**Group 1**

1. An ultraviolet photon with a wavelength of 0.45 nm will cause one of sulfurs valence electrons to transition to a higher energy level.
   * 1. Calculate the frequency of the photon.



* + 1. Calculate the energy of the photon.



* + 1. How much energy is there in one mole of UV photons?



Transition Element Inner Transition Element Representative Element

Alkaline Earth Metal Alkali Metal Noble Gas Halogen

Non-metal Semi-metal Metal

s-block element p-block element d-block element f-block element.



1. Li:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. Pd:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. Ge:\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_



1. What are the 2 variables related to coulombic attraction? How are they related to coulombic attraction?



1. The Zeff \_\_\_\_\_\_\_\_\_\_\_\_ across a period and \_\_\_\_\_\_\_\_\_\_\_\_\_\_ down a group.



* 1. How is Zeff related to coulombic attraction?



1. The shielding \_\_\_\_\_\_\_ \_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ across a period and \_\_\_\_\_ down a group.



* 1. How is shielding related to attraction?



**Use principles of atomic structure and molecular structure, to explain the following. Discuss all elements/ions in each response.**

1. Which atom has lower first ionization energy? Rb or Na. Explain.

**Rubidium has a lower first ionization energy than sodium.**

**Rubidium has valence electrons in the fifth energy level, and sodium has valence electrons in the third energy level. The effective nuclear force experienced by the valence electrons in each atom is the same.**

**Since the distance between the valence electron and nucleus is further in Rb than in Na, there is less coulombic attraction between the nucleus and valence electron. *Therefore, it will take less energy to remove the electron in Rb than Na.***

**\*\*\*Must have the part underlined**

1. Which ion is smaller? P-3 or Cl-1. Explain.

**Cl-1 is smaller than P-3.**

**The valence electrons in Cl-1 and P-3 are in the 3rd energy level. Cl-1 has more protons than P-3 and are isoelectronic.**

**The valence electron in Cl-1 experiences a higher effective nuclear charge than P-3 making Cl-1 smaller than P-3.**

**Group 2**

1. What are the 2 variables related to coulombic attraction? How are they related to coulombic attraction?



1. The Zeff \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ across a period and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ down a group.



* 1. How is Zeff related to coulombic attraction?



1. The shielding \_\_\_\_\_\_\_ \_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ across a period and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ down a group.



* 1. How is shielding related to attraction?



1. Circle the particle with the greatest chemical reactivity

a. N or O b. Br or I c. Ba or Sr



d. Sn or Pb e. Ga or Ge f. Li or Be



**Use principles of atomic structure and molecular structure, to explain the following. Discuss all elements/ions in each response.**

1. Which atom has a larger atomic radius? Magnesium or strontium. Explain.

Strontium has a larger atomic radius than magnesium.

Magnesium’s valence electrons are in the 3rd energy level, and strontium’s valence electrons are in the 5th energy level. The effective nuclear force experienced by Sr and Mg’s valence electrons are the same.

Since the valence electrons are further from the nucleus in Sr than Mg, Sr has a lower coulombic attraction than Mg. Therefore, Sr is larger than Mg.

1. Explain why S has higher first ionization energy than aluminum. Explain.

Sulfur has a higher first ionization energy than aluminum.

Both aluminum and sulfur have valence electrons occupying the 3rd energy level. Zeff is higher for sulfur (Zeff = 6) than for aluminum (Zeff = 3).

Since sulfur exhibits a higher effective nuclear charge, its valence electrons will experience a greater attractive force towards the nucleus. ***Therefore, it will take more energy to remove the valence electron in S than Al.***

\*\*Must have what is underlined

1. Explain why Al is smaller than Mg. Explain.

Aluminum has a smaller atomic radius than magnesium.

Both aluminum and magnesium have valence electrons in the 3rd energy level. The effective nuclear force experienced by aluminums valence electrons is greater (Zeff = 3) than the effective nuclear force experienced by the valence electrons in magnesium (Zeff = 2).

There is a greater coulombic attraction between the valence electron and nucleus in aluminum than magnesium because Al has a higher Zeff. Therefore, the Al will be smaller than Mg.

**Group 3**

1. What are the 2 variables related to coulombic attraction? How are they related to coulombic attraction?



1. The Zeff \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ across a period and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ down a group.



* 1. How is Zeff related to coulombic attraction?



1. The shielding \_\_\_\_\_\_\_ \_\_\_\_ \_\_\_\_\_\_\_\_\_\_\_ across a period and \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_ down a group.



* 1. How is shielding related to attraction?



***Answer the following:***

1. Use “ > ” or “ < ” symbols to compare the atomic radius of each:

a. I or I-1  b. Sr or Sr+2 c. Mg or Be



d. Cl-1 or F-1 e. Cs+1 or Ba+2 f. K or Ca



g. Si or S h. O-2 or Se-2 i. Ga+3 or As-3



1. Use “ > ” or “ < ” symbols to compare the ionization energy of each:

a. F or Cl b. Li or Cs c. Rb or Sr



d. C or O e. F or Fr f. Sr or I



1. Use “ > ” or “ < ” symbols to compare the electronegativity of each.

a. P or S b. Na or Mg c. C or Si



d. Be or Ba e. Al or Cl f. Li or F



1. Metals will \_\_\_\_\_\_\_ (gain/lose) electrons to form \_\_\_\_\_\_\_\_ (cation/anion) which have a \_\_\_\_\_\_\_\_\_\_\_ (positive/negative) charge.



1. Nonmetals will \_\_\_\_\_\_\_\_\_\_ (gain/lose) electrons to form \_\_\_\_\_\_\_\_\_\_ (cation/anion)which have a \_\_\_\_\_\_\_\_\_\_ (positive/negative) charge.



1. Cations are always \_\_\_\_\_\_\_\_\_\_ (larger/smaller) than the neutral atom because the effective nuclear



charge on cations is \_\_\_\_\_\_\_\_\_\_ (larger/smaller).



1. Anions are always \_\_\_\_\_\_\_\_\_\_(larger/smaller) than the neutral atom because the effective nuclear charge on anions is \_\_\_\_\_\_\_\_\_\_(larger/smaller).



1. Determine the charge of the most common ion formed by each of the following:



a. Na b. S c. Al d. Sn e. Ba



f. Cl g. P h. C i. Cd

