UNS
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SEBELAS MARET

Kimia Unsur
Chemical Elements

Meeting - 9
Every Thursday
at 7 – 9.30 am

Dr.paed. Nurma Yunita Indriyanti, M.Si., M.Sc.
2016

Tentative Schedule: Tentative lecture topic coverage, subject to change.

Meeting	Date	Topic
9	25-10-2016	Refresh: Studium General ''Chemistry in Context''
10	03-11-2016	Introduction, Hydrogen
	10-11-2016	
11	17-11-2016	Group 1A, IIA (1,2)
12	24-11-2016	Group IIIA, IVA (13,14)
13	01-12-2016	Group VA, VIA (15,16)
14	08-12-2016	Group VIIA, VIIIA (17,18)
15	15-12-2016	Group IB,IIB, IIIB (3,11,12)
16	22-12-2016	Group IVB, VB, VIB (4,5,6)
17	29-12-2016	Group VIIB-VIIIB (7,8,9,10)
18	05-01-2017	Final Exam

Evaluation

- **60% Exam and HW**

- 40 % Final Exam
- 20 % HW

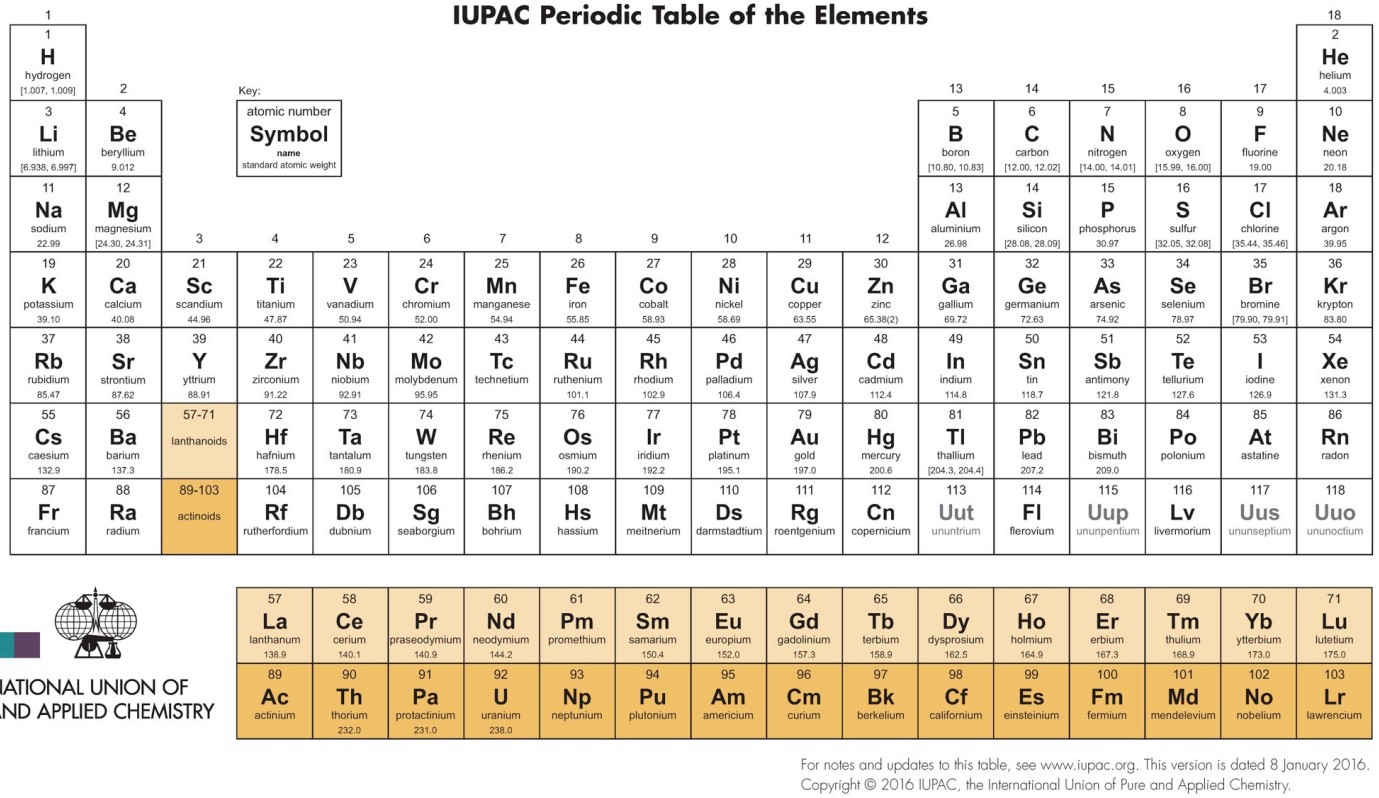
- **40% Presentation task**

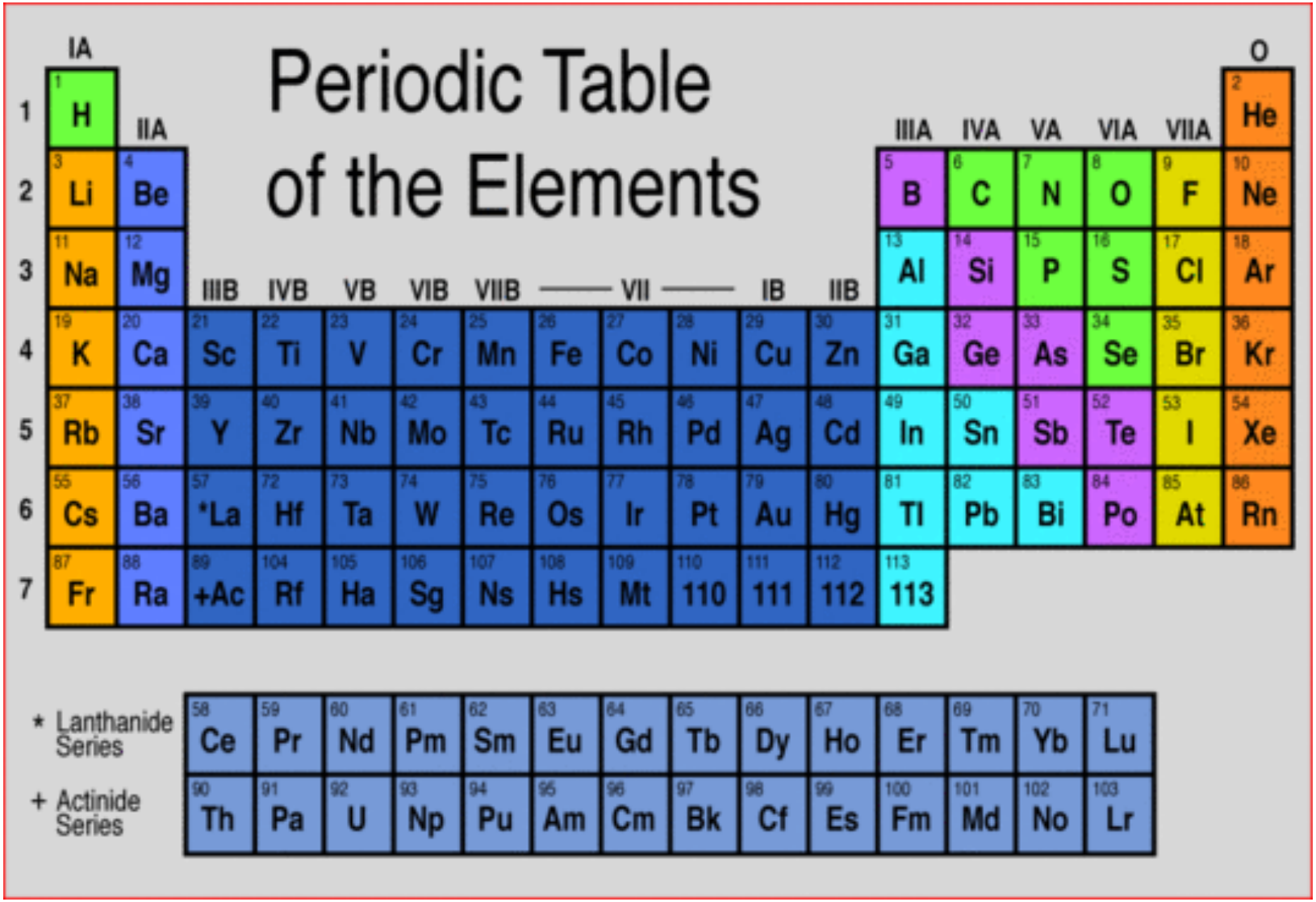
- 10% Presentation
- 10% content of the presentation
- 10% participation
- 10% Written Task

References

- Huheey et al., Inorganic Chemistry (book)
- Prakash et al., Advanced Inorganic Chemistry (book)
- Journal of Inorganic chemistry
- Journal of chemical education
- Download lecture materials:
- http://nurma.staff.uns.ac.id

Periodic table of elements




Periodic Table of the Elements
IA
IIA
IIIB
IVB
VB
VIB
VIIB
VII
IB
IIB
IIIA
IVA
VA
VIA
VIIA
O
1 H
2 He
3 Li
4 Be
5 B
6 C
7 N
8 O
9 F
10 Ne
11 Na
12 Mg
13 Al
14 Si
15 P
16 S
17 Cl
18 Ar
19 K
20 Ca
21 Sc
22 Ti
23 V
24 Cr
25 Mn
26 Fe
27 Co
28 Ni
29 Cu
30 Zn
31 Ga
32 Ge
33 As
34 Se
35 Br
36 Kr
37 Rb
38 Sr
39 Y
40 Zr
41 Nb
42 Mo
43 Tc
44 Ru
45 Rh
46 Pd
47 Ag
48 Cd
49 In
50 Sn
51 Sb
52 Te
53 I
54 Xe
55 Cs
56 Ba
57 *La
72 Hf
73 Ta
74 W
75 Re
76 Os
77 Ir
78 Pt
79 Au
80 Hg
81 Tl
82 Pb
83 Bi
84 Po
85 At
86 Rn
87 Fr
88 Ra
89 +Ac
104 Rf
105 Ha
106 Sg
107 Ns
108 Hs
109 Mt
110 110
111 111
112 112
113 113
* Lanthanide Series
58 Ce
59 Pr
60 Nd
61 Pm
62 Sm
63 Eu
64 Gd
65 Tb
66 Dy
67 Ho
68 Er
69 Tm
70 Yb
71 Lu
+ Actinide Series
90 Th
91 Pa
92 U
93 Np
94 Pu
95 Am
96 Cm
97 Bk
98 Cf
99 Es
100 Fm
101 Md
102 No
103 Lr

THE FOUR NEW ELEMENTS

Nihonium and symbol Nh, for the element 113,

Moscovium and symbol Mc, for the element 115,

Tennessine and symbol Ts, for the element 117, and

Oganesson and symbol Og, for the element 118.

Nh

- For the element with atomic number 113 the discoverers at RIKEN Nishina Center for Accelerator-Based Science (Japan) proposed the name **nihonium** and the symbol **Nh**.

- Nihon is one of the two ways to say “Japan” in Japanese, and literally mean “the Land of Rising Sun”.

- Element 113 is the first element to have been discovered in an Asian country.

Mc

- The atomic number 115
- Moscovium is in recognition of the Moscow region and honors the ancient Russian land that is the home of the Joint Institute for Nuclear Research, where the discovery experiments were conducted using the Dubna Gas-Filled Recoil Separator in combination with the heavy ion accelerator capabilities of the Flerov Laboratory of Nuclear Reactions.

Ts

- The atomic number 117
- Tennessine is in recognition of the contribution of the Tennessee region, including Oak Ridge National Laboratory, Vanderbilt University, and the University of Tennessee at Knoxville, to superheavy element research, including the production and chemical separation of unique actinide target materials for superheavy element synthesis at ORNL's High Flux Isotope Reactor (HFIR) and Radiochemical Engineering Development Center (REDC).

Og

- For the element with atomic number 118 the collaborating teams of discoverers at the Joint Institute for Nuclear Research, Dubna (Russia) and Lawrence Livermore National Laboratory (USA) proposed the name **oganesson** and symbol **Og**. The proposal is in line with the tradition of honoring a scientist and recognizes Professor Yuri Oganessian (born 1933) for his pioneering contributions to transactinoid elements research. His many achievements include the discovery of superheavy elements and significant advances in the nuclear physics of superheavy nuclei including experimental evidence for the “island of stability”.

Presentation schedule

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Hydrogen

- Place of Hydrogen in the periodic table
- Group 1, 13 or 17?

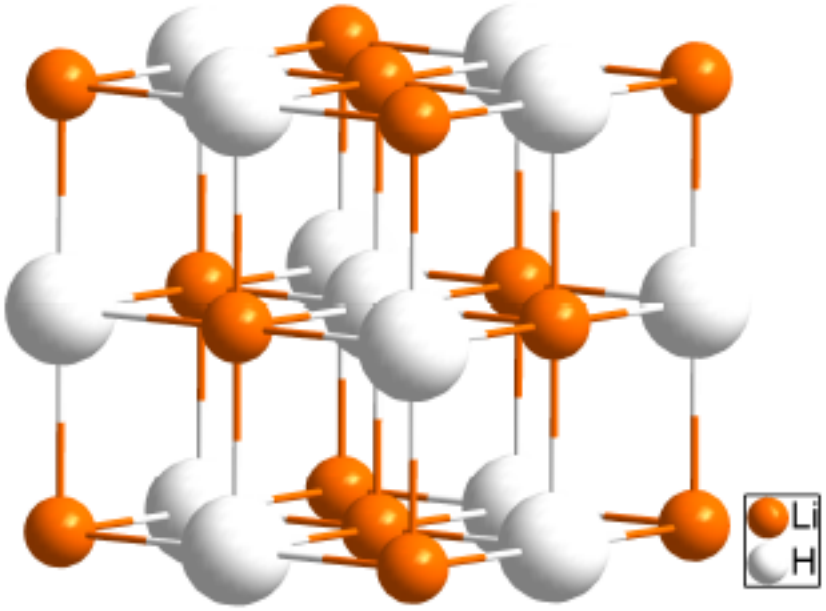
- Analogy with Halogens?
- Analogy with alkali metals?
- Analogy with carbon?

Hydride Ion

$H(g) + e^- \rightarrow H^-(g)$ $\Delta_{EA}H(298K) = -73\ kJ\ mol^{-1}$

In the solid state, all alkali metal hydrides crystallize with the NaCl structure type.

- From the crystal structure, the radius of H^- can be estimated by: internuclear distance = $r_{cation} + r_{anion}$



Isotopes of Hydrogen

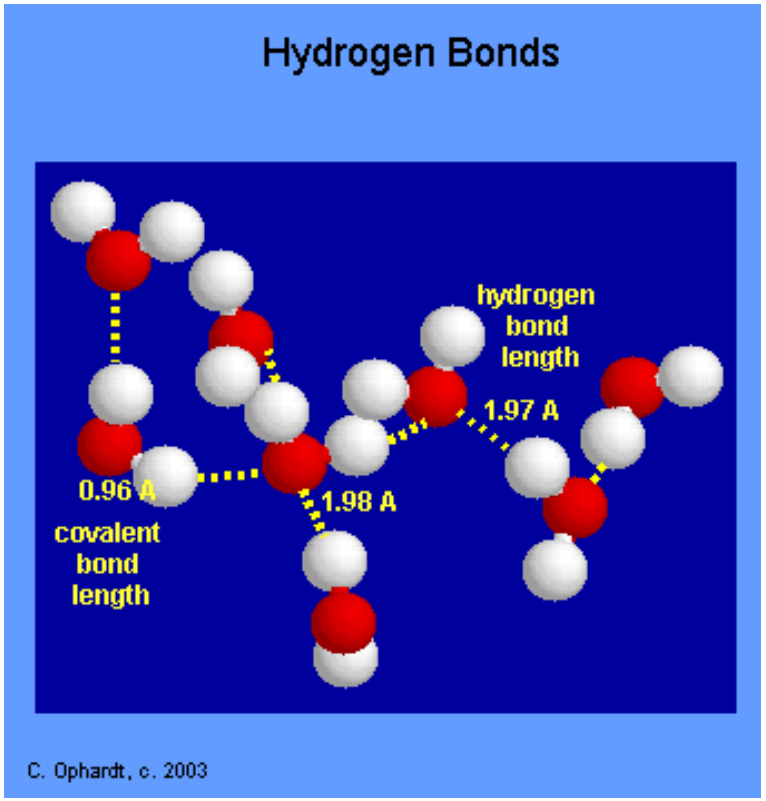
Three common isotopes: protium, deuterium, and tritium

	Protium	Deuterium	Tritium
Symbols†	^{1}H or H	^{2}H or D	^{3}H or T
Natural abundance	99.985%	0.0156%	<1 in 10^{17} atoms
Isotopic mass / u	1.0078	2.0141	3.0160
Nuclear spin	$\frac{1}{2}$	1	$\frac{1}{2}$

† Strictly, ^{1}H should be written as $^{1}_{1}$H, ^{2}H as $^{2}_{1}$H and ^{3}H as $^{3}_{1}$H, but the less rigorous symbols are generally used.

Hydrogen bonding

- A hydrogen bond is the attractive force between the hydrogen attached to an electronegative atom of one molecule and an electronegative atom of a different molecule. Usually the electronegative atom is oxygen, nitrogen, or fluorine, which has a partial negative charge. The hydrogen then has the partial positive charge.



Major Uses of Hydrogen