Periodic Trends Jigsaw

ACTIVITY I (10 MINUTES)

You will work in Groups of 4. Each group of students will begin with a common set of data (electronegativity, electron affinity, ionization energy, atomic radii).

(1) Discuss your data as a group until you are confident you can teach someone else about your data. It is probably a good idea to take notes. Address the following. (ENGAGE & EXPLORE)

(a) Start by defining the property IN YOUR OWN WORDS.

(b) Establish the scale for your property in terms of more favorable and less favorable.

(c) Describe the general trends as you move across a period *and* down a group. Why do those trends exist?

(d) Describe exceptions to the general trends. How do you explain these exceptions?

ACTIVITY II (20 MINUTES)

You will change groups so that there will be an "expert" in each of the four data sets. Teach each other about your data and come to a common understanding about the concepts, facts and theories explained by your data. Be prepared to report your work to the class. (EXPLAIN)

ACTIVITY III (20 MINUTES)

Students will be randomly chosen to explain one of the concepts (ionization energy, atomic radii, electronegativity, electron affinity). You should be prepared to explain to the class the answers to (1) for any of the four data sets. (EXPLAIN)

POST ACTIVITY IV

With your group write a group report about the periodic trends we discussed in class today. The report should address the following:

(a) Ionization Energy

(b) Electron Affinity

(c) Electronegativity

(d) Atomic Radii

(e) "Advanced Data" if assigned

For each of the first four properties, you should (1) define the property (2) State and explain the general trends (3) Identify important exceptions to the general trends and give explanations as to why these exceptions occur. As for the length of the report, keep it as short as you can where you still provide FULL explanations of the trends. It is best to type the report. If I can't read it, I won't be able to grade it. (EXPLAIN)

THIS IS A GROUP ASSIGNMENT – ONLY ONE REPORT PER GROUP!

POST ACTIVITY VI

Look up the lanthanide contraction using any resources you have available and write a paragraph explaining this phenomenon. I will be calling on several lucky students to read their explanations to the class. Make sure you can describe which elements are affected, how they are affected and what phenomenon is responsible for the "contraction". (ENGAGE, EXPLORE, EXPLAIN)

Your group report and paragraph about the lanthanide contraction are due at the beginning of the next class period.

Atomic Radii

Empirically Measured Radii

Group (vertical) / Period (horizontal)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	H 25																	He
2	Li 145	Be 105											B 85	C 70	N 65	O 60	F 50	Ne
3	Na 180	Mg 150											Al 125	Si 110	P 100	S 100	Cl 100	Ar
4	K 220	Ca 180	Sc 160	Ti 140	V 135	Cr 140	Mn 140	Fe 140	Co 135	Ni 135	Cu 135	Zn 135	Ga 130	Ge 125	As 115	Se 115	Br 115	Kr
5	Rb 235	Sr 200	Y 180	Zr 155	Nb 145	Mo 145	Tc 135	Ru 130	Rh 135	Pd 140	Ag 160	Cd 155	In 155	Sn 145	Sb 145	Te 140	I 140	Xe
6	Cs 260	Ba 215	*	Hf 155	Ta 145	W 135	Re 135	Os 130	Ir 135	Pt 135	Au 135	Hg 150	Tl 190	Pb 180	Bi 160	Po 190	At	Rn
7	Fr	Ra 215	**	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo
Lanthanides	*	La 195	Ce 185	Pr 185	Nd 185	Pm 185	Sm 185	Eu 185	Gd 180	Tb 175	Dy 175	Ho 175	Er 175	Tm 175	Yb 175	Lu 175		
Actinides	**	Ac 195	Th 180	Pa 180	U 175	Np 175	Pu 175	Am 175	Cm	Bk	Cf	Es	Fm	Md	No	Lr		

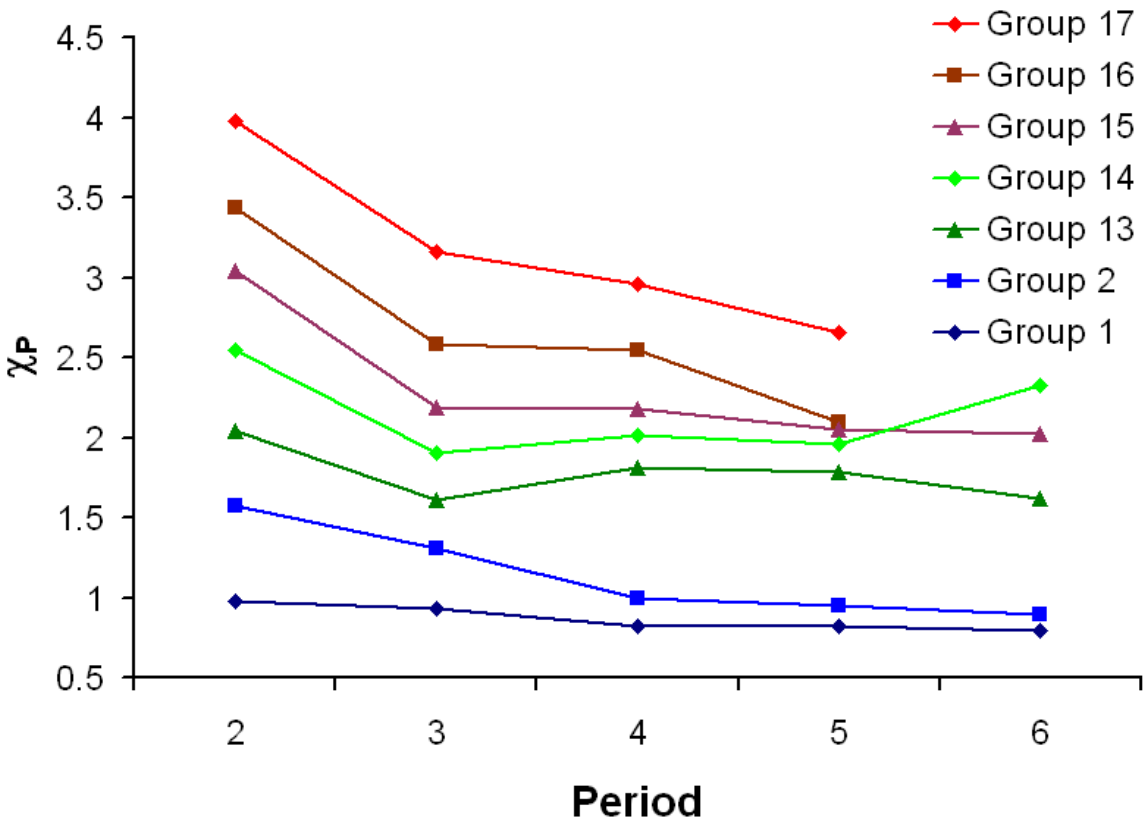
Calculated Atomic Radii

ELECTRONEGATIVITY

PAULING ELECTRONEGATIVITIES

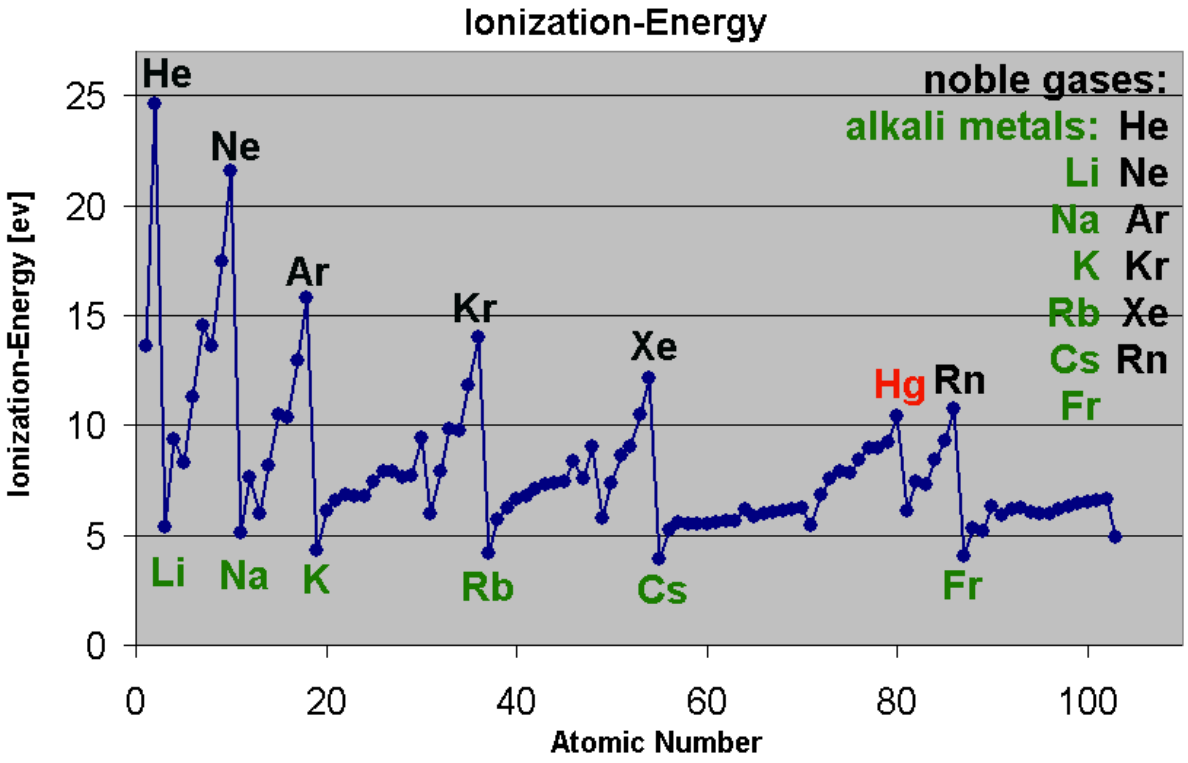
Group (vertical)	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
Period (horizontal)																		
1	H 2.300																	He 4.160
2	Li 0.912	Be 1.576											B 2.051	C 2.544	N 3.066	O 3.610	F 4.193	Ne 4.789
3	Na 0.869	Mg 1.293											Al 1.613	Si 1.916	P 2.253	S 2.589	Cl 2.869	Ar 3.242
4	K 0.734	Ca 1.034	Sc 1.19	Ti 1.38	V 1.53	Cr 1.65	Mn 1.75	Fe 1.80	Co 1.84	Ni 1.88	Cu 1.85	Zn 1.59	Ga 1.756	Ge 1.994	As 2.211	Se 2.434	Br 2.685	Kr 2.966
5	Rb 0.706	Sr 0.963	Y 1.12	Zr 1.32	Nb 1.41	Mo 1.47	Tc 1.51	Ru 1.54	Rh 1.56	Pd 1.59	Ag 1.87	Cd 1.52	In 1.656	Sn 1.824	Sb 1.984	Te 2.158	I 2.359	Xe 2.582
6	Cs 0.659	Ba 0.881	Lu 1.09	Hf 1.16	Ta 1.34	W 1.47	Re 1.60	Os 1.65	Ir 1.68	Pt 1.72	Au 1.92	Hg 1.76	Tl 1.789	Pb 1.854	Bi 2.01	Po 2.19	At 2.39	Rn 2.60
7	Fr 0.67	Ra 0.89	**															

PERIODIC VARIATION OF ELECTRONEGATIVITY

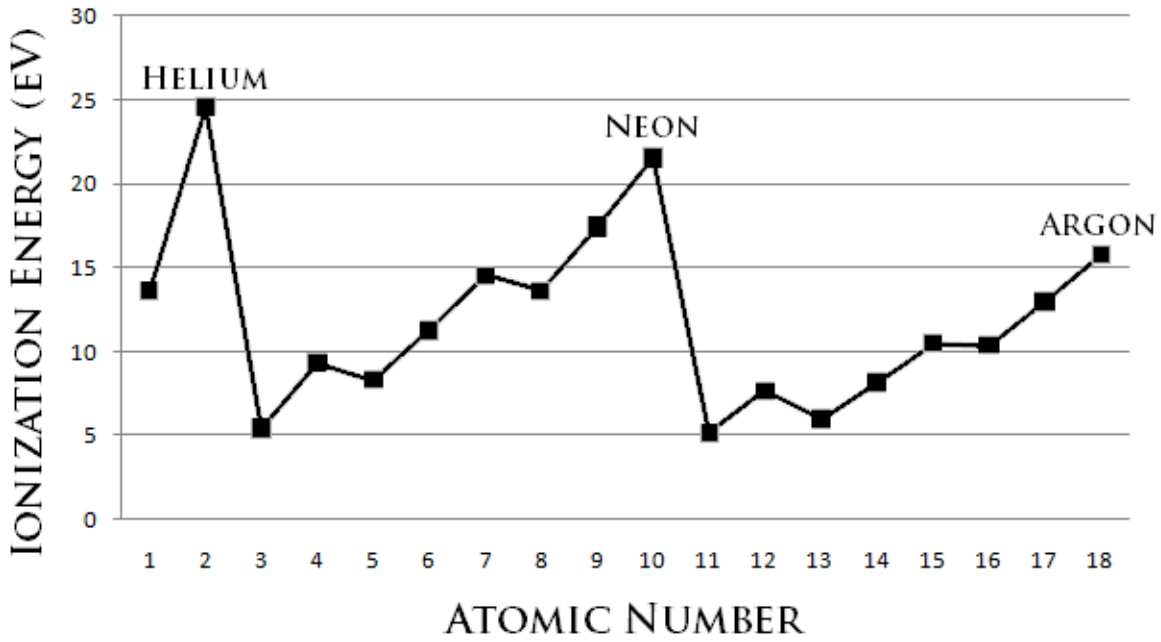


IONIZATION ENERGIES

IONIZATION ENERGY (EV) VS ATOMIC WEIGHT



IONIZATION ENERGY (EV) VS ATOMIC WEIGHT (PERIODS 1-3)



ELECTRON AFFINITY

ELECTRON AFFINITIES

Group → / ↓ Period	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18
1	H 73																	He *
2	Li 60	Be *											B 27	C 122	N *	O -141	F -328	Ne *
3	Na 53	Mg *											Al 42	Si 134	P 72	S 200	Cl *-349*	Ar *
4	K 48	Ca 2	Sc 18	Ti 8	V 51	Cr 65	Mn *	Fe 15	Co 64	Ni 112	Cu 119	Zn *	Ga 41	Ge 119	As 79	Se 195	Br -324	Kr *
5	Rb 47	Sr 5	Y 30	Zr 41	Nb 86	Mo 72	Tc *	Ru 101	Rh 110	Pd 54	Ag 126	Cd *	In 39	Sn 107	Sb 101	Te 190	I *-295*	Xe *
6	Cs 46	Ba 14	†	Hf	Ta 31	W 79	Re *	Os 104	Ir 150	Pt 205	Au 223	Hg *	Tl 36	Pb 35	Bi 91	Po	At	Rn *
7	Fr	Ra	‡	Rf	Db	Sg	Bh	Hs	Mt	Ds	Rg	Cn	Uut	Uuq	Uup	Uuh	Uus	Uuo