UNS
UNIVERSITAS
SEBELAS MARET

Kimia Unsur
Chemical Elements

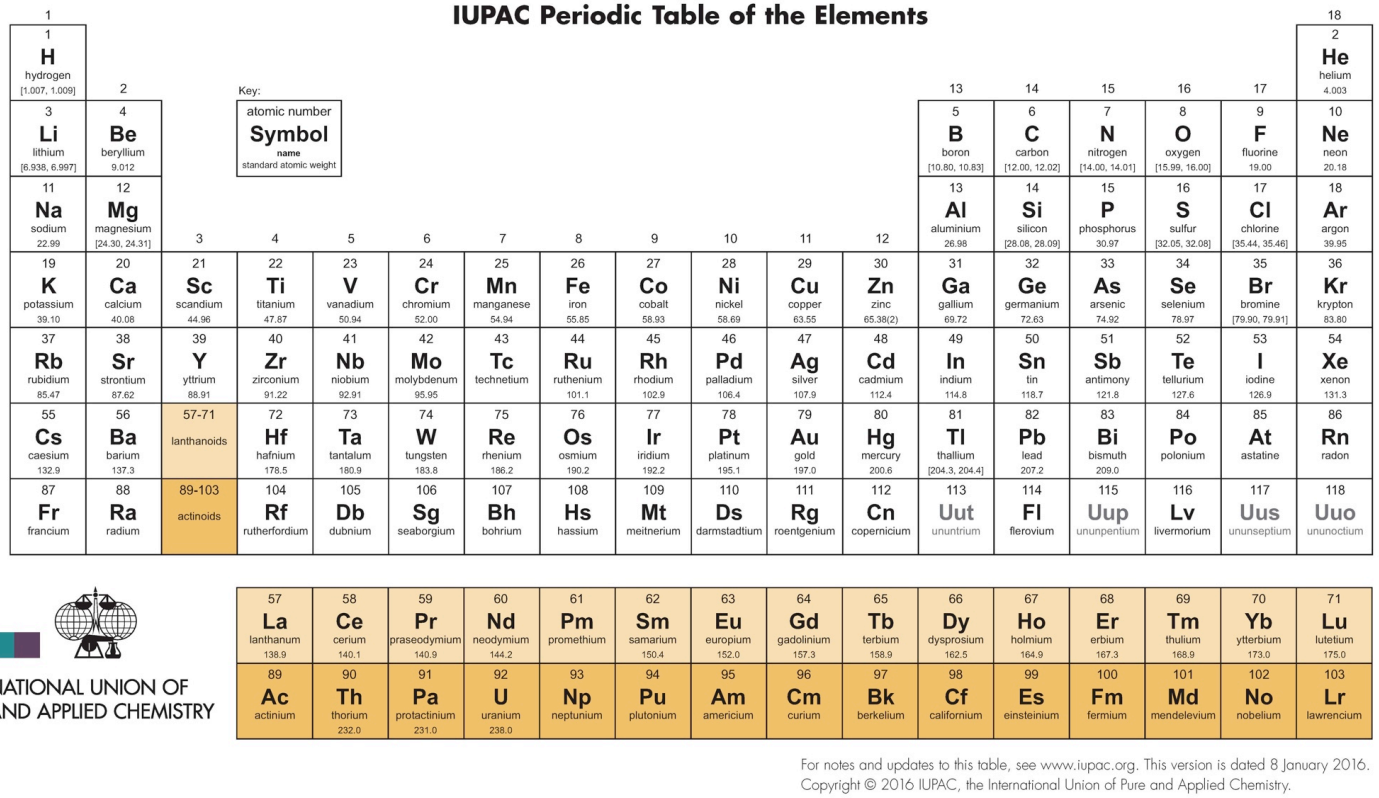
Meeting - 10
Every Thursday
at 7 – 9.30 am

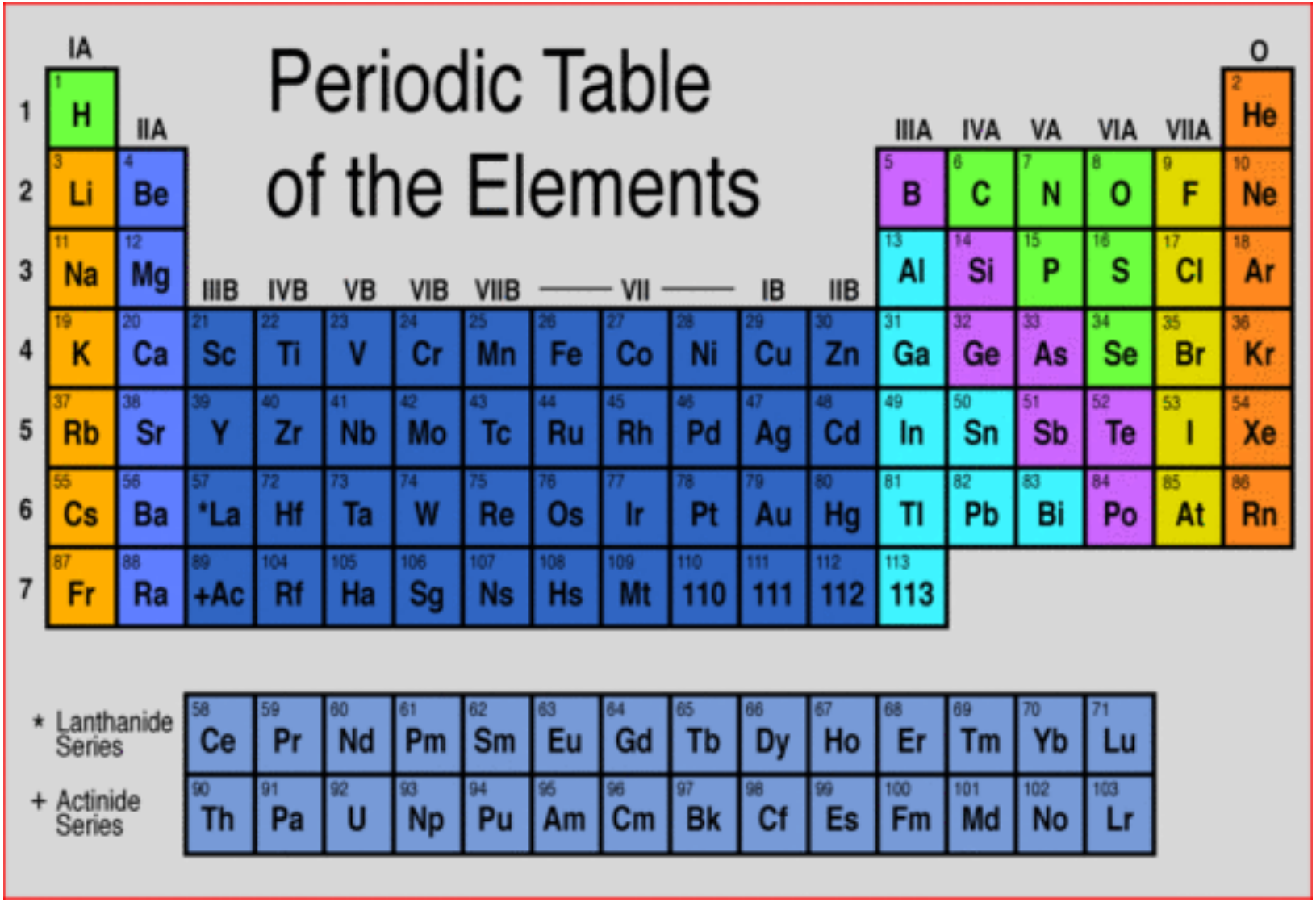
Dr.paed. Nurma Yunita Indriyanti, M.Si., M.Sc.
2016

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

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

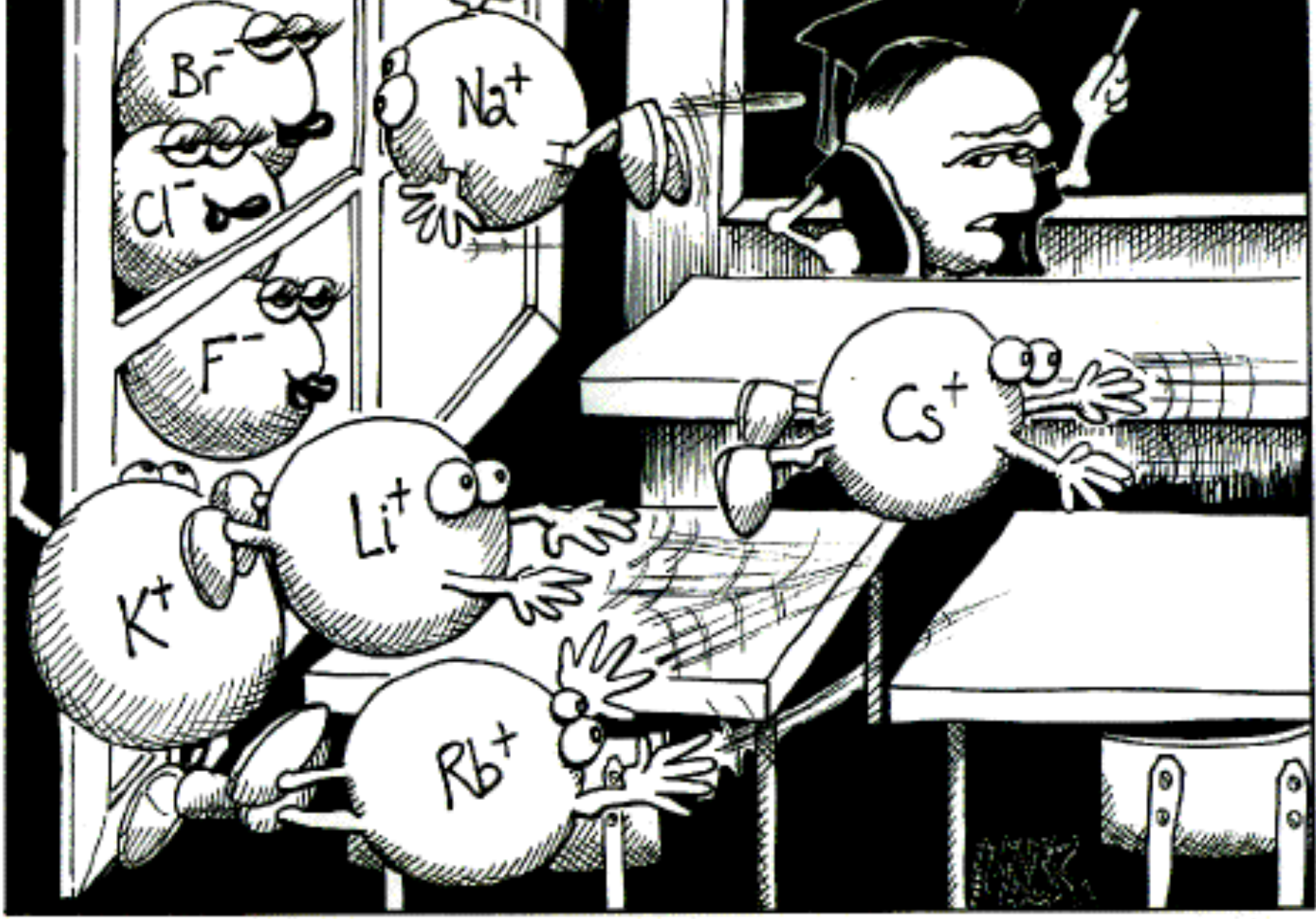
Discussion

- Which hydrogen bond would you expect to be stronger, S-H……O or O-H……S?
- Describe the expected physical properties of water in the absence of hydrogen bonding.

IUPAC def (2011)

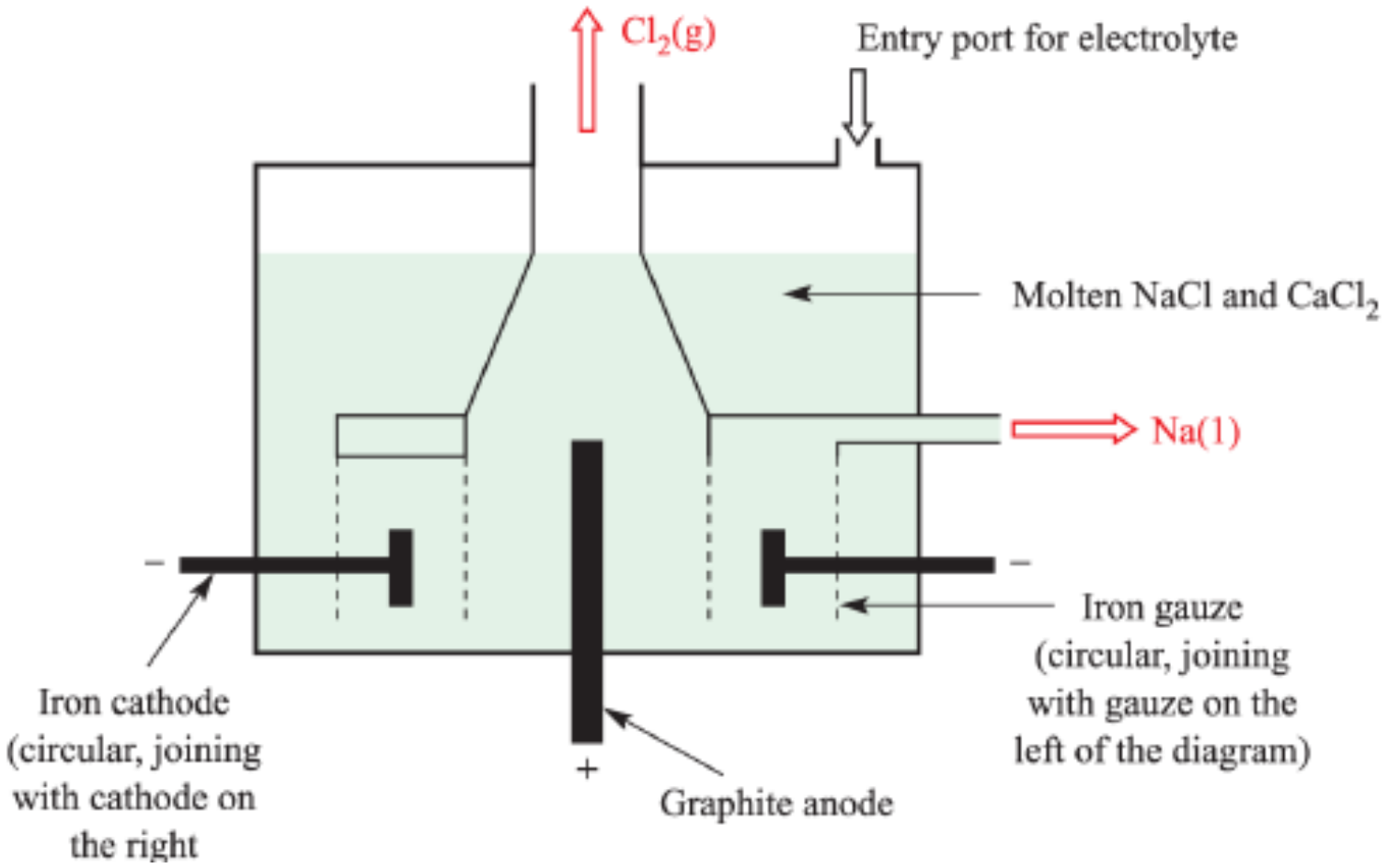
- The hydrogen bond is an attractive interaction between a hydrogen atom from a molecule or a molecular fragment X–H in which X is more electronegative than H, and an atom or a group of atoms in the same or a different molecule, in which there is evidence of bond formation.[6]

Alkali Metals and Earth Alkali



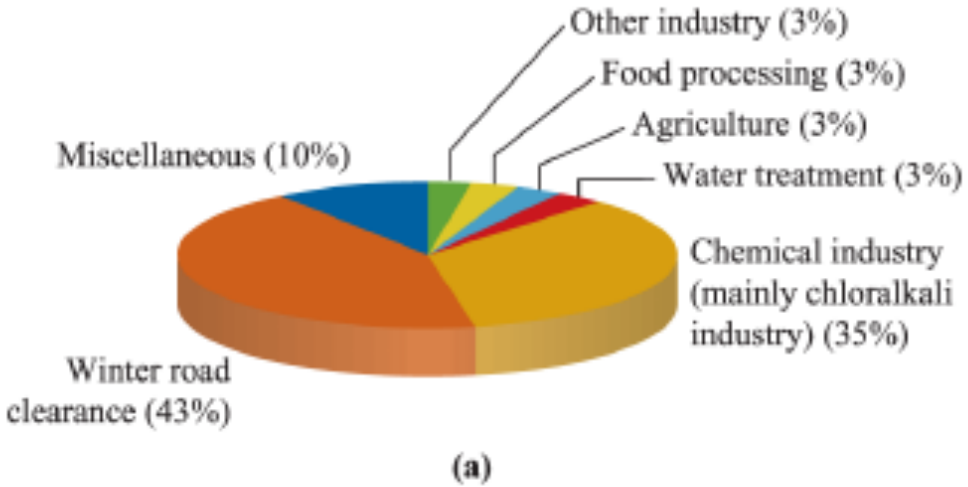
"Perhaps one of you gentlemen would mind telling me just what it is outside the window that you find so attractive...?"

Down's Process



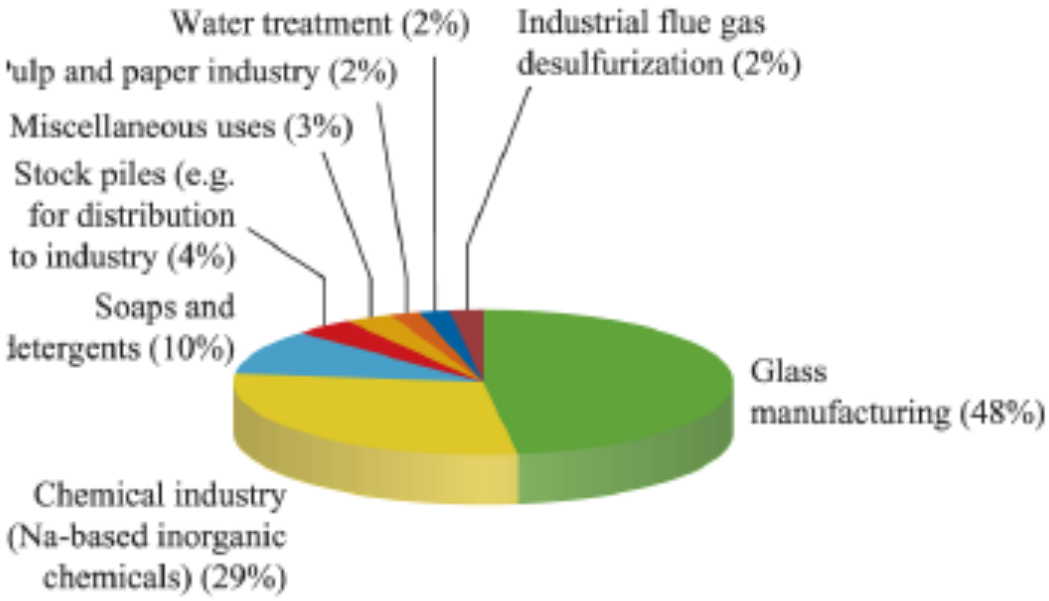
Uses of Sodium

NaCl

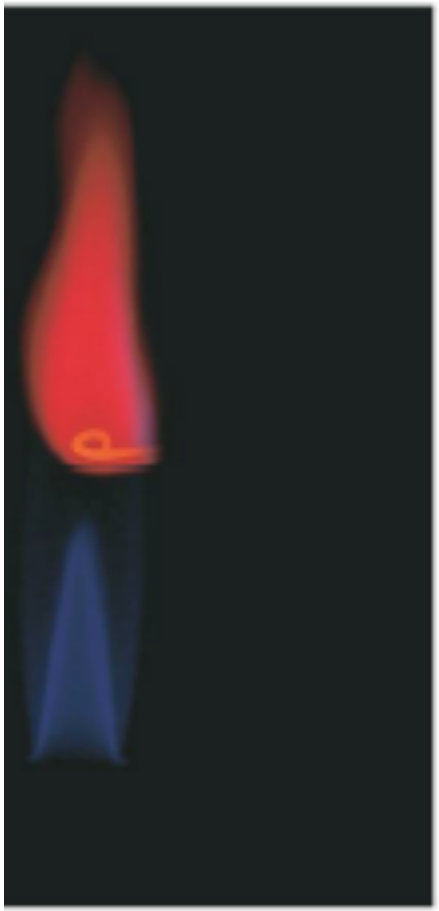


(a)

Na_2CO_3



Flame Test



Li

Na

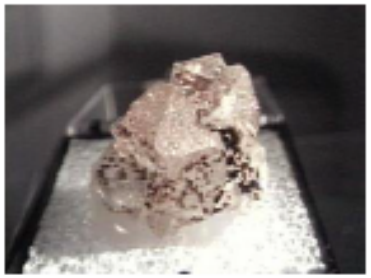
Cs

Earth Alkali

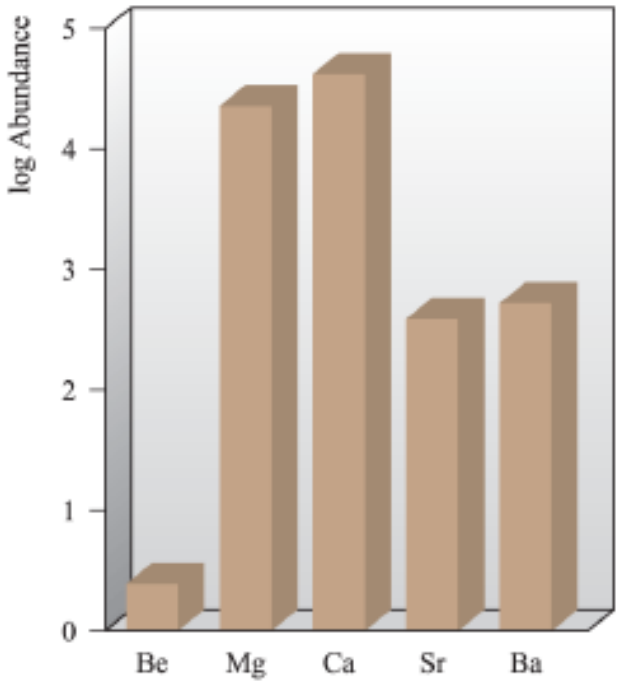
Dolomite
$CaCO_3:MgCO_3$

http://mineral.galleries.com/minerals/carbonat/dolomite/dolomite.htm

Magnesite $MgCO_3$



http://mineral.galleries.com/minerals/carbonat/magnesit/magnesit.htm

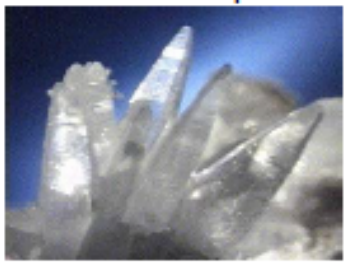


Relative abundances in the Earth's crust of the alkaline earth metals

Olivine
$(Mg,Fe)_2SiO_4$

http://mineral.galleries.com/Minerals/Silicate/OLIVINE/OLIVINE.htm

Celestite
$SrSO_4$

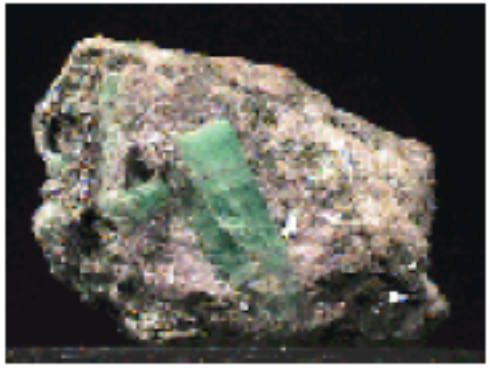


http://www.galleries.com/minerals/sulfates/celestit/celestit.htm

Beryllium

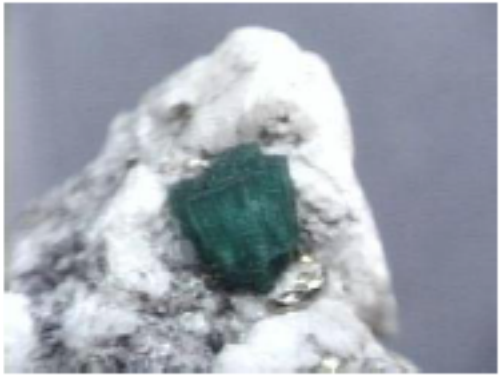
- Small size and high charge density in Be^{2+}
- Be is the only group 2 element that does not form a stable complex with $[EDTA]^{4-}$.
- Beryllium compounds tend to be covalent
- Beryllium occurs in the silicate mineral beryl $Be_3Al_2[Si_6O_{18}]$, and emerald and aquamarine.

Beryl



http://mineral.galleries.com/minerals/silicate/beryl/beryl.htm

Emerald



http://mineral.galleries.com/minerals/GEMSTONE/EMERALD/Emerald.htm

X-ray Window

http://www.berylliumproducts.com/CommercialXray.aspx

$Be_3Al_2[Si_6O_{18}]$

Flame test

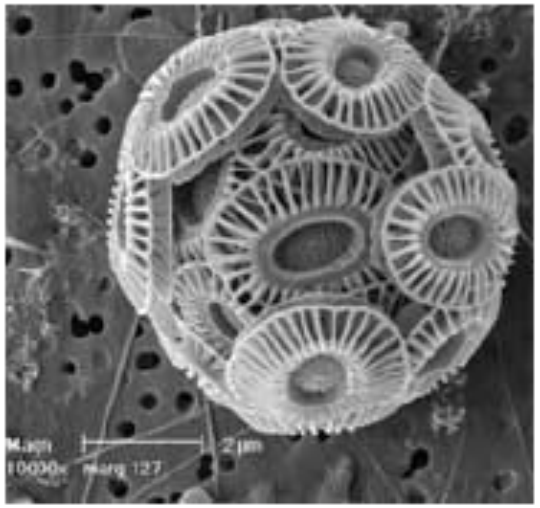
Calcium Uses

World production of CaO, $Ca(OH)_2$, CaO*MgO, $Ca(OH)_2$*MgO, and $Ca(OH)_2$*$Mg(OH)_2$ is ~125,000 Mt.

$CaO(s) + H_2O(l) \rightarrow Ca(OH)_2(s) \quad \Delta_r H^o = -65\ kJ\ mol^{-1}$

$Ca(OH)_2(s) + CO_2(g) \rightarrow CaCO_3(s) + H_2O(l)$

Hoover Dam



coccolithophore

http://www.esa.int/esaCP/SEMDOG3AR2E_Protecting_1.html

$CaF_2 + H_2SO_4 \rightarrow 2HF + Ca(HSO_4)_2$

Drying Agents and Desiccants

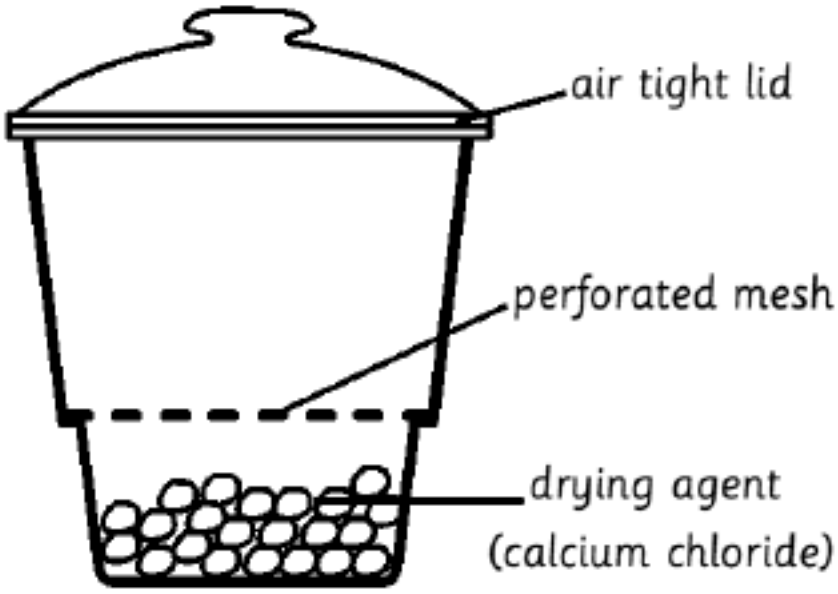
Drying agents for drying or predrying solvents include anhydrous $MgSO_4$, $CaCl_2$, $CaSO_4$, Na_2SO_4, K_2CO_3, which are hygroscopic.

- some can be regenerated by heating
- some react irreversibly with H_2O (e.g. Ca, Mg, CaH_2)

$$CaH_2 + 2\,H_2O \rightarrow Ca(OH)_2 + 2\,H_2$$

Drying agents for use in desiccators include anhydrous $CaSO_4$, $CaCl_2$, KOH, P_2O_5, which are hygroscopic.

The Desiccator



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