Honors Chemistry
Ms. Ye

Name _____
Date _____ Block ____

Do Now:

1. Complete the table based on the example given

Location	**Element**	**Metal, Nonmetal or Semi-metal (Metalloid)?**	**Group/Family Name**
Group 1, Period 1	Hydrogen (H)	Nonmetal	(none)
Group 11, period 5			
Group 14, Period 4			
Group 17, Period 5			
Group 17, Period 4			

2. Why do all elements want to be like a noble gas?

3. Which of the following elements has the most similar properties to Ca?

   (elements in the same _____ have the most similar properties because they have the same _____)

   a. K b. Sc c. Sr d. Ar

<u>Review-Properties of Elements & Periodic Trends:</u>

New terms:

- **Nuclear Charge-**a measure of the positive attractive force of the nucleus towards negatively charged electrons due to the number of _____; how much attractive force an electron feels can be affected by the number of shielding electrons (defined below)

- **Electron Shielding Effect-**electrons in the energy levels _____ to the nucleus protects the electrons in the _____ and lessens the effect of the positive, attractive force of the nucleus

1. **Atomic Radius:** _____

- When looking at elements **going down a GROUP**, **atomic radius** _____
  - As you go down a group, more _____ are being added
- When looking at elements **going across a PERIOD, atomic radius** _____
  - As you go across a period, the _____ therefore the nucleus more strongly attracts the electrons of the atom, and the radius decreases

Examples: For each pair of elements below, circle the one with the larger atomic radius.

a. Na and Cl
c. C and B
e. K and Se
g. Br and Ca

b. Mg and Sr
d. Ar and Ne
f. Sb and B
h. Ge and C

Use **nuclear charge to explain/show why Be has a smaller atomic radius than Li. Include a Bohr diagram for both Li and Be.

2. **Electronegativity:** _____

- When looking at elements **going across a PERIOD**, **electronegativity** _____
  - As you go across a period, the _____ therefore the nucleus more strongly attracts the electrons of the atom
  - Elements towards the right side of the periodic table are "closer to becoming a noble gas—they want to _____"
  - Exception: _____
- When looking at elements **going down a GROUP, electronegativity** _____
  - As you go down a group, the atomic radius increases. The <u>inner shells shield the valence electrons from the nucleus</u>, therefore the attraction for electrons decreases

Examples For each pair of elements below, circle the one with the greater Electronegativity.

a. Na and Cl
c. C and B
e. K and Se
g. Br and Ca

b. Mg and Sr
d. Ar and Ne
f. Sb and B
h. Ge and C

3. Ionization Energy: _____

- When looking at elements **going down a GROUP, ionization energy** _____
  - As you go down a group, the atomic radius _____. As the distance (size) between the nucleus and the outermost electrons increases, it is easier (requires _____ energy) to remove an electron
- When looking at elements going **across a PERIOD, ionization energy** _____
  - As you go across a period, the _____ therefore the nucleus more strongly attracts the electrons of the atom, making it harder to remove an electron
  - Elements towards the right side of the periodic table _____ (they want to gain electrons) to become like a noble gas. Therefore, it is difficult (requires _____ energy) to remove an electron

Examples: For each pair of elements below, circle the one with the greater Ionization Energy.

a. Na and Cl
b. Mg and Sr
c. C and B
d. Ar and Ne
e. K and Se
f. Sb and B
g. Br and Ca
h. Ge and C

Use **electron shielding to explain why Mg has a lower ionization energy and a lower electronegativity than Be. Include a Bohr diagram for both Mg and Be.

More about Ionization Energy….

- First Ionization Energy –energy required to _____
- Second Ionization Energy – energy required to _____
- Third Ionization Energy – energy required to _____
- In general 1st I.E. _____ 2nd I.E. _____ 3rd I.E.
- Based on the relative "jump" between ionization energies, you can tell how many _____ the element has

1.

Ionization Energy in kJ/mol	1st	2nd	3rd	4th
	578	1817	2745	11580

a. Between which 2 ionization energies do you see the biggest jump?

b. How many valence electrons would this element have?

c. What group would this element be found in?

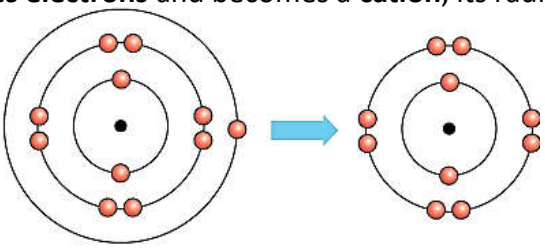
2.

Ionization Energy in kJ/mol	1st	2nd	3rd	4th
	737	1450	7732	10540

What group would this element be found in?

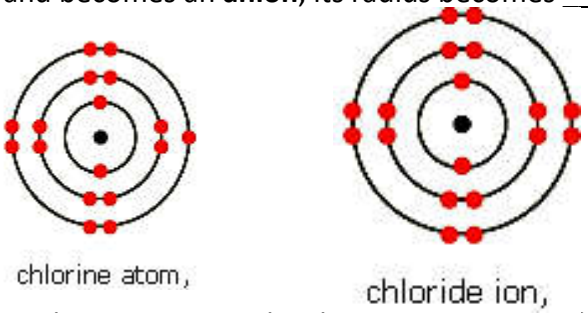
Ions and Ionic Radius

- When an atom **loses electrons** and becomes a **cation**, its radius becomes _____ than that of the neutral atom



  - # protons _____# electrons, therefore increasing the effective nuclear charge, meaning that there is a stronger pull of the electrons towards the nucleus.

- When an atom **gains electrons** and becomes an **anion**, its radius becomes _____ than that of a neutral atom



  - When electrons get added to the same energy level, they repel each other

*Note: the term **isoelectronic** refers to _____

Properties of Metals vs. Nonmetals

Metals	Nonmetals
• _____ (can be hammered/molded into sheets) • _____ (can be drawn/pulled into a wire) • Have _____ (are shiny when polished) • Good _____ (allow heat & electricity to flow throw them)	_____ malleable or ductile; instead, they are _____ (shatter easily) • _____ luster; instead, they are _____ • They are either _____ or _____ conductors

<u>Reactivity of Metals vs. Nonmetals</u>

- Reactivity of a metal is related to its _____
  - The _____,
    the _____ the metal
  - Trend (within the metals on the periodic table):
    - Going down a group: _____
    - Going across a period: _____
  - Most reactive metal: _____

- Reactivity of a nonmetal is related to its _____
  - The_____,
    the _____ the nonmetal
  - Trend (within the nonmetals on the periodic table):
    - Going down a group: _____
    - Going across a period: _____
  - Most reactive nonmetal: _____

Periodic Trends Questions:

1. Which of the following atoms has the smallest atomic radius?
   a. Li *Explain your answer using the term **nuclear charge:**
   b. Be
   c. C
   d. F

2. As the elements of a group are considered from top to bottom, the atomic radius
   a. Increases *Explain how the radius, along with electron shielding, would affect
   b. Decreases the ionization energy as you consider elements going down the group:

3. Which element in group 17 is *least likely* to lose an electron?
   a. Chlorine *Explain your answer using electronegativity and nuclear charge
   b. Iodine
   c. Bromine
   d. Fluorine

4. Of all the elements, the one with the highest electronegativity is found in period
   a. 1 *What is the identity of this element? How do you know?
   b. 2
   c. 3
   d. 4

5. As the elements in group 2 are considered in order of increasing atomic number, what happens to the atomic radius? Why?

6. Fill out the following table about metals and nonmetals

	Metals	**Nonmetals**
Location on Periodic Table		
Lose or Gain electrons to obtain noble gas electron configuration?		
Form cations or anions?		
Relative ionization energy (high or low)		
Relative electronegativity (high or low)		