

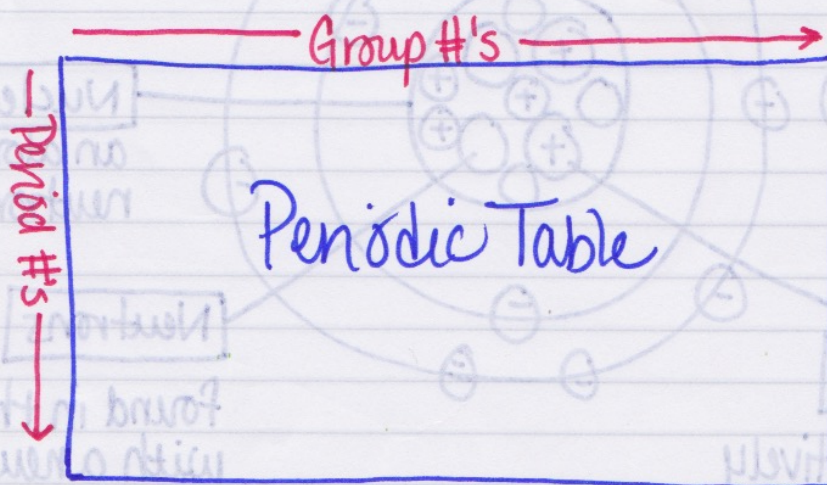
Subatomic

Particles In An Atom			
Particle	Symbol	Charge	Relative Mass
Proton	p^+	$1+$	1 amu
Neutron	n^0	0	1 amu
Electron	e^-	$1-$	$1/1836 \text{ amu}$

* Very small

Periodic Table of Elements

- Properties of the elements repeat in each period (row)
- "Periodic" means in a regular, repeated pattern"
- Arranged in order of atomic number NOT atomic mass



Groups are also called "families"

Elements

Also called chemical symbol

The name of the element.

1
H
Hydrogen
1.0079

Atomic # - # of protons in the nu

Atomic Symbol - one or 2 letters to identify the element

Atomic weight - round for mass (# amount of matter)

Metals

- occupy most of the PT
- located on left-hand side of PT
- exist as solid state, except Hg (mercury)

Physical Properties

- shininess
- malleability (can be shaped)
- ductility (ability to be pulled into long wires)
- Conductivity (ability to transfer heat or electricity)
- magnetic
- most solids at room temperature, except Mercury is liquid at room temp.

Chemical Properties

- reactivity (ease & speed at which elements combine)
- corrosion (destruction of a metal)

Alkali Metals
gr 1

Transition Metals
gr 3-12

Metals

Alkaline Earth metals
gr 2

Lanthanides & Actinides

PT
Trends
in Metals:

① decreases → ②

Reactivity
of Metals

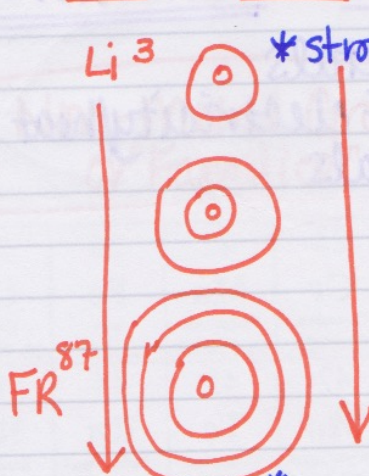
Group 1: Alkali Metals

- most are so soft, could be cut with a knife (plastic)
- shiny metals
- most reactive metal group
- one valence electron in outer shell (bonds easily)
- found only as compounds in nature
- atomic radius increases as you move down the group.

why? B/c more electrons = more orbitals

* increase reactivity
* increase atomic radius

1	H
Hydrogen	1.00794
3	Li
Lithium	6.941
11	Na
Sodium	22.989770
19	



* strong attraction btwn Protons & Electrons

* increasing in atomic #
means there are more electrons to add or to fill the orbitals so the radius gets larger.

* weaker attraction btwn protons & ~~protons~~ e^{-} 's
b/c of #'s of valence electrons & distance from protons

* reactivity increases because the more orbitals the atom has, the weaker the attraction btwn the protons & electrons.

Group 2: Alkaline Earth Metals

- hard, good conductors of electricity
- less reactive than gr 1 metals
- 2 valence electrons in the outer shell

4
Be Beryllium 9.012182
12
Mg Magnesium 24.3050
20
Ca Calcium 40.078
38
Sr Strontium 87.62
56
Ba Barium 137.327
88
Ra Radium (226)

increase radius, increase reactivity

Groups 3-12: Transition Metals

- hard & shiny metals
- good conductors of electricity/heat
- less reactive metals
- 38 elements
- ductile, malleable

21 Sc Scandium 44.955910	22 Ti Titanium 47.867	23 V Vanadium 50.9415	24 Cr Chromium 51.9961	25 Mn Manganese 54.938049	26 Fe Iron 55.845	27 Co Cobalt 58.933200	28 Ni Nickel 58.6934	29 Cu Copper 63.546	30 Zn Zinc 65.39
39 Y Yttrium 88.90585	40 Zr Zirconium 91.224	41 Nb Niobium 92.90638	42 Mo Molybdenum 95.94	43 Tc Technetium (98)	44 Ru Ruthenium 101.07	45 Rh Rhodium 102.90550	46 Pd Palladium 106.42	47 Ag Silver 107.8682	48 Cd Cadmium 112.411
57 La Lanthanum 138.9055	72 Hf Hafnium 178.49	73 Ta Tantalum 180.9479	74 W Tungsten 183.84	75 Re Rhenium 186.207	76 Os Osmium 190.23	77 Ir Iridium 192.217	78 Pt Platinum 195.078	79 Au Gold 196.96655	80 Hg Mercury 200.59
89 Ac Actinium (227)	104 Rf Rutherfordium (261)	105 Db Dubnium (262)	106 Sg Seaborgium (263)	107 Bh Bohrium (262)	108 Hs Hassium (265)	109 Mt Meitnerium (266)	110 (269)	111 (272)	112 (277)

Non-Metals

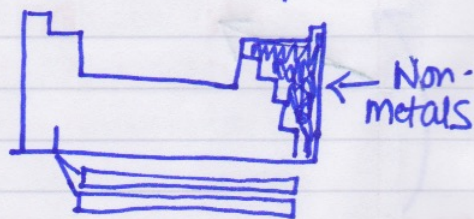
Physical Properties

- 10 out of 16 are gases at room temperature
- Carbon (C), Iodine (I), & Sulphur (S) are solids @ room temp.
- Bromine (Br) - only one liquid @ Rm temp
- dull and brittle
- typically lower densities than metals
- poor conductors of heat & electricity

Chemical Properties

- Reactive
- usually gain or share e^- 's when reacting with other atoms

* Non-metals are located on the right-hand side of the periodic table, above "stair step"



Non-Metal Groups or "Families"

Gr 14-16:
Carbon, Nitrogen,
& Oxygen families

Halogens
"salt-forming"
gr 17

Noble
Gases
gr 18

Non-Metal Notes

5
B
Boron
10.811
13
Al
Aluminum
26.981538
31
Ga
Gallium
69.723
49
In
Indium
114.818
81
Tl
Thallium
204.3833

6
C
Carbon
12.0107
14
Si
Silicon
28.0855
32
Ge
Germanium
72.61
50
Sn
Tin
118.710
82
Pb
Lead
207.2

7
N
Nitrogen
14.00674
15
P
Phosphorus
30.973761
33
As
Arsenic
74.92160
51
Sb
Antimony
121.760
83
Bi
Bismuth
208.98038

8
O
Oxygen
15.9994
16
S
Sulfur
32.066
34
Se
Selenium
78.96
52
Te
Tellurium
127.60
84
Po
Polonium
(209)

Halogens - Gr 17
• means "salt-forming"

• 7 valence e-'s

• exist in all 3 states of matter

• I & At are solid @ room temp

• Br is liquid @ rm. temp.

• F, Cl are gases @ rm temp

* • they are the most reactive non-metal

Groups 13-16: Non-Metals

- Located on the right-hand side of the PT, above the stair step.
- Boron Group (#13) have 3 valence electrons
- Carbon Group (#14) have 4 valence electrons
- Nitrogen Group (#15) have 5 valence electrons
- Oxygen Group (#16) have 6 valence electrons
- Halogens are the exception to the rule: most reactive non-metals

9
F
Fluorine
18.9984032
17
Cl
Chlorine
35.4527
35
Br
Bromine
79.904
53
I
Iodine
126.90447
85
At
Astatine
(210)

Noble Gases → Gr 18

- Inert gases, meaning they are unreactive w/ other elements (King & Queen of the PT)
- Why not reactive? B/c they have 8 valence e⁻'s

10
Ne
Neon 20.1797
18
Ar
Argon 39.948
36
Kr
Krypton 83.80
54
Xe
Xenon 131.29
86
Rn
Radon (222)

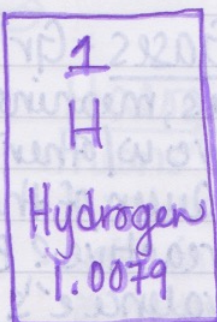
Metalloids - have characteristics of both metals and non-metals

- all are solids @ rm temp.
- brittle, hard, somewhat reactive
- have varying ability to conduct electricity (semi-conductors) used in lasers & comp. chips
- elements found on zig-zag line (steps)

5 B Boron 10.811			
	14 Si Silicon 28.0855		
	32 Ge Germanium 72.61	33 As Arsenic 74.92160	
		51 Sb Antimony 121.760	52 Te Tellurium 127.60
			84 Po Polonium (209)

Hydrogen

- one proton, one electron
- one valence electron
- odorless, colorless gas
- most abundant element on earth
- only needs 1 valence e^- in outer shell (doesn't follow valence e^- rule)



Helium

- 2 valence e^- in outer shell to be happy
- Does not follow 8 valence e^- rule

