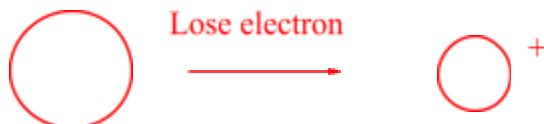


### ***Ionic Radius***

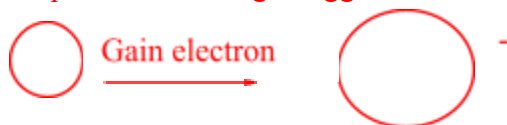
1. What happens to the size of an ion when a metal loses electrons and why? Explain with full sentences and draw an example.

Cations are always smaller than the respective neutral atom. When a metal loses an electron, there are more protons than electrons. The electron-electron repulsions are less and the nucleus pulls in the remaining electrons tightly bringing the energy levels closer to the nucleus.



2. What happens to the size of an ion when a nonmetal gains electrons and why? Explain with full sentences and draw an example.

Anions are always larger than the respective neutral atom. When a nonmetal gains an electron, electron-electron repulsions increase, and the energy levels move away from the nucleus to reduce the repulsions forming a bigger anion.



3. Circle the elements from each pair below that have a SMALLER radius.

a. Cu vs.  $\text{Cu}^{3+}$

e.  $\text{Ni}^{2+}$  vs.  $\text{Ni}^{4+}$

i. Ra vs. Ba

b. I vs.  $\text{I}^{-}$

f.  $\text{Cl}^{-}$  vs. Cl

j. P vs. S

c.  $\text{O}^{2-}$  vs. O

g.  $\text{Cl}^{-}$  vs.  $\text{Cl}^{1+}$

k. Ca vs.  $\text{Ca}^{2+}$

d. Ni vs.  $\text{Ni}^{4+}$

h. Rb vs.  $\text{Rb}^{1+}$

l.  $\text{C}^{4+}$  vs.  $\text{C}^{4-}$

4. Based on their positions in the periodic table, list the following ions in order of increasing

radius:  $\text{K}^{+}$ ,  $\text{Ca}^{2+}$ ,  $\text{Al}^{3+}$ ,  $\text{Si}^{4+}$ . \_\_\_\_\_  $\text{Si}^{4+}$ ,  $\text{Al}^{3+}$ ,  $\text{Ca}^{2+}$ ,  $\text{K}^{+}$  \_\_\_\_\_

5. List the following ions in order of increasing radius:  $\text{Br}^{-}$ ,  $\text{Li}^{+}$ ,  $\text{Te}^{2-}$ ,  $\text{Mg}^{2+}$

\_\_\_\_\_  $\text{Li}^{+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Br}^{-}$ ,  $\text{Te}^{2-}$  \_\_\_\_\_

6. The ionic radii of the ions  $\text{S}^{2-}$ ,  $\text{Cl}^{-}$ , and  $\text{K}^{+}$  are 184, 181, 138 pm respectively. Explain why these ions have different sizes even though they contain the same number of electrons.

Each of the ions have a different number of protons. The protons determine the size of an ion depending on if electrons were lost (smaller cation) or if electrons were gained (larger anion).