

3) 1<sup>st</sup> Ionization Energy - energy needed to remove the 1<sup>st</sup> valence e<sup>-</sup> from an atom.

\* down a group - 1<sup>st</sup> ionization energy decreases

Why? The larger the atom is, the more shielding there is b/w the nucleus & valence e<sup>-</sup> (less attraction to the nucleus), so less energy is needed to remove the valence e<sup>-</sup>

\* across a period - 1<sup>st</sup> ionization energy increases

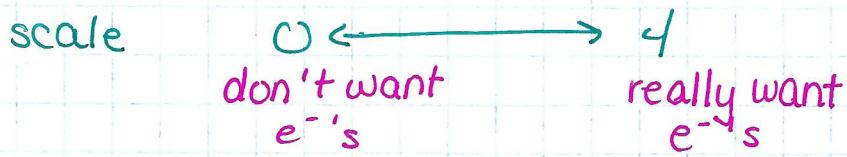
Why? The opposite reason for down a group

### Practice Problems - Warm Up

• Arrange these elements in order of decreasing ionization energy



4) Electronegativity - the attraction one atom has for another atom's electrons.



\* down a group - electronegativity decreases \*

Why? The more orbitals an atom has, the more shielding there is and the proton's in the nucleus do not feel as much attraction for another atom's electrons.

\* across a period - electronegativity increases \*

Why? The smaller the atom gets across while, simultaneously, increasing the # p<sup>+</sup> in the nucleus means more attraction between the nucleus & another atom's electrons

Practice Problems - Rank these element's in order of increasing electronegativity



# Periodic Table of the Elements

Hydrogen      Helium      2 He      4.00

1+      1e      8e

decreasing radius      increasing ion. energy

increasing electronegativity      decreasing 1st ion. energy

		largest ion. energy																		
		largest electronegativity						decreasing radius						decreasing 1st ion. energy						
		3+			4+-			3-			2-			1-			8e			
		Boron		Carbon		Nitrogen		Oxygen		Fluorine				Neon			2 He			
	1	H		C		N		O		F				10 Ne			4.00 20.18			
	1+      1e	1.01		12.01		14.01		16.00		19.00										
	2	Li	Be	Al	Si	Phosphorous		Sulfur		Chlorine				Argon			18 Ar			
		6.94	9.01				5 P	15 S	17 Cl									102.018		
	3	Sodium	Magnesium	Aluminum	Silicon	Germanium		Arsenic		Selenium				Krypton			36 Kr			
		22.99	24.31				31 Ga	32 As	34 Se								13.80 I			
	4	Potassium	Calcium	Boron	Titanium	Vanadium	Chromium	Manganese	Iron	Cobalt	Nickel	Copper	Zinc	Gallium			13.95 Iodine			
				21 Sc	22 Ti	23 V	24 Cr	25 Mn	26 Fe	27 Co	28 Ni	29 Cu	30 Zn	31 Ga						
	5	Rubidium	Strontium	Zirconium	Niobium	Molybdenum	Techneium	Ruthenium	Palladium	Cadmium										
				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	Xenon	
	6	Cesium	Barium	Hafnium	Tantalum	Tungsten	Rhenium	Osmium	Iridium	Platinum	Gold								54 Xe	
				57-70 Lu	71 Hf	72 Ta	73 W	74 Re	75 Os	76 Ir	78 Pt	79 Au	80 Hg	81 Tl	82 Pb	83 Bi	84 Po	85 At	86 Rn	
	7	Francium	Radium	Lawrencium	Rutherfordium	Dubnium	Seaborgium	Bohrium	Hassium	Meltnerium	Darmstadtium	Roentgenium	Copernicium	Nihonium	Flerovium	Moscovium	Livermorium	131.29 Iodine	126.90 Tellurium	129.13 Radon
				89-102 Fr	103 Lr	104 Rf	105 Db	106 Bk	107 Hs	108 Mt	109 Ds	110 Rg	111 Cn	112 Nh	113 Fl	114 Mc	115 Lv	117 Ts	118 Og	
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	Lanthanum	Cerium	Praseodymium	Neodymium	Promethium	Samarium	Europtium	Gadolinium	Terbium	Dysprosium	Holmium	Erbium	Thulium	Ytterbium
	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
	138.91	140.12	140.91	144.24	[145]	150.36	151.97	157.25	158.93	162.50	164.93	167.26	168.93	173.04
	Actinium	Thorium	Protactinium	Uranium	Neptunium	Plutonium	Americium	Curium	Berkelium	Californium	Einsteinium	Fermium	Mendelevium	Nobelium
	89 Ac	90 Th	91 Pa	92 U	93 Np	94 Pu	95 Am	96 Cm	97 Blk	98 Cf	99 Es	100 Fm	101 Md	102 No
	[227]				[237]	[244]	[243]	[247]	[247]	[251]	[257]	[257]	[258]	[259]