

CLIL

Periodic Table of the Elements

Vytvořeno v rámci projektu Zvýšení jazykové kompetence

2016-1-CZ01-KA101-023159

Erasmus + Vzdělávací mobilita jednotlivců – Mobilita – Mobilita
pracovníků školy



Erasmus+

Periodic Table of the Elements

Could Mendeleev have got a Nobel
prize?

Periodic Table of the Elements



a tabular arrangement of the chemical elements
ordered by

their atomic number

electron configurations

recurring chemical properties

History of the Periodic Table

Metals of Antiquity

- gold
- silver
- copper
- tin
- lead
- iron
- mercury
- carbon
- sulphur
- zinc
- arsenic
- antimony

Middle Ages

up to 1799

other 21 elements

discovered during the age of Enlightenment

Antoine-Laurent de Lavoisier

classified elements as metals and non-metals

19th century
more than 60 elements known

Johann Wolfgang Döbereiner

- ▶ formed some of the elements into groups of three – triads

chlorine, bromine, and iodine

calcium, strontium, and barium

sulfur, selenium, and tellurium

lithium, sodium, and potassium

each triad had related properties

19th century



► John Newlands

classified the sixty-two known elements into eight groups, based on their physical properties

| No. | No. | No. | No. | No. | No. | No. | No. | No. |
|------|-------|-------|------------|------------|-------|-----------|------------|-----|
| H 1 | F 8 | Cl 15 | Co & Ni 22 | Br 29 | Pd 36 | I 42 | Pt & Ir 50 | |
| Li 2 | Na 9 | K 16 | Cu 23 | Rb 30 | Ag 37 | Cs 44 | Os 51 | |
| G 3 | Mg 10 | Ca 17 | Zn 24 | Sr 31 | Cd 38 | Ba & V 45 | Hg 52 | |
| Bo 4 | Al 11 | Cr 19 | Y 25 | Ce & La 33 | U 40 | Ta 46 | Tl 53 | |
| C 5 | Si 12 | Ti 18 | In 26 | Zr 32 | Sn 39 | W 47 | Pb 54 | |
| N 6 | P 13 | Mn 20 | As 27 | Di & Mo 34 | Sb 41 | Nb 48 | Bi 55 | |
| O 7 | S 14 | Fe 21 | Se 28 | Ro & Ru 35 | Te 43 | Au 49 | Th 56 | |

Picture 1 Newland's table of the elements

Lothar Meyer

1864

worked on a periodic table independently of Mendeleev

28 elements were classified by valence, not atomic weight

his work was published in 1864 a few months before Mendeleev

no prediction of new elements

considered a co-author of the periodic table

Dimitri Ivanovic Mendeleev

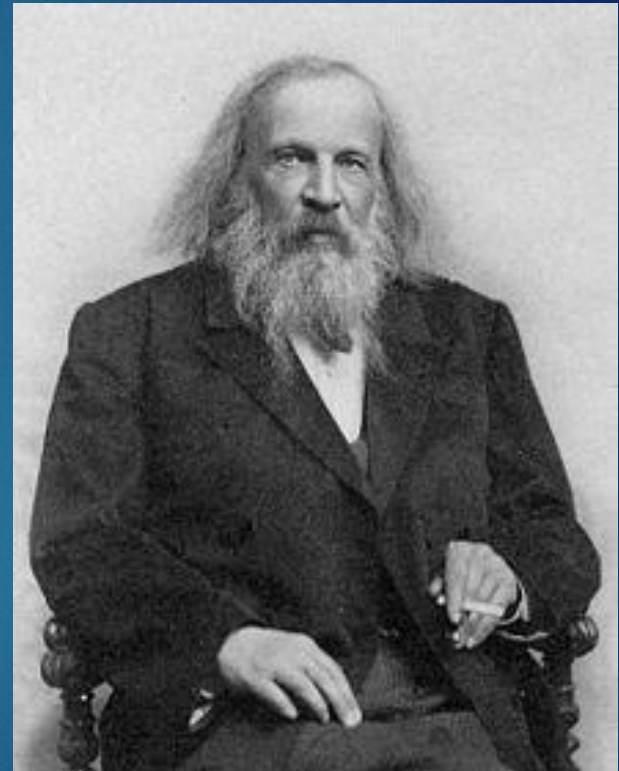
a Russian chemist and inventor

considered the most famous Russian and Slavic chemist

devoted to anorganic, organic and physical chemistry, aeronautics, meteorology, measurement techniques

designed industrial process of ratification of oil

produced smokeless gunpowder



Picture 2

Mendeleev's work

the first scientist to make a periodic table similar to the one used today

arranged the elements by atomic mass

elements exhibited the periodicity of properties

expected the discovery of many yet unknown elements

predicted the discovery of new elements and left spaces for them

eka-silicon (germanium)

eka-aluminium (gallium)

eka-boron (scandium)

Mendeleev's 1871 periodic table

Периодическая система элементов Д. Менделѣева

The image shows Mendeleev's 1871 periodic table, titled "Периодическая система элементов Д. Менделѣева". The table is organized into groups (I to VIII) and periods (I to VIII). Each element is represented by its symbol, atomic weight, and name in Russian. The table includes a small box with a note: "This system, as yet incomplete in detail, has been arranged in order of increasing atomic weight." The elements are arranged in a way that shows their periodic properties, with gaps left for elements that were not yet discovered.

| Group | Period I | Period II | Period III | Period IV | Period V | Period VI | Period VII | Period VIII | Period IX |
|--------------|----------|-----------|------------|-----------|----------|-----------|------------|-------------|-----------|
| I | H-1 | | | | | | | | |
| II | | Li-7 | | | | | | | |
| III | | | Be-9 | | | | | | |
| IV | | | | B-11 | | | | | |
| V | | | | | C-12 | | | | |
| VI | | | | | | N-14 | | | |
| VII | | | | | | | O-16 | | |
| VIII | | | | | | | | F-19 | |
| IX | | | | | | | | | Cl-35.5 |
| X | | | | | | | | | |
| XI | | | | | | | | | |
| XII | | | | | | | | | |
| XIII | | | | | | | | | |
| XIV | | | | | | | | | |
| XV | | | | | | | | | |
| XVI | | | | | | | | | |
| XVII | | | | | | | | | |
| XVIII | | | | | | | | | |
| XIX | | | | | | | | | |
| XX | | | | | | | | | |
| XXI | | | | | | | | | |
| XXII | | | | | | | | | |
| XXIII | | | | | | | | | |
| XXIV | | | | | | | | | |
| XXV | | | | | | | | | |
| XXVI | | | | | | | | | |
| XXVII | | | | | | | | | |
| XXVIII | | | | | | | | | |
| XXIX | | | | | | | | | |
| XXX | | | | | | | | | |
| XXXI | | | | | | | | | |
| XXXII | | | | | | | | | |
| XXXIII | | | | | | | | | |
| XXXIV | | | | | | | | | |
| XXXV | | | | | | | | | |
| XXXVI | | | | | | | | | |
| XXXVII | | | | | | | | | |
| XXXVIII | | | | | | | | | |
| XXXIX | | | | | | | | | |
| XL | | | | | | | | | |
| XLI | | | | | | | | | |
| XLII | | | | | | | | | |
| XLIII | | | | | | | | | |
| XLIV | | | | | | | | | |
| XLV | | | | | | | | | |
| XLVI | | | | | | | | | |
| XLVII | | | | | | | | | |
| XLVIII | | | | | | | | | |
| XLIX | | | | | | | | | |
| L | | | | | | | | | |
| LXI | | | | | | | | | |
| LXII | | | | | | | | | |
| LXIII | | | | | | | | | |
| LXIV | | | | | | | | | |
| LXV | | | | | | | | | |
| LXVI | | | | | | | | | |
| LXVII | | | | | | | | | |
| LXVIII | | | | | | | | | |
| LXIX | | | | | | | | | |
| LXX | | | | | | | | | |
| LXXI | | | | | | | | | |
| LXXII | | | | | | | | | |
| LXXIII | | | | | | | | | |
| LXXIV | | | | | | | | | |
| LXXV | | | | | | | | | |
| LXXVI | | | | | | | | | |
| LXXVII | | | | | | | | | |
| LXXVIII | | | | | | | | | |
| LXXIX | | | | | | | | | |
| LXXX | | | | | | | | | |
| LXXXI | | | | | | | | | |
| LXXXII | | | | | | | | | |
| LXXXIII | | | | | | | | | |
| LXXXIV | | | | | | | | | |
| LXXXV | | | | | | | | | |
| LXXXVI | | | | | | | | | |
| LXXXVII | | | | | | | | | |
| LXXXVIII | | | | | | | | | |
| LXXXIX | | | | | | | | | |
| LXXXX | | | | | | | | | |
| LXXXXI | | | | | | | | | |
| LXXXXII | | | | | | | | | |
| LXXXXIII | | | | | | | | | |
| LXXXXIV | | | | | | | | | |
| LXXXXV | | | | | | | | | |
| LXXXXVI | | | | | | | | | |
| LXXXXVII | | | | | | | | | |
| LXXXXVIII | | | | | | | | | |
| LXXXXIX | | | | | | | | | |
| LXXXXX | | | | | | | | | |
| LXXXXXI | | | | | | | | | |
| LXXXXXII | | | | | | | | | |
| LXXXXXIII | | | | | | | | | |
| LXXXXXIV | | | | | | | | | |
| LXXXXXV | | | | | | | | | |
| LXXXXXVI | | | | | | | | | |
| LXXXXXVII | | | | | | | | | |
| LXXXXXVIII | | | | | | | | | |
| LXXXXXIX | | | | | | | | | |
| LXXXXXX | | | | | | | | | |
| LXXXXXXI | | | | | | | | | |
| LXXXXXXII | | | | | | | | | |
| LXXXXXXIII | | | | | | | | | |
| LXXXXXXIV | | | | | | | | | |
| LXXXXXXV | | | | | | | | | |
| LXXXXXXVI | | | | | | | | | |
| LXXXXXXVII | | | | | | | | | |
| LXXXXXXVIII | | | | | | | | | |
| LXXXXXXIX | | | | | | | | | |
| LXXXXXXX | | | | | | | | | |
| LXXXXXXXI | | | | | | | | | |
| LXXXXXXXII | | | | | | | | | |
| LXXXXXXXIII | | | | | | | | | |
| LXXXXXXXIV | | | | | | | | | |
| LXXXXXXXV | | | | | | | | | |
| LXXXXXXXVI | | | | | | | | | |
| LXXXXXXXVII | | | | | | | | | |
| LXXXXXXXVIII | | | | | | | | | |
| LXXXXXXXIX | | | | | | | | | |
| LXXXXXXX | | | | | | | | | |

Picture 3

Dimitri Mendeleev

introduced the first logical classification system of elements

specified 3 undiscovered elements

predicted some other elements

his work overtook the period of 50 years

did not get a Nobel prize – one ballot was missing

20th century

Henry Moseley – an English physicist
1913 - discovered atomic numbers
specified some positions of elements

Glenn T. Seaborg – an American nuclear chemist
discovered and investigated 10 transuranium
elements and more than 100 isotopes
1951 Nobel prize for Chemistry

Mendeleev's law

The chemical and physical properties of the
elements

recur periodically when the elements
are arranged in the order
of their atomic weights

Current Periodic Law

Properties of elements recur periodically
as atomic numbers increase

Vocabulary I

- Antiquity
- Middle Ages
- Enlightenment
- Modern Times

- starověk
- středověk
- osvětlení
- novověk

Vocabulary II

- chemical element
- atomic number
- electron configuration
- chemical property
- metals, non-metals
- valence
- law
- ballot
- chemický prvek
- protonové číslo
- elektron. konfigurace
- chemická vlastnost
- kovy, nekovy
- mocenství
- zákon
- hlasovací lístek

Vocabulary III

- clasify
- recur
- discover
- form
- relate
- publish
- predict
- devote
- třídit, zařadit
- vracet se, opakovat
- objevit
- utvořit, formulovat
- vztahovat
- uveřejnit
- předpovědět
- věnovat, zasvětit

Vocabulary IV

- design
- produce
- invent
- arrange
- exhibit
- investigate
- increase
- overtake

- navrhnout
- vytvořit, vyrobit
- vynalézt
- uspořádat, upravit
- vystavit, projevit
- zkoumat, vyšetřovat
- zvýšit
- předběhnout

Questions

- ▶ 1. What is the Periodic Table of Elements?
- ▶ 2. How are the elements arranged?
- ▶ 3. What metals were known in antient times?
- ▶ 4. How many elements were known in 19th century?
- ▶ 5. Who got the Nobel Prize for Chemistry?
- ▶ 6. Why did not Mendeleev get the award?

Go to <http://www.ptable.com/?lang=cs> and show:

- ▶ Noble gases
- ▶ Other nonmetals
- ▶ Alkali metals
- ▶ Alkali earth metals
- ▶ Metaloids
- ▶ Nontransition metals
- ▶ Transition metals
- ▶ Lanthanides
- ▶ Actinides

Použité zdroje

- ▶ Pic.1 John Newlands (chemist). (2017, July 9). In *Wikipedia, The Free Encyclopedia*. Retrieved 11:45, July 11, 2017 from [https://en.wikipedia.org/w/index.php?title=John_Newlands_\(chemist\)&oldid=789837217](https://en.wikipedia.org/w/index.php?title=John_Newlands_(chemist)&oldid=789837217)
- ▶ Pic.2 Dmitri Mendeleev. (2017, June 21). In *Wikipedia, The Free Encyclopedia*. Retrieved 11:37, July 11, 2017 from https://en.wikipedia.org/w/index.php?title=Dmitri_Mendeleev&oldid=786779129
- ▶ Pic 3 History of the periodic table. (2017, June 26). In *Wikipedia, The Free Encyclopedia*. Retrieved 11:44, July 11, 2017 from https://en.wikipedia.org/w/index.php?title=History_of_the_periodic_table&oldid=787647523