	I
1	C	A	R	B	O	N	I	T	E
2	A	L	U	M	I	N	I	U	M
3	L	E	B	S	L	E	M	M	E
4	C	K	I	N	O	E	N	N	T
5	I	C	D	R	R	D	A	E	L
6	U	I	I	C	O	Z	I	N	C
7	M	N	U	R	A	N	I	U	M
8	S	R	M	O	S	M	I	U	M
9	Y	T	T	E	R	B	I	U	M

/ˊæl yəˈmɪn i əm/ /ˈɒz mi əm/ /ˈmɜr kyə ri/
/ˈkæl si əm/ /ruˈbɪd i əm/ /ˈni ɒn/
/ˈkɑr bən/ /ˈsoʊ di əm/ /ɪˈtɜr bi əm/
/ˈaɪ ərn/ /tɪn/ /ˈnɪk əl/
/lɛd/ /yʊˈreɪ ni əm/ /zɪŋk/

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

5. 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.[3]

Vocabulary:
sample (n) - vzorek
mould (n) – plíseň
volatile (adj) – těkavý
common (adj) – běžný
dispose of (v+prep) – zbavit se
feed livestock (v) – krmit dobytek
powder (n) – prášek
poisonous (adj) - jedovatý

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 from previous lesson: 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
symbol (n) – značka
atomic number (adj+n) – protonové číslo
half-life (n) – poločas rozpadu
environment (n) – životní prostředí
occur (v) – vyskytovat se
metalloid (n) - polokov
alloy (n) - slitina
amount (n) - množství
molecular structure (adj+n) – molekulární struktura
stable isotope (adj) – stabilní izotop
cause (v) - způsobit
combines with … to form (v) reaguje s … a vytvoří…
be exposed to/exposure (v/n) být vystaven / vystavení
treat (v) – ošetřovat
high/low levels (adj+n) –vysoké / nízké hladiny

ARSENIC

Adapted from Wikipedia

Arsenic is the chemical element that has the symbol **As**, atomic number 33 and atomic mass 74.92. Arsenic was first documented by Albertus Magnus in 1250. The element is a steel grey, very brittle, crystalline solid.	**1**
Arsenic is a poisonous element that occurs in the earth's crust. It is metalloid with many allotropic 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's isomers is 68mAs with a half-life of 111.	**2**
In the environment, arsenic is combined with oxygen, chlorine, and sulfur 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 for arsenic are −3 (arsenides: usually alloy-like intermetallic compounds), +3 (arsenates(III) or arsenites, and most organoarsenic compounds), and +5 (arsenates: the most stable inorganic arsenic oxycompounds. Arsenic and its compounds are used as pesticides, herbicides, insecticides and in various alloys.	**3**
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)	**4**
Upon heating arsenic sublimes (transfers from the solid to the gaseous state, without passing through the liquid state).	**5**
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	**6**
Exposure to arsenic can cause many health problems. Being exposed to low levels for a long time can change the color of your skin. Exposure to high levels of arsenic can cause death.	**7**

Symbol	
Atomic number	
Atomic mass	
Properties	
Occurence (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.

10. Speaking. Work in pairs. Each student should choose 2-3 elements from the periodic table. Try to describe the position in periodic table, properties, occurence, 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 (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 (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 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
[3] Available at http://www.youtube.com/watch?v=a2AbKwAvyos