VALENCE ELECTRONS AND ELECTRON DOT DIAGRAMS

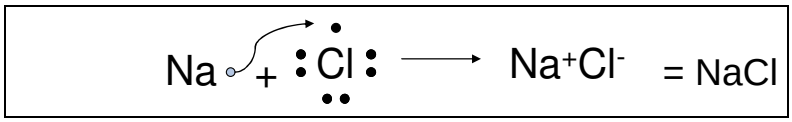
The valence electrons are the electrons in the outermost principal energy level. They are always "s", "p", or "s and p" electrons. Since the total number of electrons possible in s and p sublevels is eight, there can be no more than eight valence electrons. Electron dot structures are a way to visually indicate the number of valence electrons around an atom. Provide the number of valence electrons and an Electron Dot structure for each atom listed below.

EXAMPLE: Beryllium
Electron configuration: $1s^2\mathbf{2s^2}$
Beryllium has **2** valence electrons.

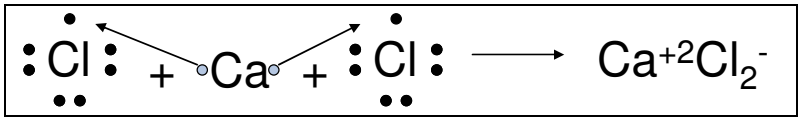
1. Calcium
2. Potassium
3. Helium
4. Mercury
5. Oxygen
6. Aluminum
7. Phosphorus
8. Bromine
9. Hydrogen
10. Barium
11. Sulfur
12. Nitrogen
13. Iodine
14. Magnesium
15. Lithium
16. Copper(I)
17. Sodium
18. Xenon

IONIC BONDING

Ionic bonding occurs when a metallic atom transfers one or more electrons to a nonmetallic atom in an effort to achieve a stable octet of electrons (noble gas configuration). This can be depicted in an Electron Dot Diagram, as shown below.



Multiple electron transfers may require more than one of an atom, as shown below.



Show the electron transfers and give the formula unit for the following combinations. A partner (1-5), B Partner (6-10).

1. K + F	6. Cu ($3d^{10}4s^{1}$) + O
2. Mg + I	7. Cu ($3d^{9}4s^{2}$) + S
3. Be + S	8. Cd + F
4. Na + O	9. Sn + Se
5. Al + Br	10. In + P

Name: _____ Date: _____ Period: _____

Show the transfer of electrons for the following pairs using electron dot structures. A partner (1-5), B partner (6-10).

1. Mg + F

2. Li + N

3. B + O

4. Be + Se

5. Al + F

6. Na + O

7. Ga + Cl

8. In + S

9. Sr + Te

10. K + As

Pre-AP Chemistry – Unit 4, Ionic and Metallic Bonding

Objective 1: Students will use the periodic table and electron dot structures to predict ion formation for common elements and will write and name the formula units of simple compounds. [AT.3.C.4, B.8.C.1, B.8.C.2]

Objective 2: Students will compare and contrast various interatomic and intermolecular forces. [B.9.C.4, B.10.C.1]

Objective 1

1. (a) Use Lewis dot structures to show the electron transfer in the reaction of lithium and nitrogen. (b) List the charge of each ion formed. (c) Write the formula of the resulting compound. (d) List three probable properties of this compound.
2. Name the following compounds: KBr, CaS, Na_3N, $CoCl_2$, AgF, MnO_2, Sn_3P_4, LiH
3. Write formulas for the following: (a) beryllium nitride, (b) mercury(I) oxide, (c) strontium selenide, (d) zinc iodide, (e) magnesium bromide, (f) titanium(IV) arsenide, (g) gallium carbide, (h) cadmium oxide. You may use dot structures to aid you if necessary.
4. Name the following: (a) $NH_4C_2H_3O_2$, (b) PbC_2O_4, (c) KOH, (d) $Be(ClO)_2$, (e) $Mg_3(PO_4)_2$
5. Write formulas for the following: (a) indium bromate, (b) vanadium (III) nitrite, (c) lithium permanganate, (d) aluminum sulfate, (e) cesium cyanide

Objective 2

1. Define the following: metallic bonding, formula unit, malleability, ductility.
2. Explain the process of metallic bonding using a diagram.
3. How are the properties of metals different from ionic compounds?
4. Explain how metals are able to have the following properties: (a) malleability, (b) ductility.