ATOMIC RADIUS AND IONIZATION ENERGY NOTES

1. Fill in the number of electrons in each shell and the number of protons in each nucleus in the chart below.

Bohr – Rutherford Diagrams for the first 20 Elements

2a) What do you notice about the number of electron shells as you go down a family in the periodic table?

increase by 1

b) What is happening to the radius (size) of the atoms as you go down a family in the periodic table?

increase

[Note: This is marked as 'Yes']

c) Looking at the ‘Intro to the Periodic Table’ sheet, does the graph support this?

d) As you move from left to right across a row, what do you think should happen to the size (radius) of the atoms?

some bigger

e) After doing the graphing activity, what actually does the radius do as you across a row left to right?

smaller (decrease)
1. Explain why you think this trend happens. Hint: think laws of attraction.

   more prol in atom = stronger nucleus → stronger nucleus has greater pull on its valence e-
   atom gets smaller atom will compact

3. So far for atomic radius, the trends are:
   a) when you go down any column, the atomic radius goes **up**
   b) when you go across a period from left to right, the atomic radius goes **down**

4. SO, to tell which atom has a greater atomic radius first you look at:

   a. which has a greater _# of shells_
   b. if they are equal, then you see which has _less protons_ because

   less pro _s = weaker nucleus ⇒ less attraction to e_−_⇒ won't compact_.

5. Using a periodic table and the information about atomic radius, CIRCLE the atom with the HIGHEST ATOMIC RADIUS in each pair below.

   a) Li, Na  f) Cs, F
   b) Ca, Mg  g) Rb, K
   c) O, S  h) Mg, S
   d) F, O  i) Sn, W
   e) Ga, Al  j) Ge, N

6. What do you notice about the:

   a) the number of outer shell (valence) electrons as you go down a family?
      **Same**

   b) the numbers of valence electrons as you go left to right across a period?
      **go up by 1**

1. Ionization energy is the amount of energy needed to
   **remove an e− from an atom**

2. Look at the Bohr diagrams for Lithium and Sodium. Which one do you think has a stronger hold on
   its valence electron? 
   **Li**
   Why? **because it's smaller, nucleus is closer to valence e−, nucleus has a stronger hold**
   on e−

3. How does this affect the ionization energy as you go down a group? Explain why this occurs.
   **decrease**, because larger atoms have their nucleus farther from e−, so
   **less energy needed to remove the e−

4. Look at the Bohr diagrams for Magnesium and Sodium. Which one do you think has a stronger hold
   on its valence electrons?
   **Mg** because its smaller
5. How does this affect the ionization energy as you go left to right across a period? **Explain why this occurs.** I.E. increases because across a row, atoms getting smaller.

4. SO, to tell which atom has a greater ionization energy, you look at which atom has a **smaller size**. This is because the smaller the atom the closer the nucleus is to the valence e⁻ and the more energy it will take to remove an electron.

6. Using a periodic table and the information about atomic radius, indicate the atom with the GREATEST IONIZATION ENERGY in each pair below.

   a) Fr, F  
   b) Ca, Mg  
   c) Te, I  
   d) F, O  
   e) Ga, Al  
   f) Li, C  
   g) Rb, K  
   h) Mg, S  
   i) Sn, W  
   j) Ge, N

Using arrows summarize the trends for atomic radius and ionization energy going down a family and left to right across a period.