

## Lesson 5: Groups and Periodicity

text: 75-85, 689-696

what to know:

- general characteristics of metals, semimetals (metalloids) and nonmetals and of the following groups: alkali metals, alkaline earth metals, halogens and noble gases, §3-1 & §3-2
- allotropes, §3-1
- periodic law, periodic table, groups (families), periods, representative elements, transition elements, lanthanides, rare earth elements, actinides, §3-2
- periodic trends of atomic and ionic radii, §17-3
- concept of ions and isoelectronic series such as  $\text{Al}^{3+}$ ,  $\text{Mg}^{2+}$ ,  $\text{Na}^+$ ,  $\text{Ne}$ ,  $\text{F}^-$ ,  $\text{O}^{2-}$ ,  $\text{N}^{3-}$
- periodicity and trends of ionization energies, p-689-690

questions:

1. Describe the general distinguishing characteristics of metals, nonmetals and metalloids.
2. Describe the general distinguishing characteristics of the following groups: alkali metals, alkaline earth metals, halogens and the noble gases.
3. Which has the largest atomic radius? K Ca Rb Sr
4. Which has the largest atomic radius?  $\text{S}^{2-}$  Cl  $\text{K}^+$   $\text{Ca}^{2+}$
5. Which has the smallest atomic radius? Na  $\text{Na}^+$   $\text{Mg}^{2+}$   $\text{Al}^{3+}$
6. Which has the smallest atomic radius?  $\text{N}^{3-}$   $\text{O}^{2-}$   $\text{F}^-$  F
7. Which has the lowest first ionization energy? Li Be Na Mg
8. Which has the largest first ionization energy? F Ne Cl Ar
9. Which has the lowest second ionization energy? Na Mg Al
10. Predict the formula for lanthanum chloride.
11. Why is the second ionization energy always greater than the first ionization energy regardless of the element being considered?
12. Explain why negative ions are always larger than their corresponding atoms.
13. Explain why atomic radii decrease going across a period from left to right.
14. What is the relationship of the size of an atom to its ionization energy and electronegativity?
15. Name the elements which are gases at room conditions. Where are they found on the periodic table?