

Name: _____ Period: _____ Date: _____

Trends in the Periodic Table

Read the notes in the back of this paper before beginning this activity.

1. Draw a line in the middle of a piece of graph paper, separating the page into top and bottom. On the top, plot a graph of ionization energy (y-axis) vs. atomic number (x-axis). On the bottom plot a separate graph of atomic radius vs. atomic number. For each graph connect successive dots with straight lines. Also, ensure that identical atomic numbers are plotted on the same vertical position on the sheet (i.e. atomic number 1 in the top graph should be on the same line as atomic number 1 in the bottom graph.)

Atomic Number	Element Symbol	First Ionization energy (kJ/mol)	Atomic Radius (pm)
1	H	1312	32
2	He	2372	31
3	Li	520	123
4	Be	899	90
5	B	801	82
6	C	1086	77
7	N	1402	75
8	O	1314	73
9	F	1681	72
10	Ne	2081	71
11	Na	496	154
12	Mg	738	136
13	Al	578	118
14	Si	786	111
15	P	1012	106
16	S	1000	102
17	Cl	1251	99
18	Ar	1521	98
19	K	419	203
20	Ca	590	174

2. Examine your graph of ionization energy (IE) vs. atomic number.

a. Which elements are found at the main peaks on your graph (there should be 3)?
What do these elements have in common?

b. Which elements are found at the main valleys on your graph (there should be 3)?
What do these elements have in common?

3. Examine your graph of atomic radius versus atomic number.

a. Which elements are found at the peaks on your graph? What do these elements have in common?

b. Which elements are found at the valleys on your graph? What do these elements have in common?

4. How are atomic radii and ionization energy related (i.e. as atomic radius increases, what happens to the ionization energy)? _____

5. Generally, as you go from left to right across a period on the periodic table, what happens to atomic radius? What about IE? _____

6. Generally, as you go down a group in the periodic table, what happens to atomic radius and IE? _____

7. When Na forms an ion it loses its outer electron to become Na^{+1} . Draw B-R diagrams for Na and Na^{+1} . What element does Na^{+} resemble (with respect to its electron arrangement)? In general, which group's electrons configuration do the alkali metals resemble when they form ions (i.e. lose an outer electron)?

8. Why does radius increases as you go down a group (hint: think of B-R diagrams)?

Why would an increase in radius make it easier to lose an outer electron (i.e. give a lower ionization energy)?

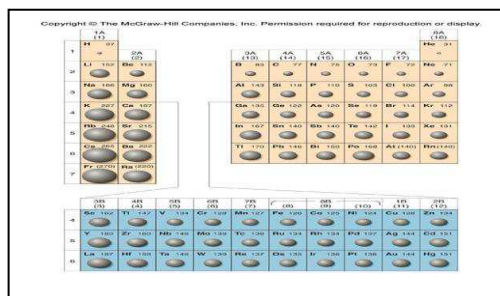
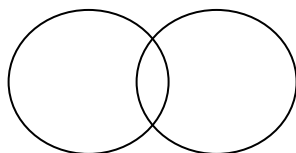
9. What happens to the number of protons in the nucleus as you go across a period? Use this to explain the trends in atomic radius and ionization energy across a period.

10. There is one group that is usually ignored because it does not follow these trends. Which group is usually ignored?

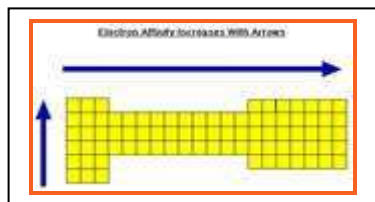
11. Define Electronegativity: Where on the periodic table is its highest?

Notes on Periodic Table Trends

Atomic Radius (atom size): a length equal to half the distance between the nuclei of two covalently bonded atoms.

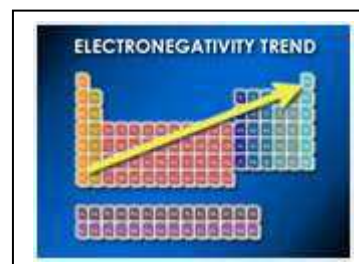


As you go down the periodic table, energy shell is added therefore the atomic radius increases. On the other hand, as you go across the table (away from H), proton is added which pulls electron closer therefore the atomic radius decreases.



Ionization Energy (IE): The amount of energy required to remove an electron from an atom, forming a cation.

Electronegativity: Ability of an atom to attract electron to itself.



$$\text{Atomic Number} = \text{Proton Number}$$