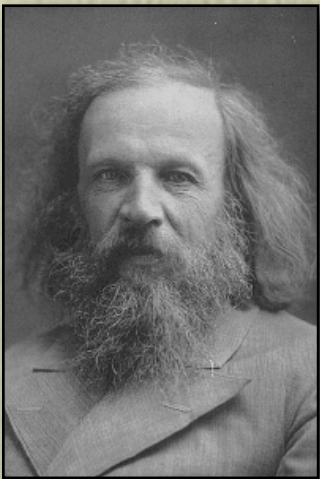


The Periodic Table: Families & Periodic Trends

The Physical Science Series
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Honors Physical Science
Sarasota High School



Mendeleev's Table (1871)

While it was the first periodic table, Mendeleev had very different elements, such as the very reactive potassium and the very stable copper, in the same family. Forty years later Moseley rearranged the elements by their atomic number which gave the table better periodicity.

Mendeleev

0	1A	1B	2A	2B	3A	3B	4A	4B	5A	5B	6A	6B	7A	7B	
He	Li	Be	B	C	N	O	F						H		
Ne	Na	Mg	Al	Si	P	S	Cl								
Ar	K Cu	Ca Zn	Sc Ga	Ti Ge	V As	Cr Se	Mn Br	Fe	Co	Ni					
Kr	Rb Ag	Sr Cd	Y In	Zr Sn	Nb Sb	Mo Te	Tc I	Ru	Rh	Pd					
Xe	Cs Au	Ba Hg	★ Tl	Hf Pb	Ta Bi	W Po	Re At	Os	Ir	Pt					
Rn	Fr	Ra	Ac	Th	Pa	U	★★								
	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
			★★ actinides	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr	
	Rf	Db	Sg	Bh	Hs	Mt	110	111	112	113	114	115	116	117	118

Short form of the Table



Moseley

In 1915 Moseley rearranged the elements by their atomic number.

1 H	2																18 He
Li	Be											13 B	14 C	15 N	16 O	17 F	Ne
Na	Mg	3	4	5	6	7	8	9	10	11	12	Al	Si	P	S	Cl	Ar
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe
Cs	Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
Fr	Ra	Ac	Rf	Db	Sg	Bh	Hs	Mt	110	111	112	113	114	115	116	117	118

Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu
Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr

Long form of the Table

1 H	2																	18 He
Li	Be																	Ne
Na	Mg	3																Ar
K	Ca	Sc																Kr
Rb	Sr	Y																Xe
Cs	Ba	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu		Rn
Fr	Ra	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	Lr		118

Chinese Periodic Table

Notice that the chemical symbols are in English.

This is true throughout the world.

元素周期表

族 周期	I A	II A	过渡元素										III A	IV A	V A	VI A	VII A	0			
1	1 H 氢 $1s^1$ 1.008		<p>原子序数 — 92 U — 元素符号, 红色指放射性元素</p> <p>元素名称注*的是人造元素</p> <p>铀 $5f^3 6d^1 7s^2$</p> <p>238.0 — 相对原子质量</p>																		2 He 氦 $1s^2$ 4.003
2	3 Li 锂 $2s^1$ 6.941	4 Be 铍 $2s^2$ 9.012											5 B 硼 $2s^2 2p^1$ 10.81	6 C 碳 $2s^2 2p^2$ 12.01	7 N 氮 $2s^2 2p^3$ 14.01	8 O 氧 $2s^2 2p^4$ 16.00	9 F 氟 $2s^2 2p^5$ 19.00	10 Ne 氖 $2s^2 2p^6$ 20.18			
3	11 Na 钠 $3s^1$ 22.99	12 Mg 镁 $3s^2$ 24.31	III B	IV B	V B	VI B	VII B	VIII	IB	II B	13 Al 铝 $3s^2 3p^1$ 26.98	14 Si 硅 $3s^2 3p^2$ 28.09	15 P 磷 $3s^2 3p^3$ 30.97	16 S 硫 $3s^2 3p^4$ 32.07	17 Cl 氯 $3s^2 3p^5$ 35.45	18 Ar 氩 $3s^2 3p^6$ 39.95					
4	19 K 钾 $4s^1$ 39.10	20 Ca 钙 $4s^2$ 40.08	21 Sc 钪 $3d^1 4s^2$ 44.96	22 Ti 钛 $3d^2 4s^2$ 47.87	23 V 钒 $3d^3 4s^2$ 50.94	24 Cr 铬 $3d^5 4s^1$ 52.00	25 Mn 锰 $3d^5 4s^2$ 54.94	26 Fe 铁 $3d^6 4s^2$ 55.85	27 Co 钴 $3d^7 4s^2$ 58.93	28 Ni 镍 $3d^8 4s^2$ 58.69	29 Cu 铜 $3d^{10} 4s^1$ 63.55	30 Zn 锌 $3d^{10} 4s^2$ 65.39	31 Ga 镓 $4s^2 4p^1$ 69.72	32 Ge 锗 $4s^2 4p^2$ 72.61	33 As 砷 $4s^2 4p^3$ 74.92	34 Se 硒 $4s^2 4p^4$ 78.96	35 Br 溴 $4s^2 4p^5$ 79.90	36 Kr 氪 $4s^2 4p^6$ 83.80			
5	37 Rb 铷 $5s^1$ 85.47	38 Sr 锶 $5s^2$ 87.62	39 Y 钇 $4d^1 5s^2$ 88.91	40 Zr 锆 $4d^2 5s^2$ 91.22	41 Nb 铌 $4d^4 5s^1$ 92.91	42 Mo 钼 $4d^5 5s^1$ 95.94	43 Tc 锝 $4d^5 5s^2$ [99]	44 Ru 钌 $4d^7 5s^1$ 101.1	45 Rh 铑 $4d^8 5s^1$ 102.9	46 Pd 钯 $4d^{10}$ 106.4	47 Ag 银 $4d^{10} 5s^1$ 107.9	48 Cd 镉 $4d^{10} 5s^2$ 112.4	49 In 铟 $5s^2 5p^1$ 114.8	50 Sn 锡 $5s^2 5p^2$ 118.7	51 Sb 锑 $5s^2 5p^3$ 121.8	52 Te 碲 $5s^2 5p^4$ 127.6	53 I 碘 $5s^2 5p^5$ 126.9	54 Xe 氙 $5s^2 5p^6$ 131.3			
6	55 Cs 铯 $6s^1$ 132.9	56 Ba 钡 $6s^2$ 137.3	57-71 La-Lu 镧系	72 Hf 铪 $5d^2 6s^2$ 178.5	73 Ta 钽 $5d^3 6s^2$ 180.9	74 W 钨 $5d^4 6s^2$ 183.8	75 Re 铼 $5d^5 6s^2$ 186.2	76 Os 锇 $5d^6 6s^2$ 190.2	77 Ir 铱 $5d^7 6s^2$ 192.2	78 Pt 铂 $5d^9 6s^1$ 195.1	79 Au 金 $5d^{10} 6s^1$ 197.0	80 Hg 汞 $5d^{10} 6s^2$ 200.6	81 Tl 铊 $6s^2 6p^1$ 204.4	82 Pb 铅 $6s^2 6p^2$ 207.2	83 Bi 铋 $6s^2 6p^3$ 209.0	84 Po 钋 $6s^2 6p^4$ [209]	85 At 砹 $6s^2 6p^5$ [210]	86 Rn 氡 $6s^2 6p^6$ [222]			
7	87 Fr 钫 $7s^1$ [223]	88 Ra 镭 $7s^2$ 226.0	89-103 Ac-Lr 锕系	104 Rf 钚* $(6d^2 7s^2)$ [261]	105 Ha 镎* $(6d^3 7s^2)$ [262]	106 钷* $(6d^4 7s^2)$ [263]	107 钷* $(6d^5 7s^2)$ [262]	108 钷* $(6d^6 7s^2)$ [265]	109 钷* $(6d^7 7s^2)$ [266]												
镧系	57 La 镧 $5d^1 6s^2$ 138.9	58 Ce 铈 $4f^1 5d^1 6s^2$ 140.1	59 Pr 镨 $4f^3 6s^2$ 140.9	60 Nd 钕 $4f^4 6s^2$ 144.2	61 Pm 钷 $4f^5 6s^2$ [147]	62 Sm 钐 $4f^6 6s^2$ 150.4	63 Eu 铕 $4f^7 6s^2$ 152.0	64 Gd 钆 $4f^7 5d^1 6s^2$ 157.3	65 Tb 铽 $4f^9 6s^2$ 158.9	66 Dy 镝 $4f^{10} 6s^2$ 162.5	67 Ho 铈 $4f^{11} 6s^2$ 164.9	68 Er 铈 $4f^{12} 6s^2$ 167.3	69 Tm 铈 $4f^{13} 6s^2$ 168.9	70 Yb 铈 $4f^{14} 6s^2$ 173.0	71 Lu 铈 $4f^{14} 5d^1 6s^2$ 175.0						
锕系	89 Ac 锕 $6d^1 7s^2$ 227.0	90 Th 钍 $6d^2 7s^2$ 232.0	91 Pa 镤 $5f^2 6d^1 7s^2$ 231.0	92 U 铀 $5f^3 6d^1 7s^2$ 238.0	93 Np 镎 $5f^4 6d^1 7s^2$ 237.0	94 Pu 钷* $5f^6 7s^2$ [244]	95 Am 镅* $5f^7 7s^2$ [243]	96 Cm 锔* $5f^7 6d^1 7s^2$ [247]	97 Bk 锫* $5f^9 7s^2$ [247]	98 Cf 锿* $5f^{10} 7s^2$ [251]	99 Es 镱* $5f^{11} 7s^2$ [252]	100 Fm 镆* $5f^{12} 7s^2$ [257]	101 Md 钷* $(5f^{13} 7s^2)$ [258]	102 No 镎* $(5f^{14} 7s^2)$ [259]	103 Lr 镆* $(5f^{14} 6d^1 7s^2)$ [260]						

Periods & Families

Periods run horizontally.
All elements of a period have the same number of electron energy levels.
All the elements from rubidium to xenon have 5 electron energy levels.

	IA						VIIA	VIIIA
I	1 H							2 He
2	3 Li						9 F	10 Ne
3	11 Na						17 Cl	18 Ar
4	19 K						35 Br	36 Kr
5	37 Rb	38 Sr		39 Y			53 I	54 Xe
6	55 Cs	56 Ba	57-70 *				85 At	86 Rn
7	87 Fr	88 Ra	89-103 **					
	6 ^{lanthanoids} La							
	7 ^{actinoids} Ac	Th						

Families, aka Groups, run vertically.
All elements of a family have the same number of valence electrons - which determine an element's chemical & physical properties

Alkali Metals, Group 1-A

Lithium, Sodium, Potassium, Rubidium, Cesium & Francium



IA

VIIIA

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	57-70 *	71 Lu	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	89-102 **	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub			114 Uuq								

*lanthanoids

**actinoids

57 La	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
89 Ac	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

Alkaline Earth Metals, Group 2-A

Less reactive than the alkali metals but more reactive than the other metals.

Be 4
Beryllium

Mg 12
Magnesium

Ca 20
Calcium

Sr 38
Strontium

Ba 56
Barium

Ra 88
Radium

IIA

4
Be

12
Mg

20
Ca

38
Sr

56
Ba

88
Ra

*lanthanoids

**actinoids

										VIII A					
										III A	IV A	V A	VIA	VII A	He
										5 B	6 C	7 N	8 O	9 F	10 Ne
										13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
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
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
57-70 * Lu	71 Hf	72 Ta	73 W	74 Re	75 Os	76 Ir	77 Pt	78 Au	79 Hg	80 Tl	81 Pb	82 Bi	83 Po	84 At	85 Rn
89-102 ** Lr	103 Rf	104 Db	105 Sg	106 Bh	107 Hs	108 Mt	109 Uun	110 Uuu	111 Uub	112 Uuq					
87 La	88 Ce	89 Pr	90 Nd	91 Pm	92 Sm	93 Eu	94 Gd	95 Tb	96 Dy	97 Ho	98 Er	99 Tm	100 Yb		
89 Ac	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		

Transition Metals

Sc 21  Scandium	Ti 22  Titanium	V 23  Vanadium	Cr 24  Chromium	Mn 25  Manganese	Fe 26  Iron	Co 27  Cobalt	Ni 28  Nickel	Cu 29  Copper	Zn 30  Zinc
Y 39  Yttrium	Zr 40  Zirconium	Nb 41  Niobium	Mo 42  Molybdenum	Tc 43  Technetium	Ru 44  Ruthenium	Rh 45  Rhodium	Pd 46  Palladium	Ag 47  Silver	Cd 48  Cadmium
	Hf 72  Hafnium	Ta 73  Tantalum	W 74  Tungsten	Re 75  Rhenium	Os 76  Osmium	Ir 77  Iridium	Pt 78  Platinum	Au 79  Gold	Hg 80  Mercury
	Rf 104  Rutherfordium	Db 105  Dubnium	Sg 106  Seaborgium	Bh 107  Bohrium	Hs 108  Hassium	Mt 109  Meitnerium	Ds 110  Darmstadtium	Rg 111  Roentgenium	Uub 112  Ununbium
La 57  Lanthanum	Ce 58  Cerium	Pr 59  Praseodymium	Nd 60  Neodymium	Pm 61  Promethium	Sm 62  Samarium	Eu 63  Europium	Gd 64  Gadolinium	Tb 65  Terbium	Dy 66  Dysprosium
Ac 89  Actinium	Th 90  Thorium	Pa 91  Protactinium	U 92  Uranium	Np 93  Neptunium	Pu 94  Plutonium	Am 95  Americium	Cm 96  Curium	Bk 97  Berkelium	Cf 98  Californium

Boron Family, 3-A

Boron, Aluminum, Gallium, Indium and Thallium.


IA		IIA												B 5											VIII A		
1 H		4 Be												5 B											2 He		
3 Li		6 Mg												13 Al											8 O	9 F	10 Ne
11 Na		12 Ca		21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga											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											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											52 Te	53 I	54 Xe
55 Cs		56 Ba	87-90 *	71 Lu	72 Hf	73 Ta	74 W	75 Re	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl											84 Po	85 At	86 Rn
87 Fr		88 Ra	89-102 **	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub											114 Fl	115 Mc	116 Lv	
				*lanthanoids										In 49											VIII B		
				57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho											78 Pt	79 Au	80 Hg
				**actinoids										81 Tl											102 No		
				89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es											104 Rf	105 Db	106 Sg

B
5
Al
13
Ga
31
In
49
Tl
81


Carbon Family, 4-A

Contain a wide variety of elements from 1 nonmetal (C), 2 metalloids (Si & Ge) and 2 metals (Pb & Sn).


IA		IIA												III A	IV A	VIA		VII A	VIII A																		
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	57-70 *	71 Lu	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	89-102 **	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	113 Uuq	114 Uuq	115 Uuq	116 Uuq	117 Uuq	118 Uuq
*lanthanoids		57 La	58 Ce	59 Pr	60 Nd	61 Pm	62 Sm	63 Eu	64 Gd	65 Tb	66 Dy	67 Ho	68 Er																								
**actinoids		89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Bk	98 Cf	99 Es	100 Fm																								




Carbon




Silicon



Germanium



Tin



Lead

Oxygen Family, 6-A

Oxygen, Sulfur, Selenium, Tellurium & Polonium.

IA											IIIA	IVA	VA	VIA																																																																																					
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16																																																																																				
H	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl																																																																																				
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34																																																																																				
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se																																																																																				
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52																																																																																				
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te																																																																																				
55	56	57-70	71	72	73	74	75	76	77	78	79	80	81	82	83	84																																																																																			
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po																																																																																			
87	88	89-102	103	104	105	106	107	108	109	110	111	112	114																																																																																						
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub	Uuq																																																																																						
		<table border="1"> <tr> <td>57</td> <td>58</td> <td>59</td> <td>60</td> <td>61</td> <td>62</td> <td>63</td> <td>64</td> <td>65</td> <td>66</td> <td>67</td> <td>68</td> <td>69</td> <td>70</td> </tr> <tr> <td>La</td> <td>Ce</td> <td>Pr</td> <td>Nd</td> <td>Pm</td> <td>Sm</td> <td>Eu</td> <td>Gd</td> <td>Tb</td> <td>Dy</td> <td>Ho</td> <td>Er</td> <td>Tm</td> <td>Yb</td> </tr> <tr> <td colspan="14">*lanthanoids</td> </tr> <tr> <td>89</td> <td>90</td> <td>91</td> <td>92</td> <td>93</td> <td>94</td> <td>95</td> <td>96</td> <td>97</td> <td>98</td> <td>99</td> <td>100</td> <td>101</td> <td>102</td> </tr> <tr> <td>Ac</td> <td>Th</td> <td>Pa</td> <td>U</td> <td>Np</td> <td>Pu</td> <td>Am</td> <td>Cm</td> <td>Bk</td> <td>Cf</td> <td>Es</td> <td>Fm</td> <td>Md</td> <td>No</td> </tr> <tr> <td colspan="14">**actinoids</td> </tr> </table>														57	58	59	60	61	62	63	64	65	66	67	68	69	70	La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	*lanthanoids														89	90	91	92	93	94	95	96	97	98	99	100	101	102	Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No	**actinoids													
57	58	59	60	61	62	63	64	65	66	67	68	69	70																																																																																						
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb																																																																																						
*lanthanoids																																																																																																			
89	90	91	92	93	94	95	96	97	98	99	100	101	102																																																																																						
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No																																																																																						
**actinoids																																																																																																			

O	8		Oxygen
S	16		Sulfur
Se	34		Selenium
Te	52		Tellurium
Po	84		Polonium

Halogens, Group 7-A

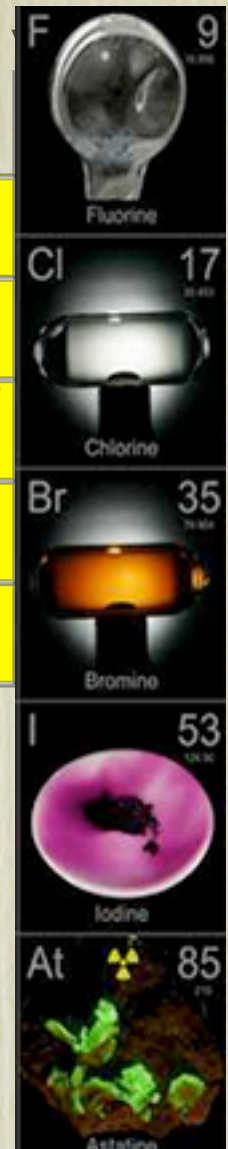
The most reactive nonmetals:
Fluorine, Chlorine, Bromine,
Iodine & Astatine.

IA		IIA									IIIA	IVA	VA	VIA	VIIA		
1 H		4 Be									5 B	6 C	7 N	8 O	9 F		
3 Li		12 Mg									13 Al	14 Si	15 P	16 S	17 Cl		
11 Na		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
19 K		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
37 Rb		56 Ba	57-70 *	71 Lu	72 Hf	73 Ta	74 W	76 Os	77 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At
55 Cs		89-102 **	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Uun	111 Uuu	112 Uub	114 Uuq				
87 Fr																	

*lanthanoids

**actinoids

57 La	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
89 Ac	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



Noble Gases, Group 8-A

The inert (non-reactive) gases:

Helium, Neon, Argon, Krypton, Xenon & Radon

IA																		VIIIA
1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18
H	He	Li	Be	B	C	N	O	F	Ne	Na	Mg	Al	Si	P	S	Cl	Ar	18
19	20	21	22	23	24	25	26	27	28	29	30	31	32	33	34	35	36	36
K	Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr	36
37	38	39	40	41	42	43	44	45	46	47	48	49	50	51	52	53	54	54
Rb	Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe	54
55	56	57-70	71	72	73	74	75	76	77	78	79	80	81	82	83	84	85	86
Cs	Ba	*	Lu	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn
87	88	89-102	103	104	105	106	107	108	109	110	111	112						
Fr	Ra	**	Lr	Rf	Db	Sg	Bh	Hs	Mt	Uun	Uuu	Uub						

*lanthanoids

**actinoids

89	90	91	92	93	94	95	96	97	98	99	100	101	102
La	Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb
Ac	Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Md	No

He²
Helium

Ne¹⁰
Neon

Ar¹⁸
Argon

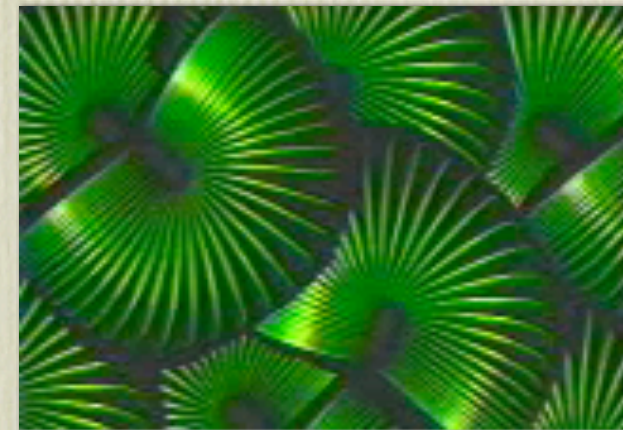
Kr³⁶
Krypton

Xe⁵⁴
Xenon

Rn⁸⁶
Radon

Metallic Properties

- Silver in color and have luster.
- Solid @ Room Temperature.
- Have high densities.
- Are malleable & ductile.
- Are good conductors of heat & electricity.
- Atoms have between 1-3 valence electrons.
- Atoms have a loose hold on their valence electrons - they give them up easily.
- Corrode (rust) in the presence of oxygen.



Periodic Trends: Periods and Metallic Properties

PERIODIC TABLE OF THE ELEMENTS
Metals and Non-Metals

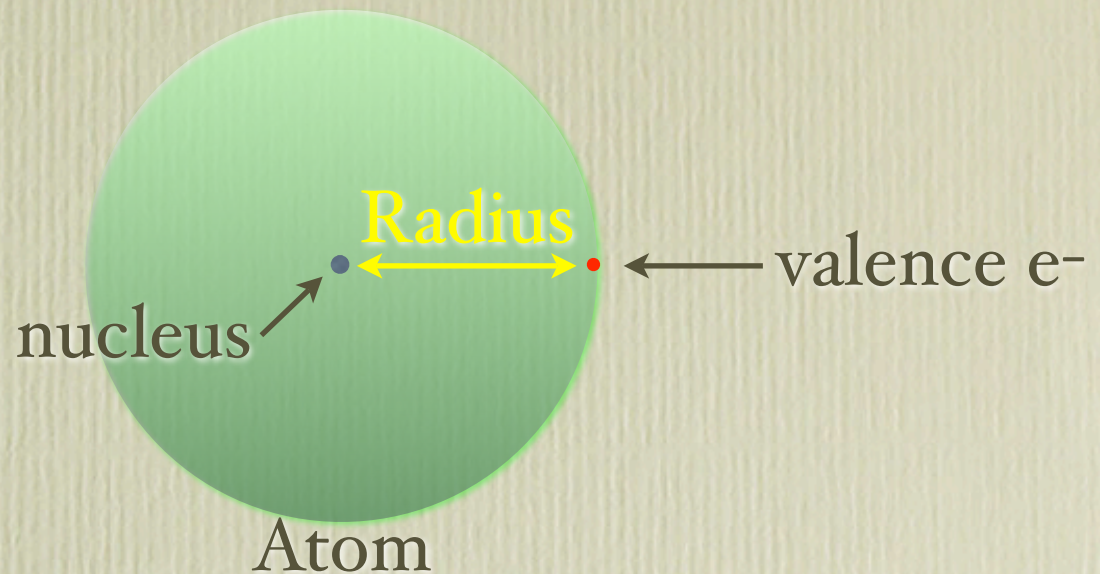
Legend:
 ○ Non-Metal
 ● Metal
 ◐ Metalloid

1 H	2 He											13 B	14 C	15 N	16 O	17 F	18 Ne
3 Li	4 Be											13 Al	14 Si	15 P	16 S	17 Cl	18 Ar
11 Na	12 Mg	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
19 K	20 Ca	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
37 Rb	38 Sr	71 Lu	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
55 Cs	56 Ba	103 Lr	104 Rf	105 Db	106 Sg	107 Bh	108 Hs	109 Mt	110 Ds	111 Rg	112 Uub	113 Uut	114 Uuq	115 Uup	116 Uuh	117 Uus	118 Uuo
87 Fr	88 Ra																
		57 La	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		
		89 Ac	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		

More
Metallic

Less Metallic

Periodic Trends: Atomic Radii



Two variables determine the atomic radius of an atom:

- ☑ the ***number of protons*** in the nucleus
- ☑ the ***number of electron energy levels*** in the atom.

The number of protons and radius are inversely proportional.

As protons increase, the radius decreases.

The number of energy levels and radius are proportional.

As energy levels increase, the radius also increases.

Atomic Radii of the Elements

Atomic Radii increases due to an increase in the number of e- energy levels.

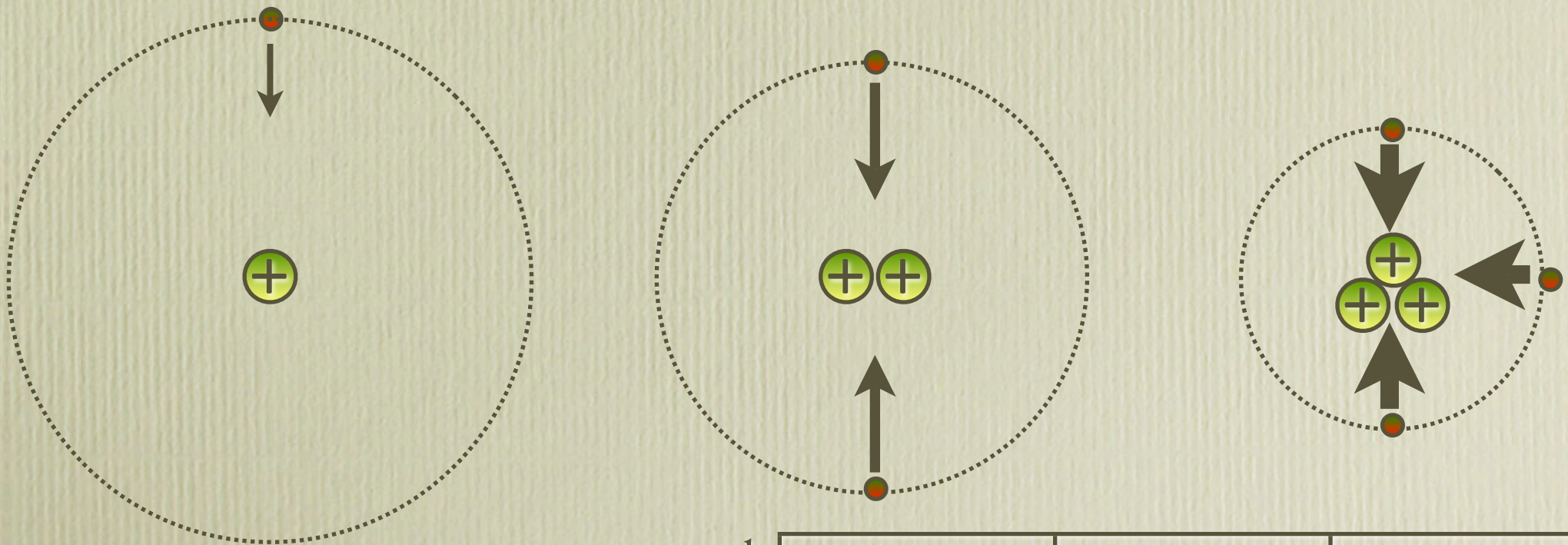


Atomic Radii decreases due to the increase in the number of protons.

Atomic Radii & Protons

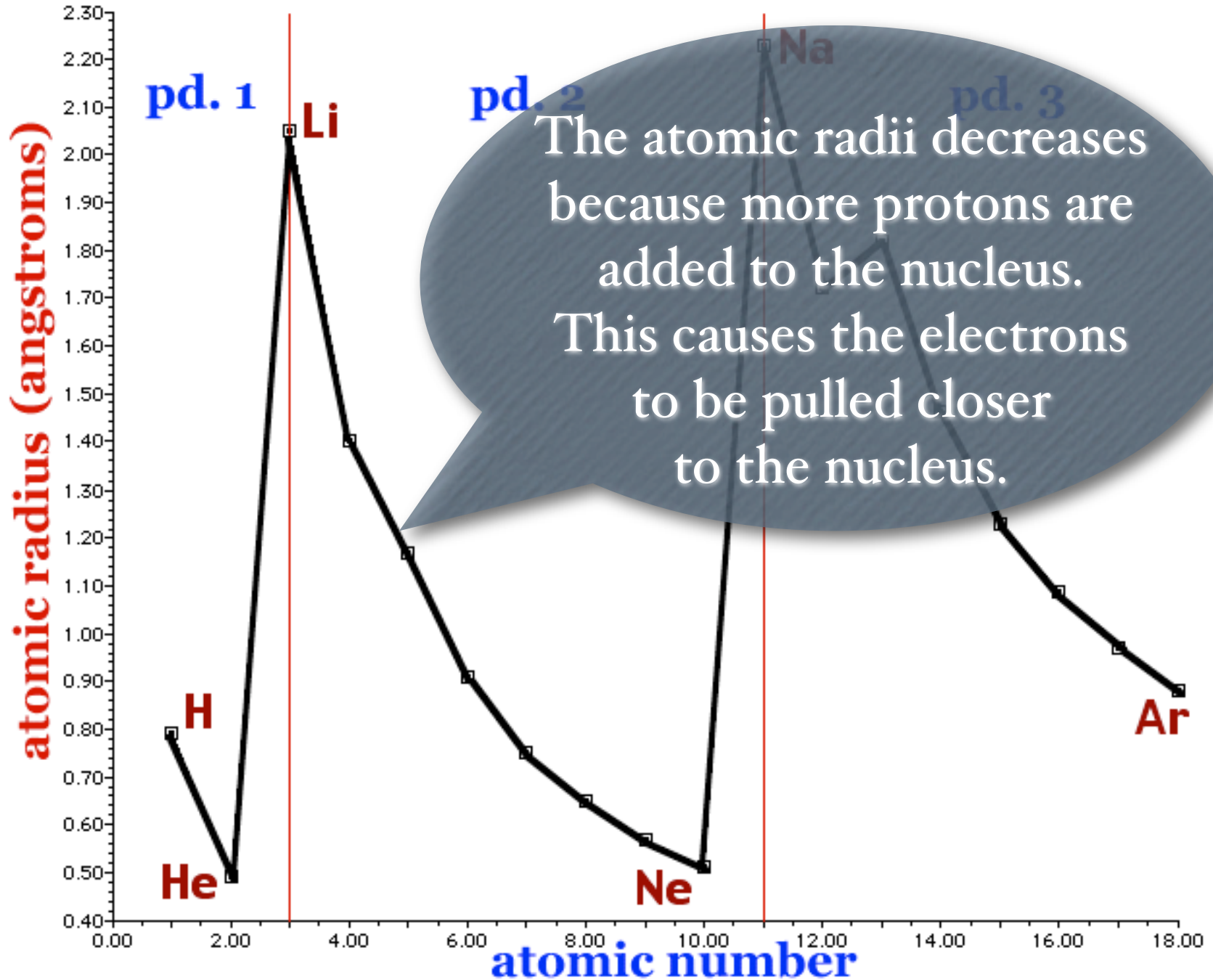
As you go across a period, the *atoms gain protons* while the number of electron energy levels remain the same. This *increase in the number of protons* causes a greater attraction between the nucleus and the electrons in the atom.

The electrons are pulled closer the nucleus giving the atom a smaller radius as you go across a period.

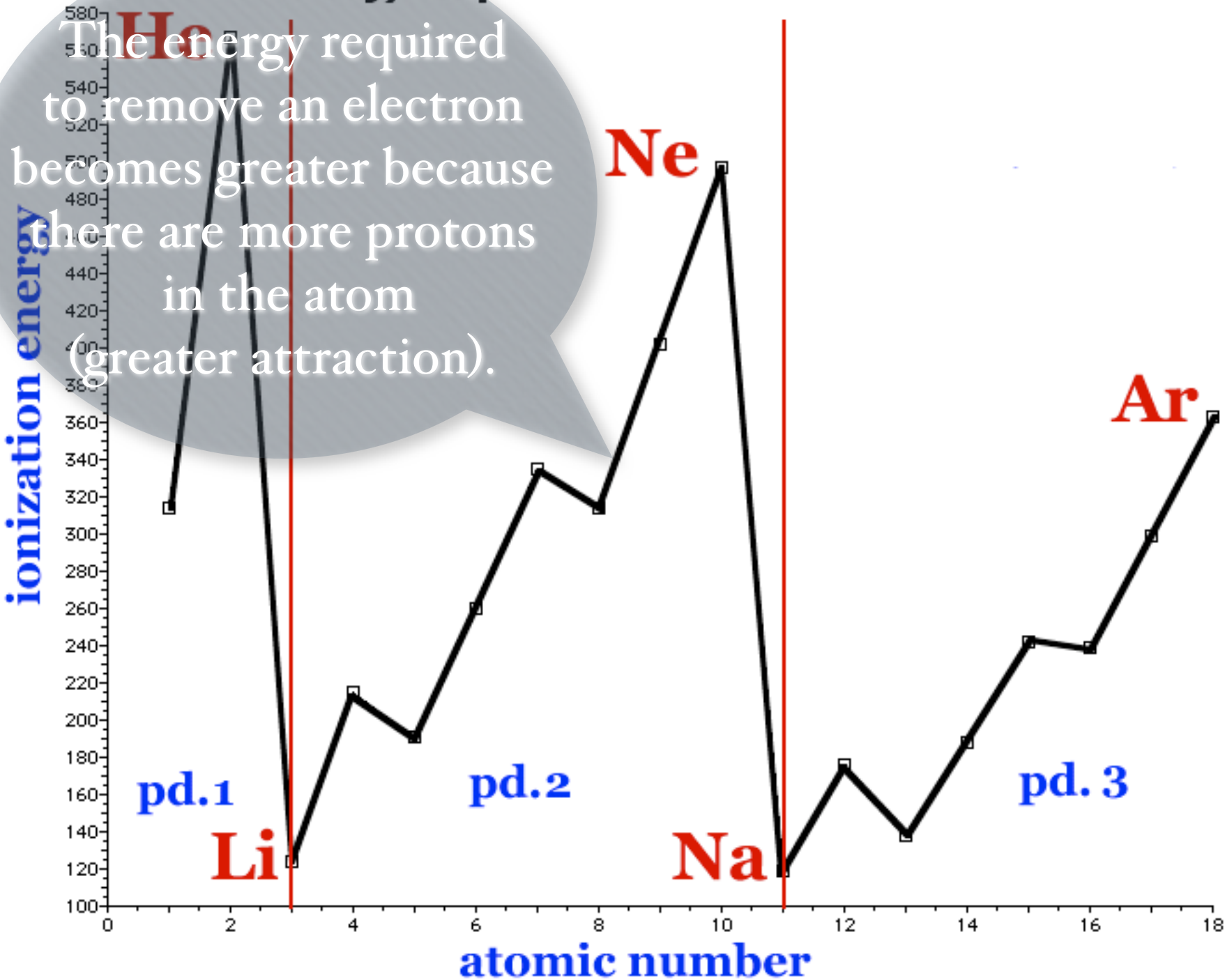


k e y	proton	electron	Force of Attraction

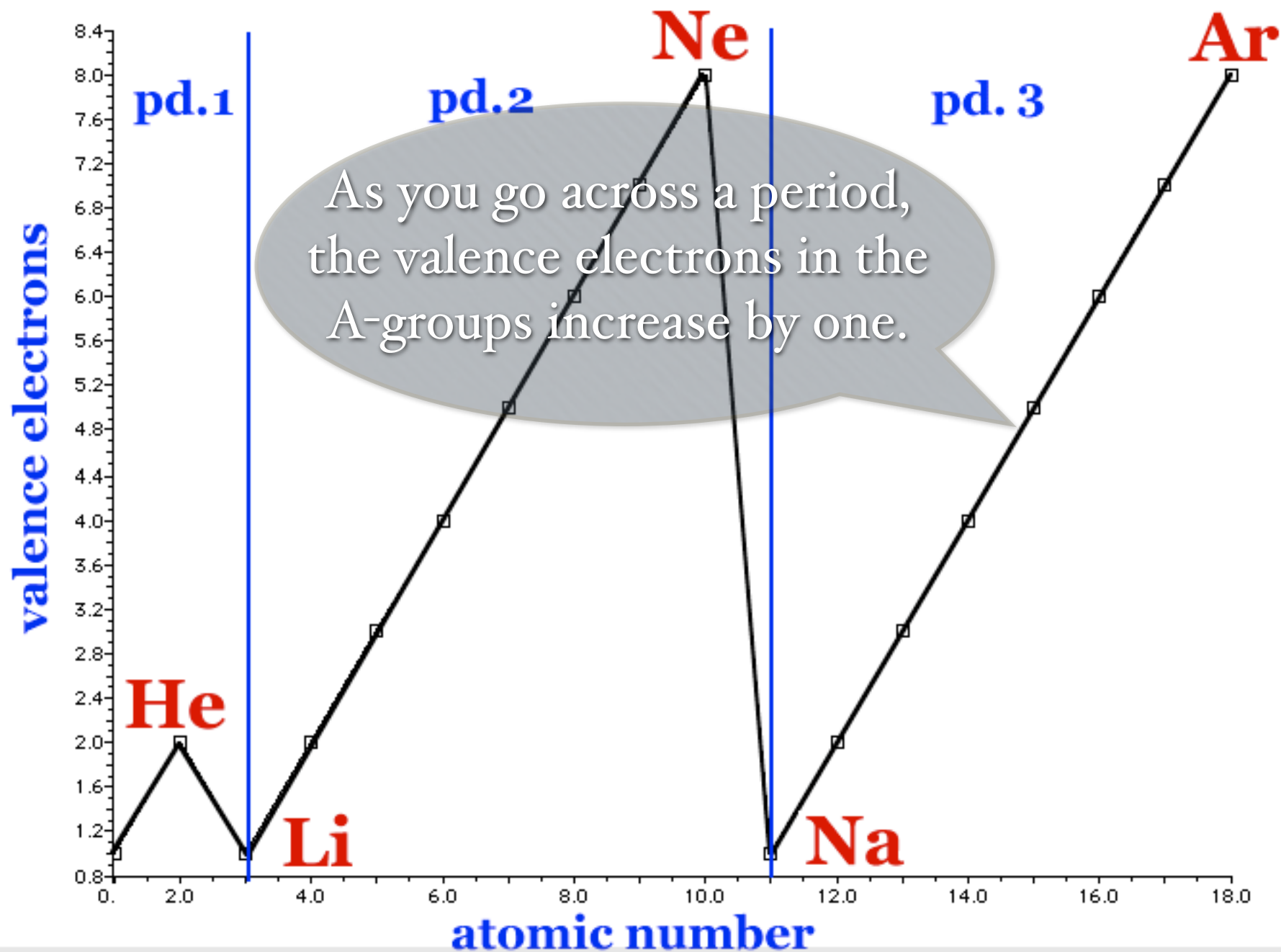
atomic radii vs atomic number



Energy required to remove an electron

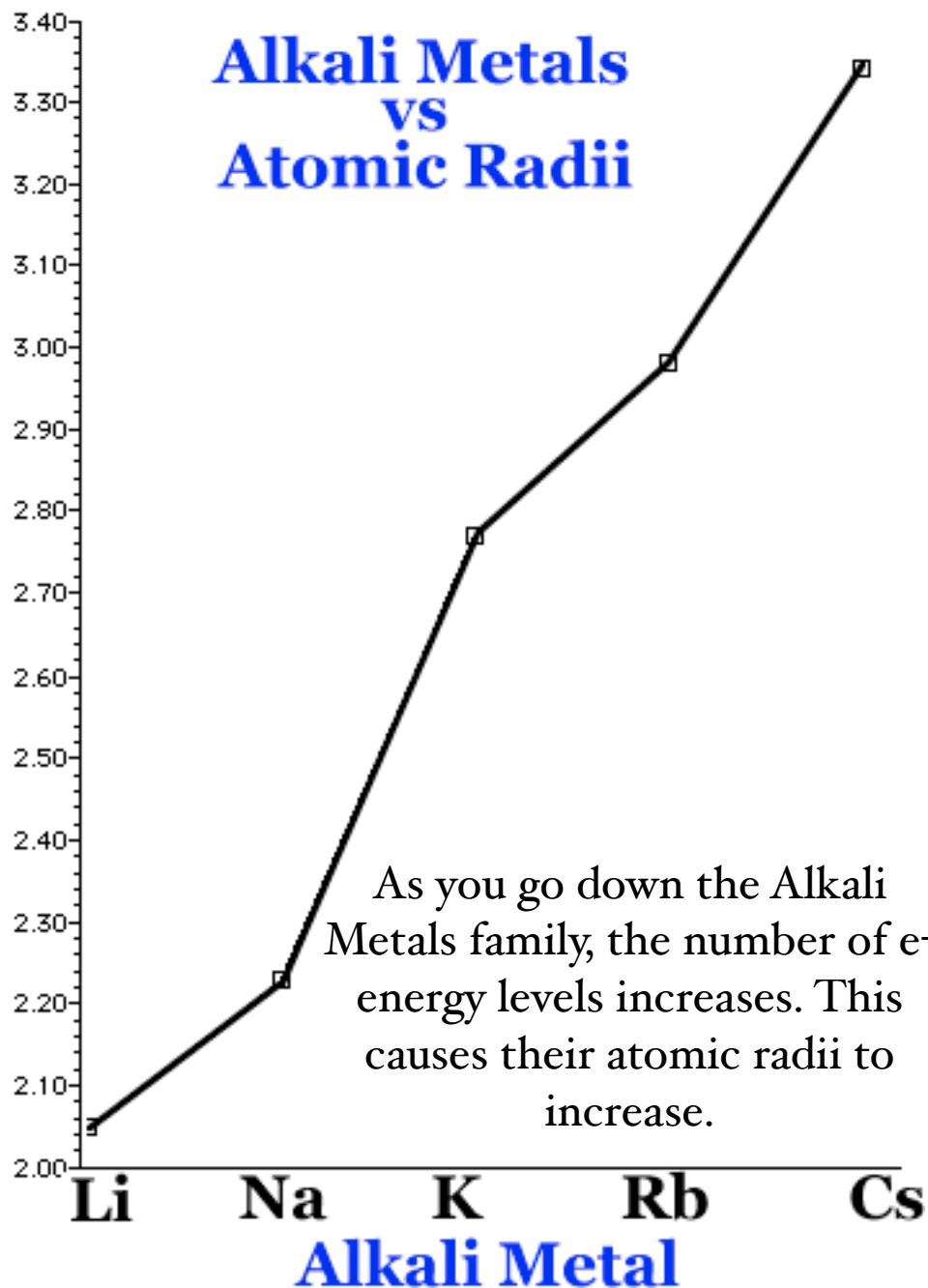


Valence Electrons vs Atomic Number



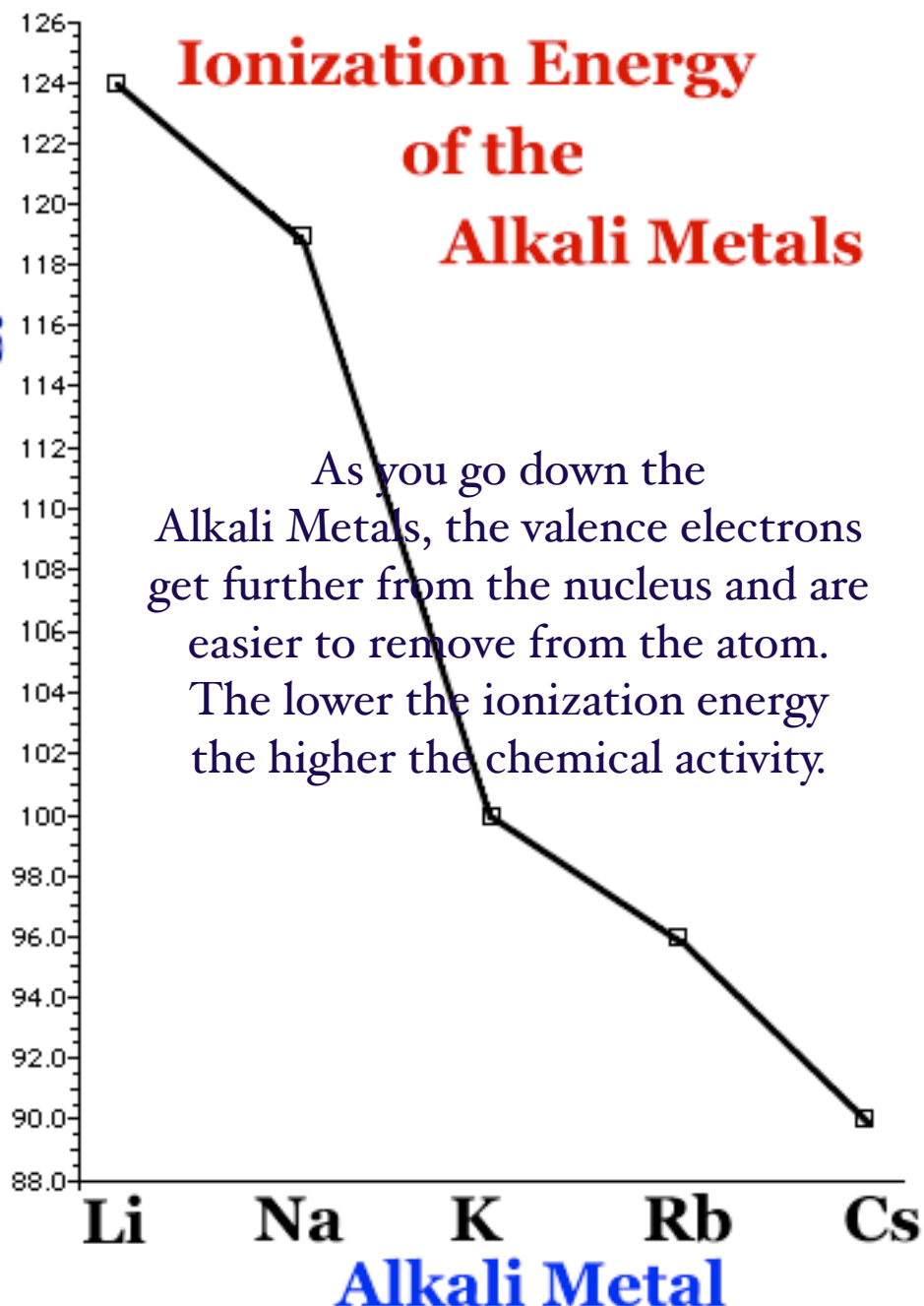
Alkali Metals VS Atomic Radii

Atomic Radii



Ionization Energy of the Alkali Metals

ionization energy



Alkali Metals: Chemical Activity

Li

Na

K

Rb







 Cs

Fr



As you go down the Alkali Metal Family the radii of the atoms becomes greater and their hold on the valence electron becomes weaker.

Weak hold on valence electron =
greater chemical activity.

Li	3	
Na	11	
K	19	
Rb	37	
Cs	55	
Fr	87	

Metallic properties increase

Energy levels increase

Atomic Radii increases

Summing Up Periodic Trends

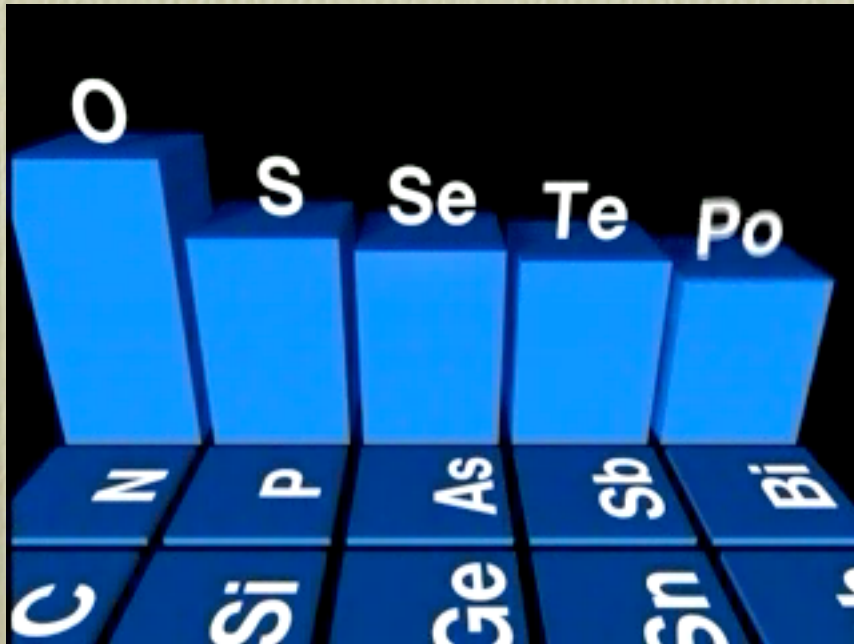
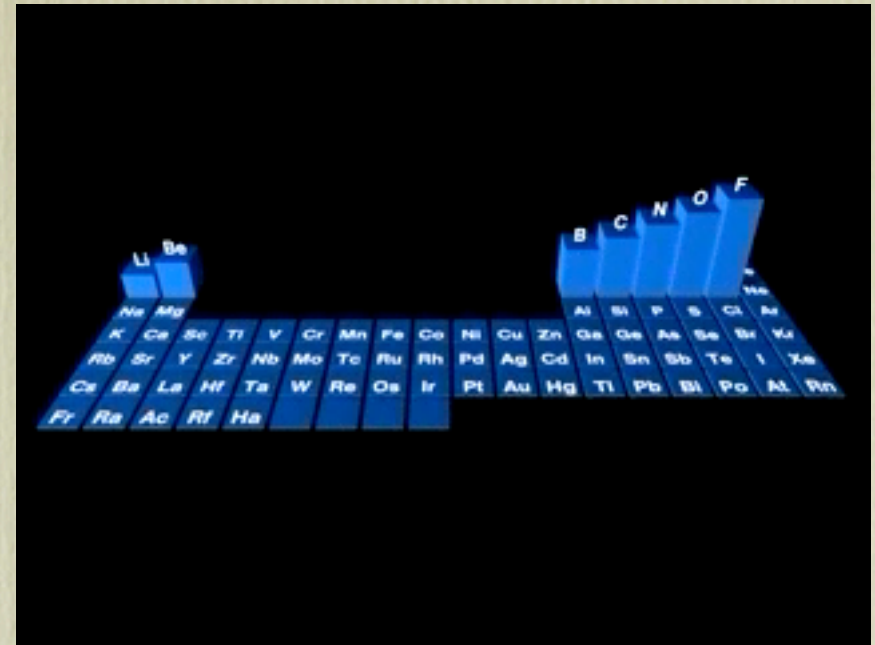
This table is called a *Periodic* Table because periodic trends occur as you go down families and across periods.

2														13	14	15	16	17	18
Be														Al	Si	P	S	Cl	Ar
Ca	Sc	Ti	V	Cr	Mn	Fe	Co	Ni	Cu	Zn	Ga	Ge	As	Se	Br	Kr			
Sr	Y	Zr	Nb	Mo	Tc	Ru	Rh	Pd	Ag	Cd	In	Sn	Sb	Te	I	Xe			
Ba	La	Hf	Ta	W	Re	Os	Ir	Pt	Au	Hg	Tl	Pb	Bi	Po	At	Rn			
Ra	Ac																		
		Ce	Pr	Nd	Pm	Sm	Eu	Gd	Tb	Dy	Ho	Er	Tm	Yb	Lu				
		Th	Pa	U	Np	Pu	Am	Cm	Bk	Cf	Es	Fm	Mn	No	Lr				

We will use these periodic trends to understand how elements combine to form compounds in the next chapter.

Periodic Trends: Electronegativity

The ability of an atom to attract valence electrons to itself.



Periodic Trends: Ionization Energy

The energy required to remove and electron from an atom.

