

6. PERIODIC TABLE OF THE ELEMENTS

Useful website: www.webelements.com

1. Speaking. Discuss these questions in pairs. Take notes.

- a) What is the periodic table of the elements? Try to define it.
- b) How are the elements organized in the periodic table – according to what principle?
- c) Who organized the periodic table? Where was he from?
- d) Do you know how many elements are known today?
- e) What is the difference between an element (e.g. H) and a compound (e.g. H₂SO₄)?
- f) What types and groups of elements do you know?
- g) Do you know any names of elements? What do you know about them?
- h) What information can you find in the periodic table?

2. Listening. Listen to the song of the elements by Tom Lehrer and fill in the gaps.¹

<p>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.</p>	<p>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.</p>
<p>There's yttrium, ytterbium, actinium, _____ And boron, gadolinium, niobium, iridium. And strontium and _____ and silver and samarium, And bismuth, bromine, lithium, beryllium and barium.</p>	<p>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 _____.</p>
	<p>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.</p>

**Now look at the at the periodic table with pronunciation.
Read aloud the names of elements. Mind your pronunciation.**

3. 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?

C	A	R	B	O	N	I	T	E
A	L	U	M	I	N	I	U	M
L	E	B	S	L	E	M	M	E
C	K	I	N	O	E	N	N	T
I	C	D	R	R	D	A	E	L
U	I	I	C	O	Z	I	N	C
M	N	U	R	A	N	I	U	M
S	R	M	O	S	M	I	U	M
Y	T	T	E	R	B	I	U	M

/ 'æ l yə 'mɪ n i ə m /

/ 'b ɜ z m i ə m /

/ 'm ɜ r k y ər i /

/ 'k æ l s i ə m /

/ r u ' b ɪ d i ə m /

/ 'n i θ n /

/ 'k ɑ r b ə n /

/ 's oʊ d i ə m /

/ ɪ ' t ɜ r b i ə m /

/ ' aɪ ə r n /

/ t ɪ n /

/ ' n ɪ k ə l /

/ l ɛ d /

/ y ɜ ' r eɪ n i ə m /

/ z ɪ ŋ k /

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

- Which element makes more than 90 % of the universe?
- What is the lightest element?
- What elements are present in the air? Do you know the percentages?
- Which element is used as rocket fuel and as alternative fuel for cars?
- What elements are present in the human body?
- Which elements are important for our good health? What are they good for?
- What forms of carbon do you know? What are their uses?
- What is an isotope? Do you know any isotopes? Which ones?
- Do you know any alloys (combinations of metals)? Which ones? What metals are they made of?
- Which elements can be dangerous? How are they dangerous?

H																			He
Li	Be											B	C	N	O	F			Ne
Na	Mg											Al	Si	P	S	Cl			Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br			Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I			Xe
Cs	Ba		Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At			Rn
Fr	Ra		Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub								
			La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb			Lu
			Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No			Lr

5. What do you know about arsenic?

Listening / Watching. ARSENIC. Watch the video and note down the uses of arsenic.²

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:

Reading: ARSENIC

6. Vocabulary:

Do you know these words from previous lessons?

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

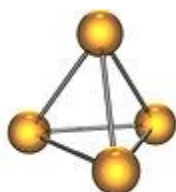
high/low levels (adj+n) –vysoké / nízké hladiny

ARSENIC³

<p>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.</p>	1
<p>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 ^{68m}As with a half-life of 111 seconds.</p>	2
<p>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.</p>	3
<p>Arsenic is made on an industrial scale by heating appropriate minerals in the absence of air. The arsenic is condensed out as a solid.</p> $\text{FeAsS} (700^\circ\text{C}) \rightarrow \text{FeS} + \text{As}(\text{g}) \rightarrow \text{As}(\text{s})$	4
<p>Upon heating arsenic sublimates (transfers from the solid to the gaseous state, without passing through the liquid state).</p>	5
<p>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</p>	6
<p>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.</p>	7

Table: basic information about and classifications of arsenic.

Name: Arsenic Symbol: As Atomic number: 33 Atomic weight: 74.92160 (2) Standard state: solid at 298 K CAS Registry ID: 7440- 38-2	Group in periodic table: 15 Group name: Pnictogen Period in periodic table: 4 Block in periodic table: p-block Colour: metallic grey Classification: Semi-metallic (Metalloid)
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Structure of yellow arsenic As₄

7. Complete the table according to the article:

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	

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

Nouns	Verbs	Adjectives
<i>symbol</i>	<i>occurs</i>	<i>crystalline</i>

9. 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 small groups. 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 ...

11. HOMEWORK: Comparing⁴

2. stupeň (comparative) *light* → *lighter* *lehký* → *lehčí*

Example: How shall we travel? By car or by train?

Let's go by train. It's **cheaper**.

Don't go by train. It's **more expensive**.

a) koncovka **-er**: jednoslabičná přídavná jména a dvouslabičná přídavná jména končící na -y po souhlásce (light → lighter, y → ier: heavy → heavier)

b) pomocí výrazu **more**: všechna ostatní přídavná jména a také příslovce, která končí na -ly. (abundant → more abundant, heavily → more heavily)

c) **nepravidelné tvary**: good/well → better, bad/badly → worse, far → further (*nebo* farther) little → less, old → older/elder (elder brother – o členech rodiny)

- před druhým stupněm lze použít následující výrazy: **far** (= a lot), **much**, **a lot**, **a bit**, **a little**, **slightly** (= a little); e.g. much heavier – mnohem těžší, slightly lighter – o trochu lehčí

- Let's go by car. It's **much cheaper**. (*nebo* It's **a lot cheaper**.)
Pojedme autem. Je to mnohem levnější.

3. stupeň (superlative) *the lightest* *nejlehčí*

Example:

- What is **the longest** river in the world?
- What was **the most enjoyable** holiday you've ever had?

a) light → lighter → **the lightest**, heavy → heavier → the heaviest

b) abundant → more abundant → **the most** abundant

c) good → the best, bad → the worst, far → the furthest, little → the least, old → the eldest

Po *třetím* stupni používáme předložku **in** s místy (města, budovy, atd.):

- What is the longest river **in the world**?

S časovým určením se běžně užívá **of**:

- What was the happiest day **of your life**?

V kladných větách a v otázkách použijte **konstrukci as.....as** (NE so...as):

- I'm sorry I'm late. I got here **as fast as** I could.
Omlouvám se, jdu pozdě. Dorazil jsem jak nejrychleji to šlo.
- There's plenty of food. You can have **as much** as you like.
Je tu spousta jídla. Můžete sníst kolik chcete.

Také narazíte na konstrukci **twice as....as, three times as....as**, atd.:

- Petrol is **twice as expensive as** it was a few years ago.
Benzin je dvakrát dražší než býval před několika lety.

Říkejte **the same as** (NE the same like):

- Ann gets **the same salary as** me. *nebo* Ann's salary is **the same as** mine.
Anna má stejný plat jako já.

Than me / than I am. Obvykle se používá:

- You are taller than **me**. (NE than I)
- He is not as clever as **her** (NE as she).

Less..... (than) je podobné jako **not as(as)**:

- I spent **less** money **than** you.
Utratila jsem méně peněz než vy.

Exercises:

a) Přečtěte si úvodní věty a dokončete větu další. Použijte tvary s **-er** nebo **more...**

1. Yesterday the temperature was nine degrees. Today it's only six degrees.
It's colder today than it was yesterday.
2. The journey takes four hours by car and five hours by train.
It takes.....
3. Dave and I went for a run. I ran ten kilometres. Dave stopped after eight kilometres. I ran
4. Chris and Joe both did badly in the exam. Chris got 20% but Joe only got 15%. Joe did

b) Jaký je druhý+třetí stupeň těchto slov?

1. small – **smaller** – **the smallest**
2. ugly
3. destructive
4. unpleasant
5. far

c) Použijte slov v závorkách a dokončete věty. Použijte **much / a bit** + *druhý stupeň*, popř. **than**:

1. Her illness was **much more serious than** we thought at first. (much / serious)
2. This bag is too small. I need something (much / big)
3. I'm afraid the problem is it seems. (much / complicated)
4. You looked depressed this morning but you look now. (a bit / happy)
5. I enjoyed our visit to the museum. It was I expected. (far / interesting)

d) Dokončete věty, použijte **as.....as**:

1. I'm quite tall but you are taller. I'm not **as tall as you.**
2. My salary is high but yours is higher. My salary isn't
3. You know a bit about cars but I know more. You don't
4. It's still cold but it was colder yesterday. It isn't

e) Vytvořte věty, kde použijete **the same as**:

1. Sally and Kate are both 22 years old. **Sally is the same age as Kate.**
2. You and I both have dark brown hair. Your hair
3. I arrived at 10:25 and so did you. I
4. My birthday is 5 April. Tom's birthday is 5 April, too. My

f) Dokončete věty. Použijte **than....** nebo **as**:

1. I can't reach as high as you. You are taller **than me.**
2. He doesn't know much. I know more
3. I don't work particularly hard. Most people work as hard
4. We were very surprised. Nobody was more surprised
5. She's not a very good player. I'm a better player

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>

⁴ Raymond Murphy: *English Grammar in Use (A self-study reference and practice book for intermediate students)*, second edition, Cambridge University Press 1994. Adapted from Marie Sabolová.

Week 6 – 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

