Lesson 9 - PERIODIC TRENDS PRACTICE

ATOMIC RADIUS

1. Does atomic radius increase or decrease as you go down a group/family on the periodic table?
   ▼ increase

2. What causes this trend?
   greater number of electron shells
   valence electrons are farther away.

3. Does atomic radius increase or decrease as you go across a period/row on the periodic table?
   → decrease

4. What causes this trend?
   greater # of protons, greater Zeff
   valence electrons are pulled closer to nucleus.

5. 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

6. List the following neutral elements in order of INCREASING radius. At, Mg, Ba, P
   P, Mg, At, Ba

7. List the following neutral elements in order of DECREASING radius. C, Al, K, O.
   K, Al, C, O

8. List the following neutral elements in order of DECREASING radius. Rb, Ca, K, Sr.
   Rb, Sr, K, Ca
IONS

9. What is the difference between a cation and an anion?
   cation = positively charged ion (lost e-)
   anion = negatively charged ion (gained e-)

10. Which is larger, Ca\(^{2+}\) or Ca and why?
    Ca \(\text{same # of p^+, more e^- (ca^{2+} \text{ has stronger Zeff})}\)

11. Which is larger, F\(^-\) or F and why?
    F\(^-\) \(\text{same # of p^+, more e^- F^- \text{ has less Zeff}}\)

12. Cations are \underline{smaller} than the neutral element and anions are \underline{larger} than the neutral element.

13. How does the ionic radius of a nonmetal compare with its atomic radius?
    nonmetals make anions. anions are bigger (larger radius)

    \underline{same # of e^- \text{ same e^- configuration}}

15. List the following isoelectronic series in order of INCREASING radius. Ne, Na\(^+\), O\(^2-\), Mg\(^{2+}\), F
    Mg\(^{2+}\), Na\(^+\), Ne, F\(^-\), O\(^2-\) \(\underline{\text{more p^+ less p^+}}\) \(\underline{\text{all 10e^-}}\)

16. List the following isoelectronic series in order of INCREASING radius. Cl\(^-\), K\(^+\), Ca\(^{2+}\), S\(^2-\), Ar
    Ca\(^{2+}\), K\(^+\), Ar, Cl\(^-\), S\(^2-\) \(\underline{\text{more p^+ less p^+}}\) \(\underline{\text{all 18e^-}}\)

17. List the following isoelectronic series in order of DECREASING radius. Kr, Sr\(^{2+}\), Br\(^-\), Rb\(^+\), Se\(^2-\)
    Se\(^2-\), Br\(^-\), Kr, Rb\(^+\), Sr\(^{2+}\) \(\underline{\text{less p^+ more p^+}}\) \(\underline{36e^-}\)

18. For isoelectronic series, the more \underline{protons} there are, the \underline{smaller} its size.
IONIZATION ENERGY

19. What trend in ionization energy do you see as you go down a group/family on the periodic table?
   \[ \text{decrease} \]

20. What causes this trend?
   \[ \text{atoms at bottom of table are larger, have less } Z_{\text{eff}}, \text{valence } e^- \text{ held less tightly.} \]

21. What trend in ionization energy do you see as you go across a period/row on the periodic table?
   \[ \rightarrow \text{increase} \]

22. What causes this trend?
   \[ \text{atoms become smaller, larger } Z_{\text{eff}}, \text{ valence electrons are held more tightly.} \]

23. Circle the atom in each pair that has the greater ionization energy.

   a) Li  Be  b) Na  K  c) Cl  Si
   d) Ca  Ba  e) P  Ar  f) Li  K
   g) Mg  Al  h) Ga  Ca  i) S  P  \( \rightarrow \text{Exceptions!} \)
   2A  3A  3A  2A  2A  6A  5A

24. List the following neutral elements in order of INCREASING ionization energy. At, Br, F, Cl, I
   \[ \text{At} \rightarrow \text{I} \rightarrow \text{Br} \rightarrow \text{Cl} \rightarrow \text{F} \]
   \[ \rightarrow \text{inc} \rightarrow \text{inc} \]

25. *EDITED* List the following neutral elements in order of DECREASING ionization energy. O, Ba, Zn, Os, Ne
   \[ \text{Ne} \rightarrow \text{O} \rightarrow \text{Zn} \rightarrow \text{Os} \rightarrow \text{Ba} \]
   \[ \rightarrow \text{dec} \rightarrow \text{dec} \]

26. How does the trend in ionization energy relate to the atom’s radius?
   \[ \text{large radius} = \text{low IE} \]
   \[ \text{small radius} = \text{large IE} \]
27. What is this picture showing? 

28. Why are valence electrons the most loosely bound electrons? 

- They're the farthest away from the nucleus. 
- Have the most energy. 
- Experience the most shielding.