

**Unit 5 – Atomic Structure and Periodicity**

1. When an electron is in a higher the energy level, it is farther away from the nucleus and therefore has less Coulombic attraction to the nucleus and is therefore easier to remove (...it has a lower 1st ionization energy.)
2. Moving across a row on the periodic table, the  $Z_{\text{eff}}$  increases, therefore the valence electrons are more attracted to the nucleus, therefore the atomic radius decreases and the ionization energy increases.
3. When reading a PES graph, the higher the peak, the more electrons there are in that sublevel, and a larger binding energy means that the electrons are closer to the nucleus.
4.  $1s^2 2s^2 2p^6 3s^2 3p^6 4s^2 3d^{10} 4p^6$
5. When writing the electron configuration for a cation, remove the valence electrons first...the ones in the p-orbital and s-orbital...then you can remove d-orbital electrons if necessary.
6. Isotopes of an element have the same number of protons, but different numbers of neutrons.
7. Mass spectroscopy graphs measure atomic masses of isotopes.
8. Elements in the same group (vertical columns) have similar chemical and physical properties.
9. Metals are on the left side of the zig-zag line and nonmetals are on the right side of this line on the periodic table.
10. Cations (+) are smaller than their atoms since you are removing valence electrons that are farther from the nucleus and anions (–) are larger than their atoms since adding extra electrons increases electron-electron repulsions.

# Thou Shalt Not Forget Questions

Credit: Dan Reid

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- When an e<sup>-</sup> is in a higher energy level, is it closer or farther away from the nucleus?  
When an e<sup>-</sup> is in a lower energy level, is it closer or farther away from the nucleus?
  - When an e<sup>-</sup> is in a higher energy level does it have more or less Coulombic attraction to nucleus?  
When an e<sup>-</sup> is in a lower energy level does it have more or less Coulombic attraction to nucleus?
  - When an electron is in a higher energy level, is it easier to remove or harder to remove?  
When an electron is in a lower energy level, is it easier to remove or harder to remove?
  - When an electron is in a higher energy level, does it have a higher or lower 1st ionization energy?  
When an electron is in a lower energy level, does it have a higher or lower 1st ionization energy?
  - Why is a calcium atom larger than a magnesium atom?
- Moving across a row (L to R) on the PT, does  $Z_{\text{eff}}$  increase, decrease, or stay the same?
  - Moving across a row (L to R) on the PT are valence electrons more or less attracted to the nucleus?
  - Moving across a row (L to R) on the PT, does the atomic radius increase or decrease?
  - Moving across a row (L to R) on the PT, does the ionization energy increase or decrease?
  - Why do atoms get smaller moving across a row (L to R) on the PT?
- When reading a PES graph, what does the height of a peak represent?
  - When reading a PES graph, does a larger binding energy mean that the electrons are closer or farther from the nucleus?
- Which orbital comes after 4s? After 3d? After 4p? After 5s?
- Which electrons are removed first when making a cation? s, p, d, or f?
  - Arrange these electrons in the order in which they are removed when forming a cation: s, p, d, f.
- Isotopes of an element have the same number of \_\_\_\_\_, but different number of \_\_\_\_\_.
  - What makes an isotope of an element different from one another?
- What do mass spectroscopy graphs measure?
  - What instrument measures the atomic masses of the isotopes of an element?
- Elements in the same group (vertical columns) have similar \_\_\_\_\_.
  - Elements in the same \_\_\_\_\_ have similar chemical and physical properties.
- Is gallium a metal, nonmetal or metalloid? What about hydrogen? What about uranium?
- Are cations larger or smaller than their atoms? What about anions?
  - Why are anions larger than their atoms?