

Name: **KEY** _____

Periodic Trends Worksheet

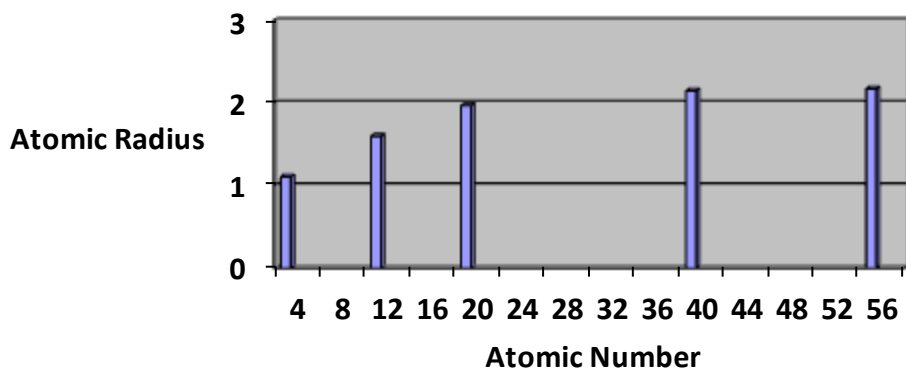
Atomic Radius

1. Using the data below, make a bar graph of atomic radius vs. atomic number for Group 2A and for Period 3 of the periodic table.

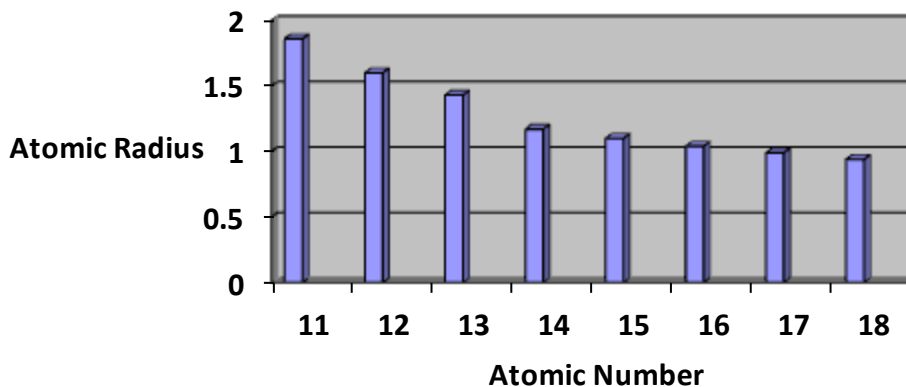
Group 2A		
Element	Atomic Number	Atomic Radius
Be	4	1.11
Mg	12	1.60
Ca	20	1.97
Sr	38	2.15
Ba	56	2.17

Period 3		
Element	Atomic Number	Atomic Radius
Na	11	1.86
Mg	12	1.60
Al	13	1.43
Si	14	1.17
P	15	1.10
S	16	1.04
Cl	17	0.99
Ar	18	0.94

Atomic Radius vs. Atomic Number (Group 2A)



Atomic Radius vs. Atomic Number (Period 3)



Answer the following questions about atomic radius in complete sentences.

1. What trend in atomic radius do you see as you go down a group/family on the periodic table?

The atomic radius gets bigger as the atomic number increases.

2. What trend in atomic radius do you see as you go across a period/row on the periodic table?

The atomic radius gets smaller as you go across a period on the periodic table.

3. What causes these two trends?

As you go down the table, the elements have more electrons so their radius becomes larger. However, as you go across the table, the protons act as magnets and the more protons you have, the stronger the pull of electrons towards the nucleus making the radius smaller.

4. Circle the atom in each pair that has the largest atomic radius.

a) **Al** B

b) **S** O

c) **Br** Cl

d) **Na** Al

e) **O** F

f) Mg **Ca**

Ionization Energy

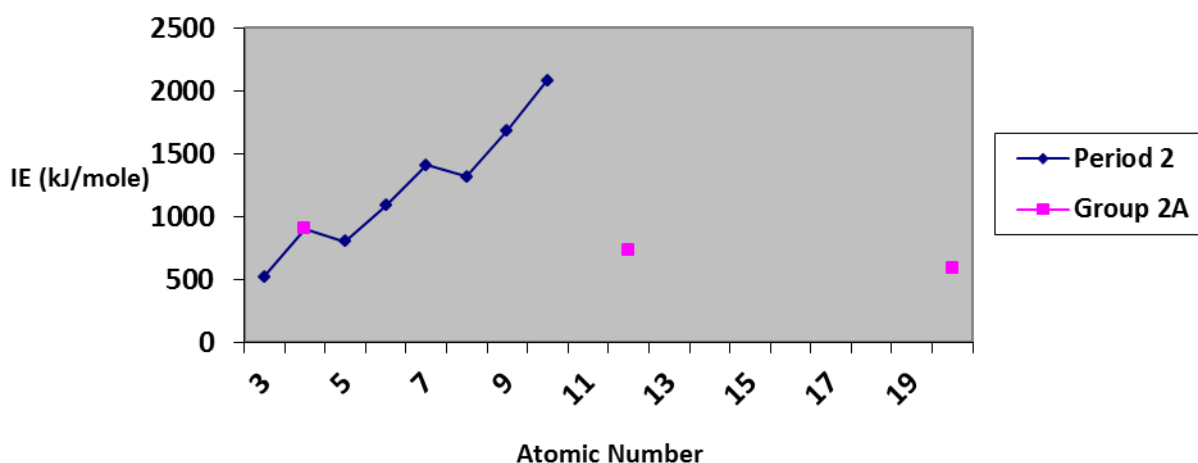
Ionization energy is the amount of energy required to remove an electron from an element. Using the ionization energies of the elements in Period 2 listed below, make a line graph the values vs. atomic number.

Period 2			
Element	IE (kJ/mole)	Element	IE (kJ/mole)
Li	519	N	1406
Be	900	O	1314
B	799	F	1682
C	1088	Ne	2080

On the same graph, make a line graph the first three atoms in Group 2A listed below in a different color.

Group 2A	
Element	IE (kJ/mole)
Be	900
Mg	736
Ca	590

Ionization Energy vs. Atomic Number



Answer the following questions about ionization energy in complete sentences.

5. What trend do you notice for the ionization energies in Period 2?

They go up as the atomic number increases.

6. What trend do you notice for the ionization energies of Group 2A?

They go down as the atomic number increases.

7. Explain why this trend occurs.

Going down a group, the ionization energy decreases because the electron is further away from the attraction of the protons in the nucleus. Lower ionization energy means it takes less energy to remove the electron from the atom.

Electronegativity

8. Define electronegativity

Electronegativity is how likely an atom is to attract a bonding pair of electrons.

10. What trend in electronegativity do you see as you go down a group/family on the periodic table?

Electronegativity decreases as you go down the group.

12. What trend in electronegativity do you see as you go across a period/row on the periodic table?

Electronegativity increases as you go across a period on the periodic table.

13. What causes these two trends?

14. Circle the atom in each pair that has the greater electronegativity.

a) Ca **Ga** b) Li **O** c) **Cl** S d) **Br** As e) Ba **Sr** f) **O** S

15. For each of the following, circle or highlight the correct element that best matches the statement on the right.

N	P	As	smallest ionization energy
K	Ca	Sc	largest atomic mass
Ga	Al	Si	largest atomic radius
V	Nb	Ta	largest atomic number
Si	Ge	Sn	4 energy levels
As	Se	Br	6 valence electrons
H	Li	Na	nonmetal
Hg	Tl	Pb	member of transition metals
Na	Mg	Al	electron distribution ending in $3s^23p^1$
Pb	Bi	Po	metalloid
Ca	Sc	Ti	electron distribution ending in $4s^23d^2$

Instructions Fill in the arrows below with the following terms: *increasing electronegativity, increasing atomic radius, increasing ionization energy.*

Increasing Ionization Energy

																		Helium 2 He 4.0026													
1 H 1.0079																	2 He 4.0026														
3 Li 6.941	4 Be 9.0122															5 B 10.811	6 C 12.011	7 N 14.007	8 O 15.999	9 F 18.998	10 Ne 20.180										
11 Na 22.990	12 Mg 24.305															13 Al 26.982	14 Si 28.086	15 P 30.974	16 S 32.065	17 Cl 35.453	18 Ar 39.948										
19 K 39.098	20 Ca 40.078															21 Sc 44.956	22 Ti 47.867	23 V 50.942	24 Cr 51.996	25 Mn 54.938	26 Fe 55.845	27 Co 58.933	28 Ni 58.693	29 Cu 63.546	30 Zn 65.39	31 Ga 69.723	32 Ge 72.61	33 As 74.922	34 Se 78.96	35 Br 79.904	36 Kr 83.80
37 Rb 85.468	38 Sr 87.62															39 Y 88.906	40 Zr 91.224	41 Nb 92.906	42 Mo 95.94	43 Tc [98]	44 Ru 101.07	45 Rh 102.91	46 Pd 106.42	47 Ag 107.87	48 Cd 112.41	49 In 114.82	50 Sn 118.71	51 Sb 121.76	52 Te 127.60	53 I 126.90	54 Xe 131.29
55 Cs 132.91	56 Ba 137.33	57-70 *	71 Lu 174.97	72 Hf 178.49	73 Ta 180.95	74 W 183.84	75 Re 186.21	76 Os 190.23	77 Ir 192.22	78 Pt 195.08	79 Au 196.97	80 Hg 200.59	81 Tl 204.38	82 Pb 207.2	83 Bi 208.98	84 Po [209]	85 At [210]	86 Rn [222]													
87 Fr [223]	88 Ra [226]	89-102 **	103 Lr [262]	104 Rf [261]	105 Db [262]	106 Sg [266]	107 Bh [264]	108 Hs [269]	109 Mt [268]	110 Uun [271]	111 Uuu [272]	112 Uub [277]																			
																		114 Uuq [289]													

Increasing Atomic Radius

*lanthanoids

lanthanum 57 La 138.91	cerium 58 Ce 140.12	praseodymium 59 Pr 140.91	neodymium 60 Nd 144.24	promethium 61 Pm [145]	samarium 62 Sm 150.36	europium 63 Eu 151.96	gadolinium 64 Gd 157.25	terbium 65 Tb 158.93	dysprosium 66 Dy 162.50	holmium 67 Ho 164.93	erbium 68 Er 167.26	thulium 69 Tm 168.93	ytterbium 70 Yb 173.04
actinium 89 Ac [227]	thorium 90 Th 232.04	protactinium 91 Pa 231.04	uranium 92 U 238.03	neptunium 93 Np [237]	plutonium 94 Pu [244]	americium 95 Am [243]	curium 96 Cm [247]	berkelium 97 Bk [247]	californium 98 Cf [251]	einsteinium 99 Es [252]	fermium 100 Fm [257]	mendelevium 101 Md [258]	nobelium 102 No [259]

**actinoids

Increasing Electronegativity

Increasing Ionization Energy

Increasing Electronegativity

Increasing Atomic Radius

