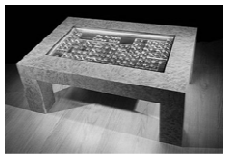
The Periodic Table



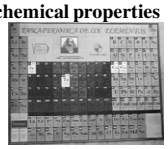


World's Largest: Wayne State, 10/23/2019

LPT

The Periodic Table

Periodic – having repeated cycles
First proposed by Mendeleyev, a Russian chemist in 1869
Arranged 69 known elements by weight and chemical properties
Had 4 empty spaces, 3 of which he predicted
eka-Aluminum (Gallium)
eka-Boron (Scandium)
eka-Silicon (Germanium)



Eka = Samarian for "undiscovered"
The 4 th, technecium was not discovered until the 1920's
Ordered Te & I by chemical properties, not weight
Established state standards for alcohol content in Vodka

LPT

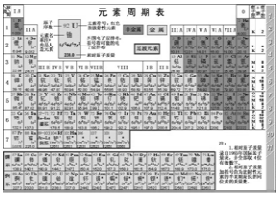
Chemistry Department Periodic Table

[1] 1A												[13] 3A	[14] 4A	[15] 5A	[16] 6A	[17] 7A	[18] 8A
1 H 1.008	[2] 2A																2 He 4.003
3 Li 6.941	4 Be 9.012											5 B 10.81	6 C 12.01	7 N 14.01	8 O 16.00	9 F 19.00	10 Ne 20.18
11 Na 22.99	12 Mg 24.31	[3] 3B	[4] 4B	[5] 5B	[6] 6B	[7] 7B	[8]	[9] 8B	[10]	[11] 1B	[12] 2B	13 Al 26.98	14 Si 28.09	15 P 30.97	16 S 32.07	17 Cl 35.45	18 Ar 39.95
19 K 39.10	20 Ca 40.08	21 Sc 44.96	22 Ti 47.87	23 V 50.94	24 Cr 52.00	25 Mn 54.94	26 Fe 55.85	27 Co 58.93	28 Ni 58.69	29 Cu 63.55	30 Zn 65.41	31 Ga 69.72	32 Ge 72.59	33 As 74.92	34 Se 78.96	35 Br 79.91	36 Kr 83.80
37 Rb 85.47	38 Sr 87.62	39 Y 88.91	40 Zr 91.22	41 Nb 92.91	42 Mo 95.94	43 Tc 98.00	44 Ru 101.1	45 Rh 102.9	46 Pd 106.4	47 Ag 107.9	48 Cd 112.4	49 In 114.8	50 Sn 118.7	51 Sb 121.8	52 Te 127.6	53 I 126.9	54 Xe 131.3
55 Cs 132.9	56 Ba 137.3	57 La 138.9	72 Hf 178.5	73 Ta 180.9	74 W 183.9	75 Re 186.2	76 Os 190.2	77 Ir 192.2	78 Pt 195.1	79 Au 197.0	80 Hg 200.6	81 Tl 204.4	82 Pb 207.2	83 Bi 209.0	84 Po (210)	85 At (210)	86 Rn (222)
87 Fr (223)	88 Ra (226)	89† Ac (227)	104 Rf (267)	105 Db (268)	106 Sg (271)	107 Bh (272)	108 Hs (270)	109 Mt (276)	110 Ds (281)	111 Rg (280)	112 Cn (285)	113 Nh (286)	114 Fl (289)	115 Mc (290)	116 Lv (293)	117 Ts (294)	118 Og (294)

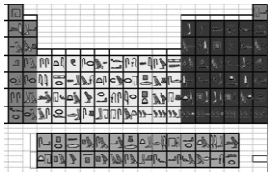
*Lathanides	58 Ce 140.1	59 Pr 140.9	60 Nd 144.2	61 Pm (147)	62 Sm 150.4	63 Eu 152.0	64 Gd 157.3	65 Tb 158.9	66 Dy 162.5	67 Ho 164.9	68 Er 167.3	69 Tm 168.9	70 Yb 173.0	71 Lu 175.0
†Actinides	90 Th 232.0	91 Pa 231.0	92 U 238.0	93 Np (237)	94 Pu (242)	95 Am (243)	96 Cm (247)	97 Bk (249)	98 Cf (251)	99 Es (252)	100 Fm (257)	101 Md (258)	102 No (259)	103 Lr (262)

LPT

The Periodic Table Is Universal



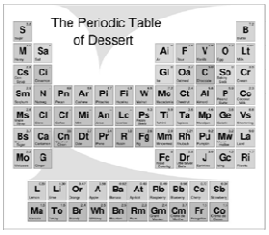
Implies Organized Knowledge

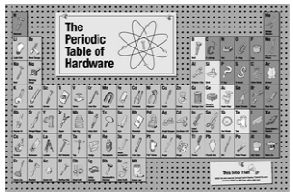


LPT

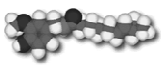
The Periodic Table

Format often used (incorrectly) for humor

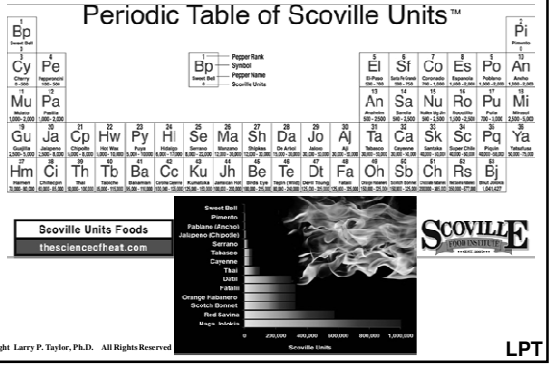




LPT

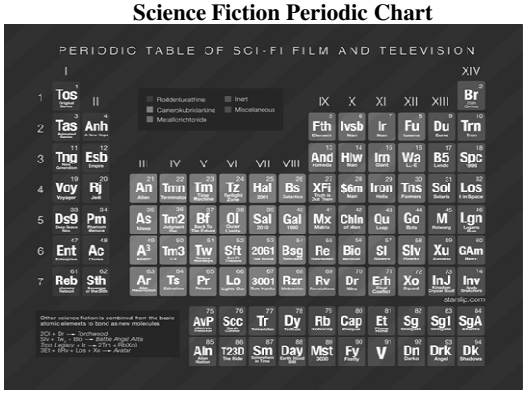


Periodic Table of Scoville Units™



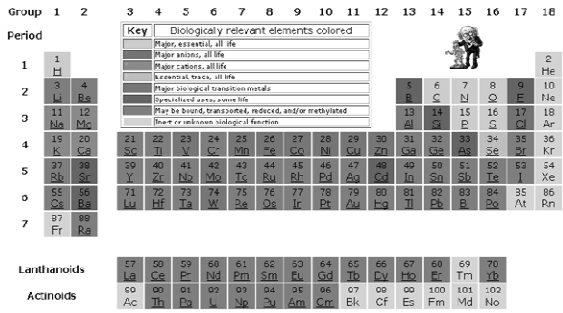
LPT

Science Fiction Periodic Chart



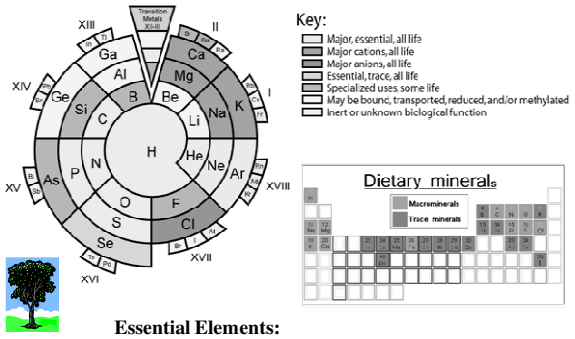
LPT

Biochemical Elements of Life



LPT

Biochemical Elements of Life



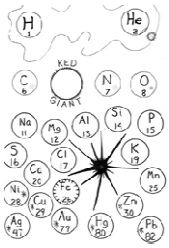
Essential Elements:

Some Homes Provide Needed Oreo Cookies

LPT

Elemental Stellar Origins

Elements > Fe Only From Supernova Events

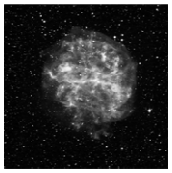


Primordial Gas

Red Giants

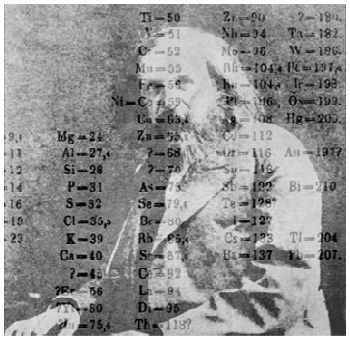
Hot Blue Stars

*** Supernovas**



LPT

Mendeleev's Original "Table"



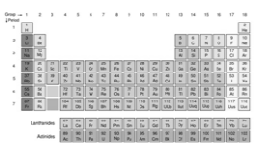
63 Known Elements
No Rare (Noble) Gases

Arranged by Atomic Weight

LPT

The Periodic Table

Periodic = repeating
Elements ordered by Z show "repeating properties"
Period: rows ~ similar trends
Groups: columns ~ similar chemical properties
Groups = chemical families



LPT

Periodic Table exists in many forms

Depends upon Publisher's Choice:

Data Provided

Geometric Format

Elemental Special Properties

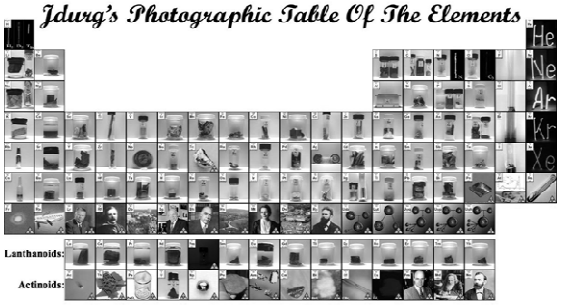
Student Learning

Unit Exam will not test different Formats

No matter what geometry is used
Elements show periodicity

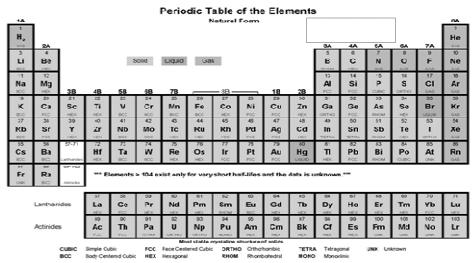
LPT

Periodic Table - Photographic



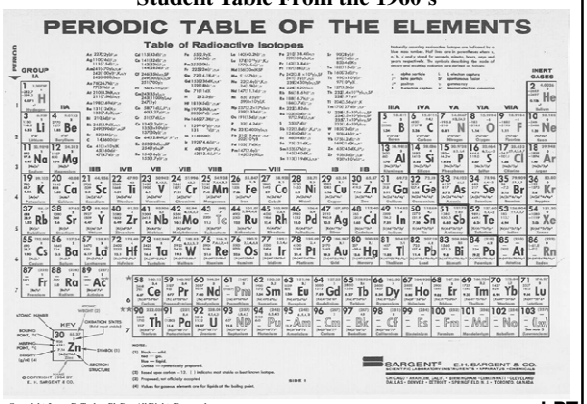
LPT

Periodic Table Emphasizing Physical State



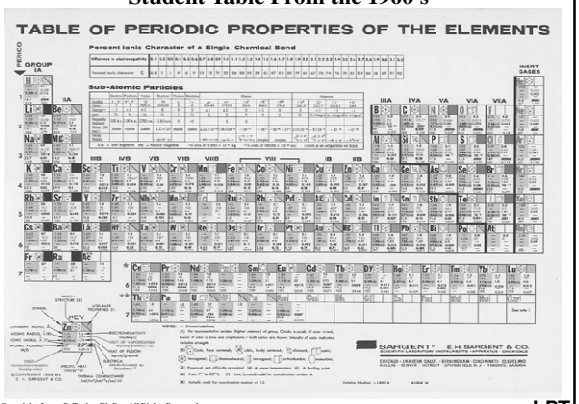
LPT

Student Table From the 1960's



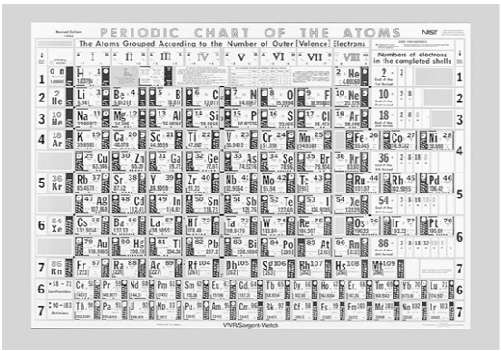
LPT

Student Table From the 1960's



LPT

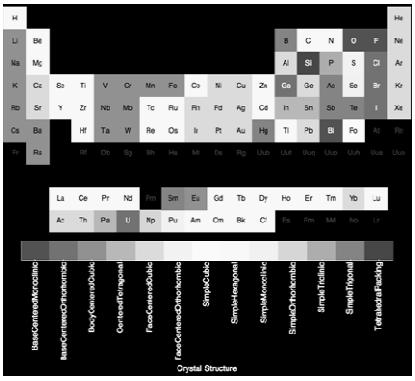
Welch – Standard for Decades



Set Dressing for Movies

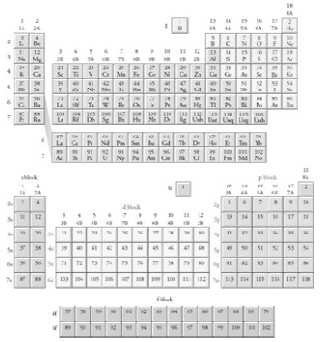
LPT

Crystal Structures of the Elements

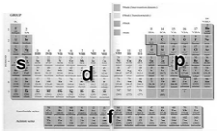


LPT

Periodic Table - Blocks



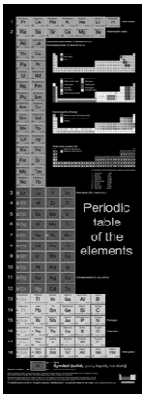
Column Labels:
A & B
Numerals

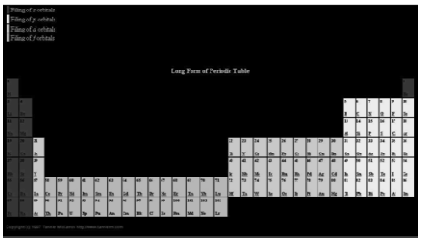


Emphasizes Filling Sub-Orbitals

LPT

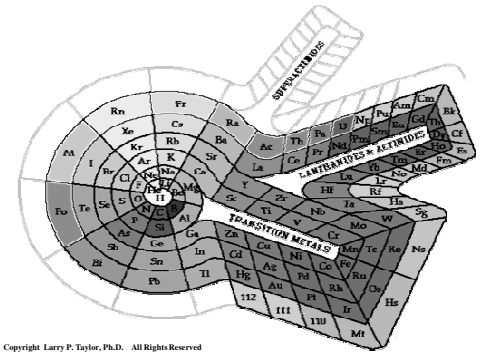
Periodic Table - Extended





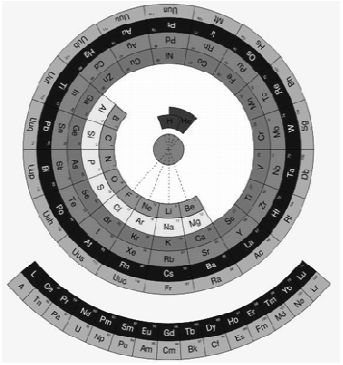
LPT

A Circular Periodic Table



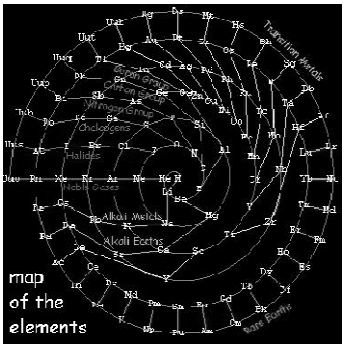
LPT

Another Circular Periodic Table



LPT

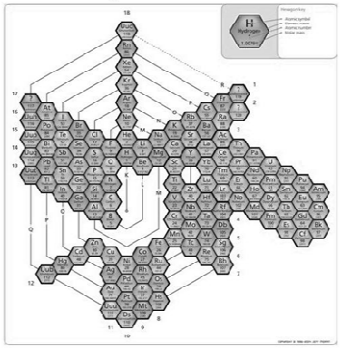
Elemental Spiral Map



LPT

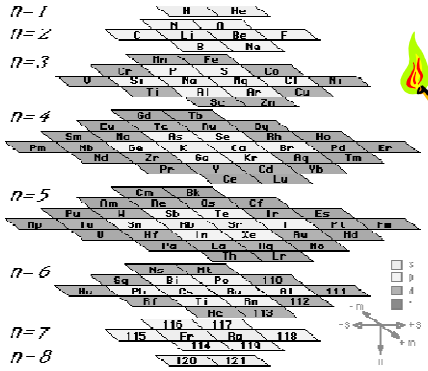
Periodic Table - Hexes

Periodic table gets a makeover



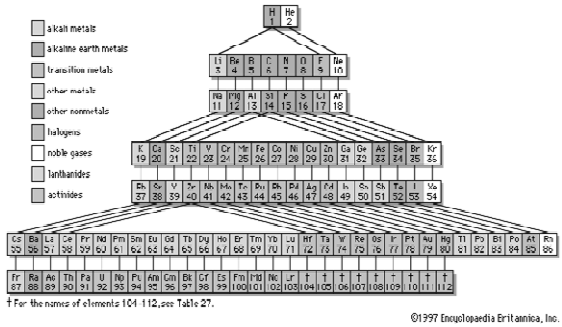
LPT

Periodic Table - Planar



LPT

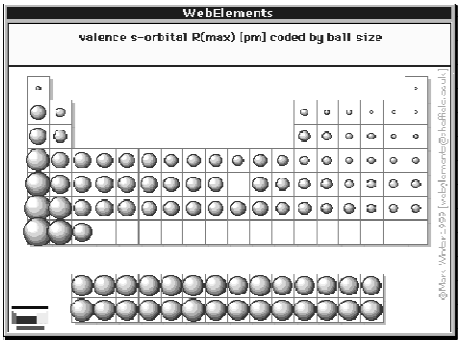
Periodic Table - Pyramid



† For the names of elements 104–112, see Table 27.

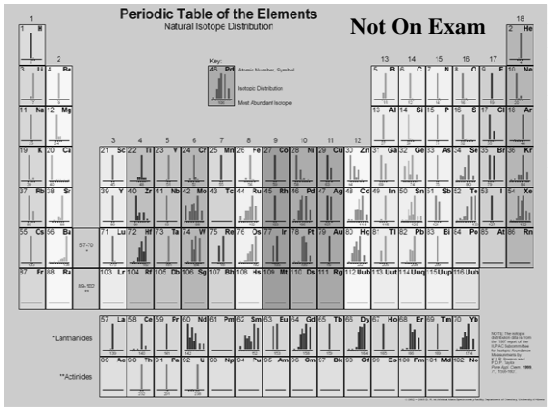
LPT

The Periodic Table- Atomic Size



Atomic size increases as you descend within a family

LPT



LPT

The Periodic Table Notation

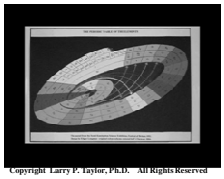
Placement of data at publisher's option

16 ← **Z**

S ← **Symbol**

32.07 ← **AMU (weighted)**

Mass
Always greater

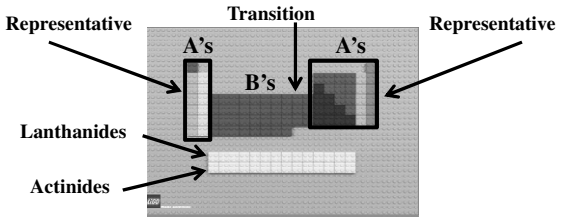


Isotope information not given

LPT

The Periodic Table

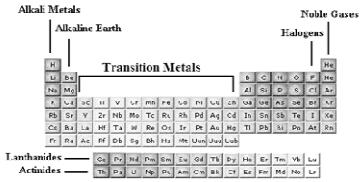
Representative Elements: "A" groups (Edges)
Transition Elements: "B" groups (Middle)
Lanthanides: #58 - #71 (Bottom - upper)
Actinides: #90 - #103 (Bottom - lower)



LPT

The Periodic Table - Families

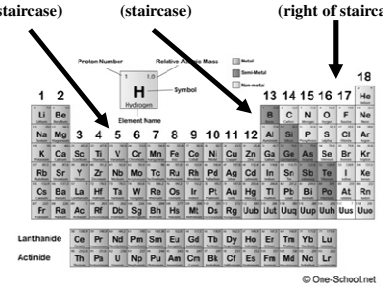
Group 1A (1): Alkali Metals
Group 2A (2): Alkaline Earths
Group 7A (17): Halogens
Group 8A (18): Noble (Inert, Rare) Gases



LPT

3 Categories: of Elements

Metals (left of staircase)
Metalloids (staircase)
Nonmetals (right of staircase)



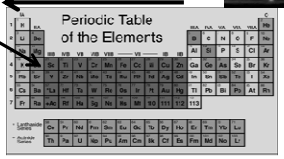
LPT

Metals - Left Side Periodic Table

Metallic shine or luster
Flexible
Solids (mostly) @ room temp
Ductile - can be drawn into wires
Malleable - can be pounded into thin sheets
Conduct heat & electricity

More Metallic

Metals



Most Elements (> 80)

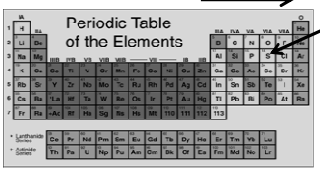
Beyond Iron:
"Heavy Metals"

LPT

Nonmetals - Right Side Periodic Table

No shine ~ variable colors
Brittle, hard (when solid)
Mostly gases @ room temperature
Not malleable
Not ductile
Poor conductors

More Non-metallic



Non-Metals

17 or 18 Elements

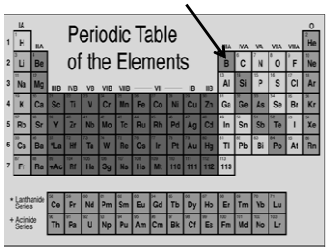
At has some metallic, some metalloid, and mostly halide properties

LPT

Metalloids (Semi-Metals) – "Staircase"

Properties (metallic or nonmetallic) depend on environment
Semi-conductors
good conductor at high T
poor conductor at low T

Staircase



B Boron
Si Silicon
Ge Germanium
As Arsenic
Sb Antimony
Te Tellurium
Po Polonium ?
At Astatine ??

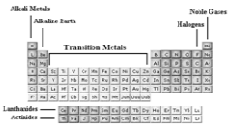
6 , 7, or 8 Elements

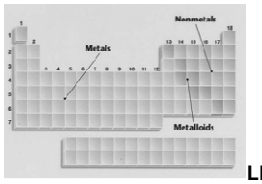
At on some, Most consider At a halide

LPT

Periodic Table – Summary of Families

Group 1A (1):alkali metals
Group 2A (2):alkaline earths
Group 7A (17): halogens
Group 8A (18): noble (inert, rare) gases
Representative (1-2;13-18) : The "A" Groups (the Edges)
Transition Metals (3-12) : The "B" Groups (the Center)
Metalloids: "Staircase" ➔ B, Si, Ge, As, Sb, Te, Po
Lanthanides = upper, of lower rows
Actinides = lower, of lower row



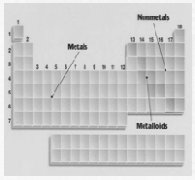


LPT

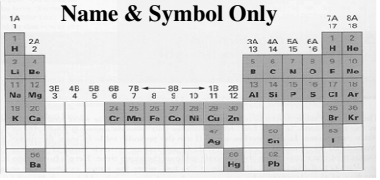
Common Elements – Need To Memorize

Common Elements

Atomic Number	Symbol	Element	Atomic Number	Symbol	Element	Atomic Number	Symbol	Element
1	H	Hydrogen	13	Al	Aluminum	28	Ni	Nickel
2	He	Helium	14	Si	Silicon	29	Cu	Copper
3	Li	Lithium	15	P	Phosphorus	30	Zn	Zinc
4	Be	Beryllium	16	S	Sulfur	35	Br	Bromine
5	B	Boron	17	Cl	Chlorine	36	Kr	Krypton
6	C	Carbon	18	Ar	Argon	47	Ag	Silver
7	N	Nitrogen	19	K	Potassium	50	Sn	Tin
8	O	Oxygen	20	Ca	Calcium	53	I	Iodine
9	F	Fluorine	24	Cr	Chromium	56	Ba	Barium
10	Ne	Neon	25	Mn	Manganese	80	Hg	Mercury
11	Na	Sodium	26	Fe	Iron	82	Pb	Lead
12	Mg	Magnesium	27	Co	Cobalt			

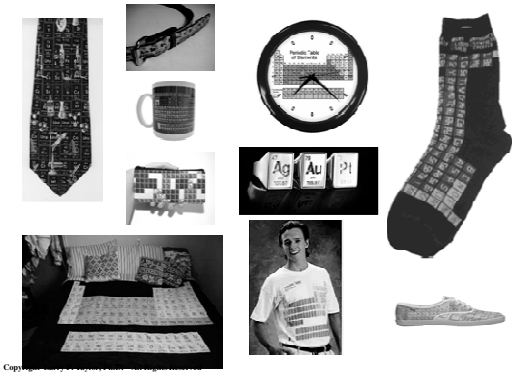


Name & Symbol Only



LPT

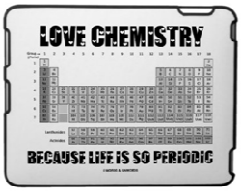
Memorizing Preferable to Alternatives

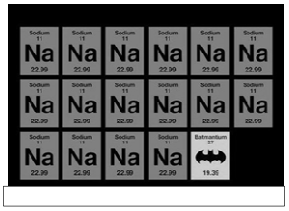


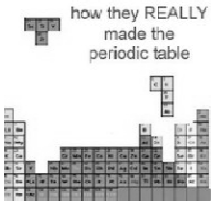
LPT

Slightly Extreme Learning Aids

LPT







LPT